CCLRC
Rutherford Appleton Laboratory

W3C Semantic Web Activity

SKOS RDF

SKOS

Simple Knowledge Organisation System

Alistair Miles

W3C Semantic Web Best Practices and Deployment Working Group

Overview

- Intro
- The Semantic Web
- RDF
- SKOS Core

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- The Semantic Web
- RDF
- SKOS Core

Intro (1)

- Simple Knowledge Organisation System
- SKOS Core
  - An extensible RDF language for **concept schemes**.
- SKOS Mapping
  - An extensible RDF language for **concept mappings.**
- SKOS API
  - A **web service API** for a terminological service

Intro (2)

- Simple Knowledge Organisation System
- SKOS Core
  - An **extensible RDF language** for describing concepts and concept schemes …

  … a **concept scheme** is a ‘set of concepts, optionally including relationships between concepts.’ …

  … i.e. controlled vocabularies, thesauri, classification schemes, glossaries, subject heading systems, terminologies …

  … e.g. AAT, DDC, GEMET, AGROVOC …

Intro (3)

- OWL is the Web Ontology Language, an RDF language for describing ontologies.

- So why SKOS Core if OWL?
  - … modelling directly in OWL requires a **class/instance** based approach …
  - … many controlled vocabularies (KOS) do not take this approach …
  - … therefore expressing such KOS in RDF using OWL requires **remodelling** …
  - … which is potentially **expensive** and sometimes **does not add value**.

Intro (4)

- So SKOS Core …
  - … more flexible, less demanding approach to modelling concepts …
  - … better suited to types of KOS mentioned …
  - … requiring little or no remodelling to express in RDF …
  - … therefore low cost, while adding value through simple benefits of RDF/semantic web approach.

Intro (5)

Conceptual information

Express in RDF using SKOS Core

Low cost
Significant incremental benefits

Remodel as OWL ontology

Higher cost
Added value depends on requirements

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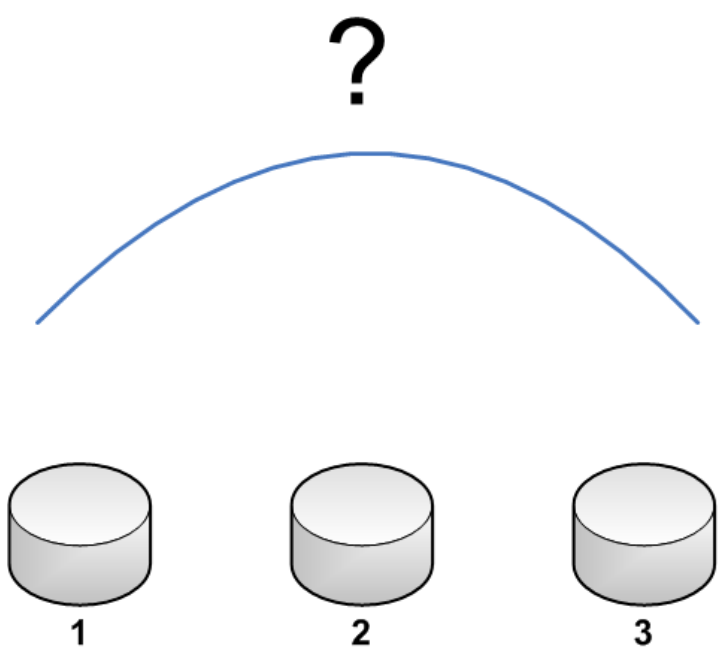
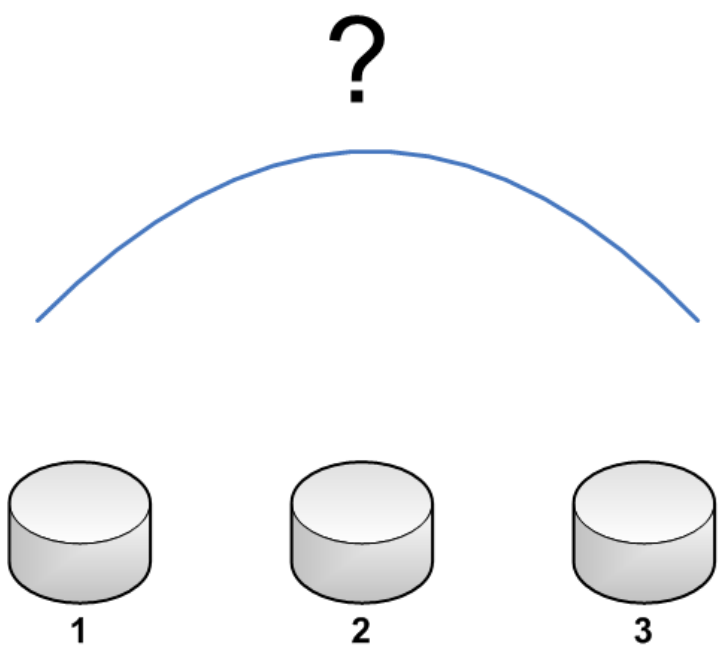
Semantic Web



- Multiple sources of data
- Query as if single source

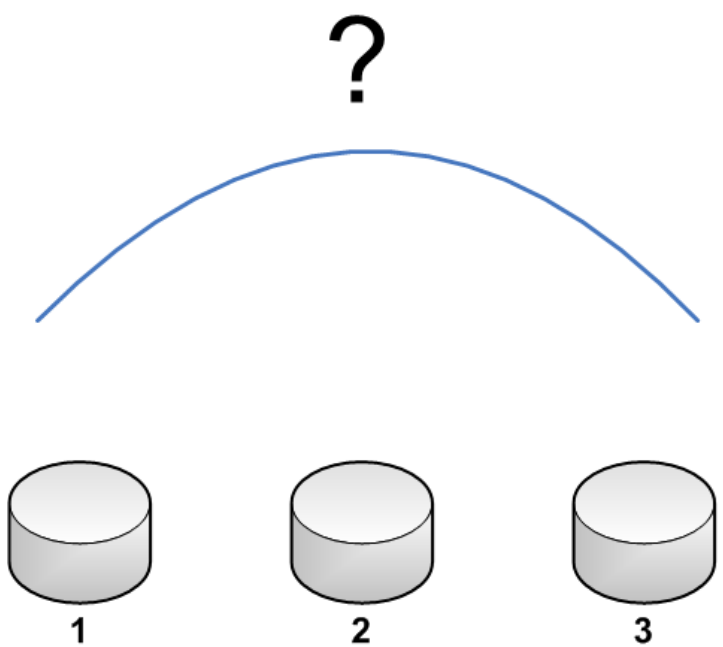
… and that's (pretty much) it.

SW e.g.



1. British library book records, indexed with DDC
2. Bibliotheque nationale de France book records, indexed with DDC
3. The Dewey Decimal Classification Scheme (DDC)

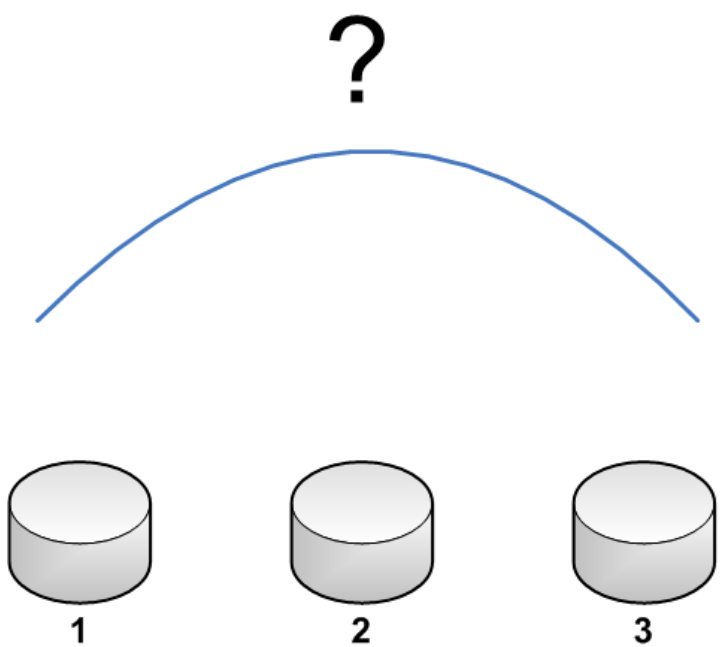
SW e.g.



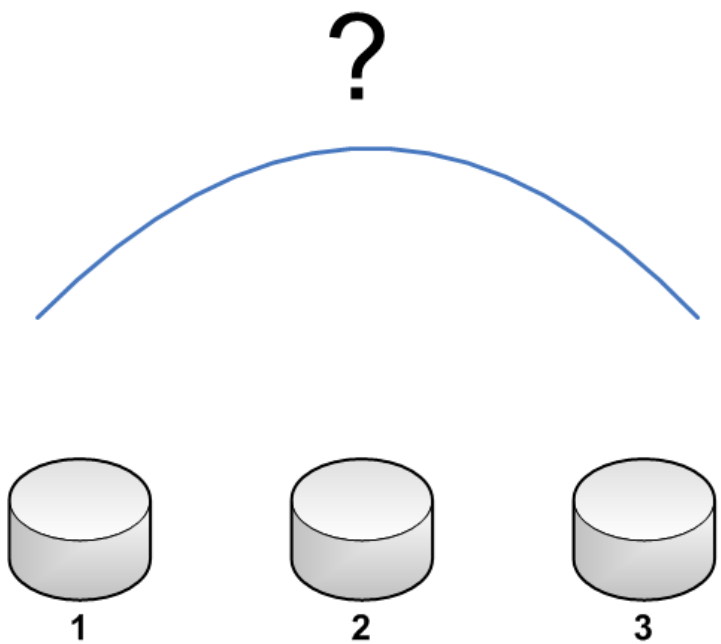
1. PDF document with embedded metadata
2. XHTML 2.0 document with embedded metadata
3. MPEG media file with embedded metadata

SW e.g.

1. Some data
2. Some metadata
3. Some metametadata



SW e.g.


?
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2
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1.


Fuji
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Product of Canada

2.


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Semantic Web is …

… machinery for distributing data.

SW Machinery: URI

- URI
  - Uniform Resource Identifier is a …

  … mechanism for unambiguous identification of ‘resources’ in a global context.

- N.B. ‘Resource’ = ‘Thing’
  - I.e. Can use URIs to identify **anything**, concrete or abstract.

- Architecture of the WWW volume one
  - W3C Recommendation

  http://www.w3.org/TR/webarch/

SW Machinery: RDF

- RDF

  Resource Description Framework is a …

  … tool for **publishing data** …

  … designed to make meaningful composition/integration/aggregation of data sources **easier**.

- N.B. ‘Resource’ = ‘Thing’
  - I.e. Can use RDF to describe anything, concrete or abstract.

- Now a W3C Recommendation

http://www.w3.org/RDF/

SW Machinery: SPARQL

- SPARQL is a …
  … query language for RDF …
  … designed for querying distributed data.

- Now a W3C working draft

http://www.w3.org/TR/rdf-sparql-query/

SW Machinery: RDFS

- RDFS

  The RDF Vocabulary Description Language is a …

  … tool for building data schemas (data vocabularies) …

  … designed to make **re-using** and **combining** data schemas easier, and …

  … designed to support simple inference.

- Now a W3C recommendation

http://www.w3.org/TR/rdf-schema/

SW Machinery: OWL

- OWL

  The Web Ontology Language is a …

  … tool for building data schemas (data vocabularies), extending RDFS …

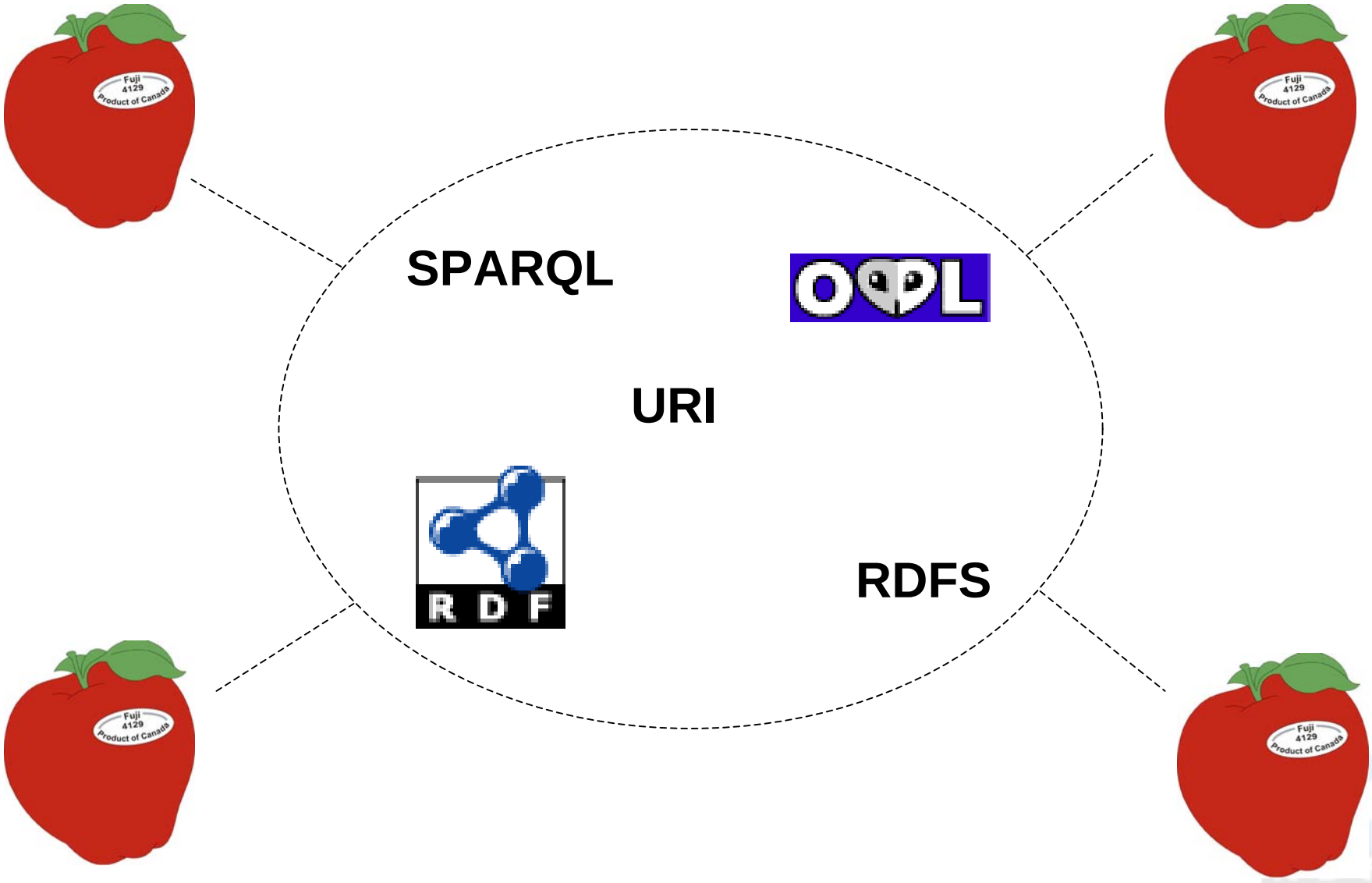
  … designed to support expression of data constraints and …

  … designed to support further levels of inference.

- Now a W3C recommendation

http://www.w3.org/2004/OWL/

SW Machinery



Is it useful?

- Semantic Web grand vision:

  "The Semantic Web is an extension of the current web in which information is given well-defined meaning, better enabling computers and people to work in cooperation."

- … in practice:

  The **Semantic Web** provides a common technological framework (i.e. URI, RDF, SPARQL, RDFS, OWL …) that allows **data** to be shared and reused across application, enterprise, and community boundaries.

- N.B. even if you only have 2 sources of data to integrate, RDF can make your life easier.
  - RDF can reduce cost of data integration at any scale.

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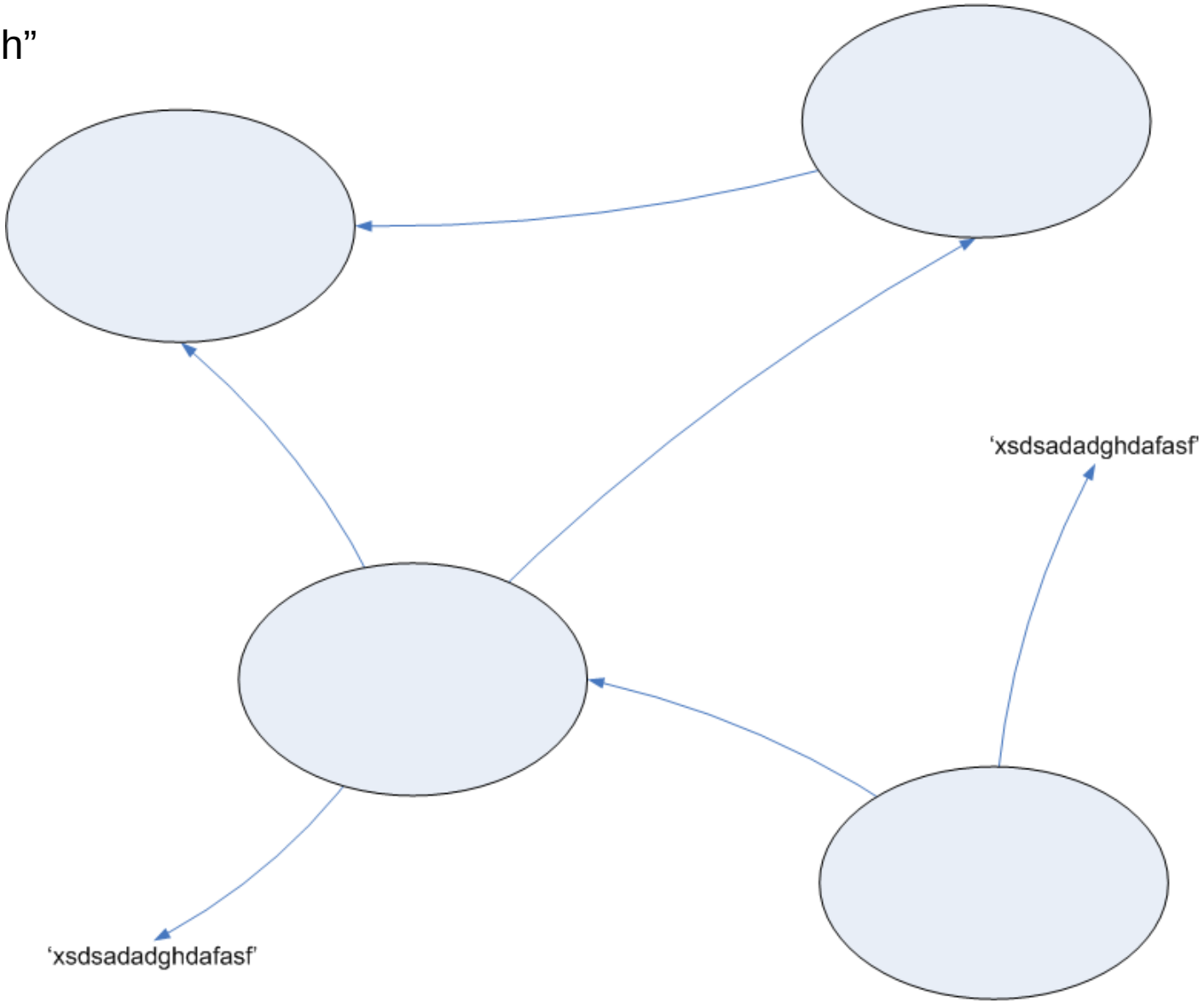
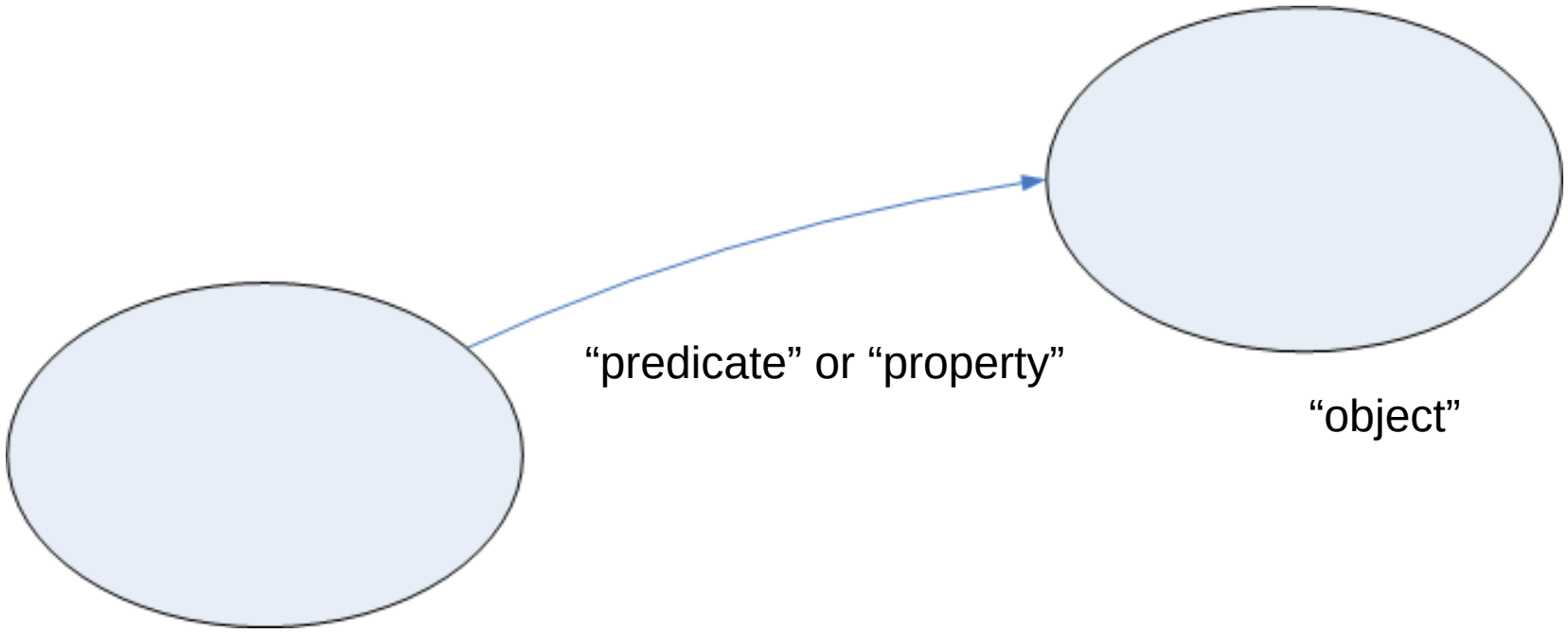
Data in RDF: Graphs

"Graph"

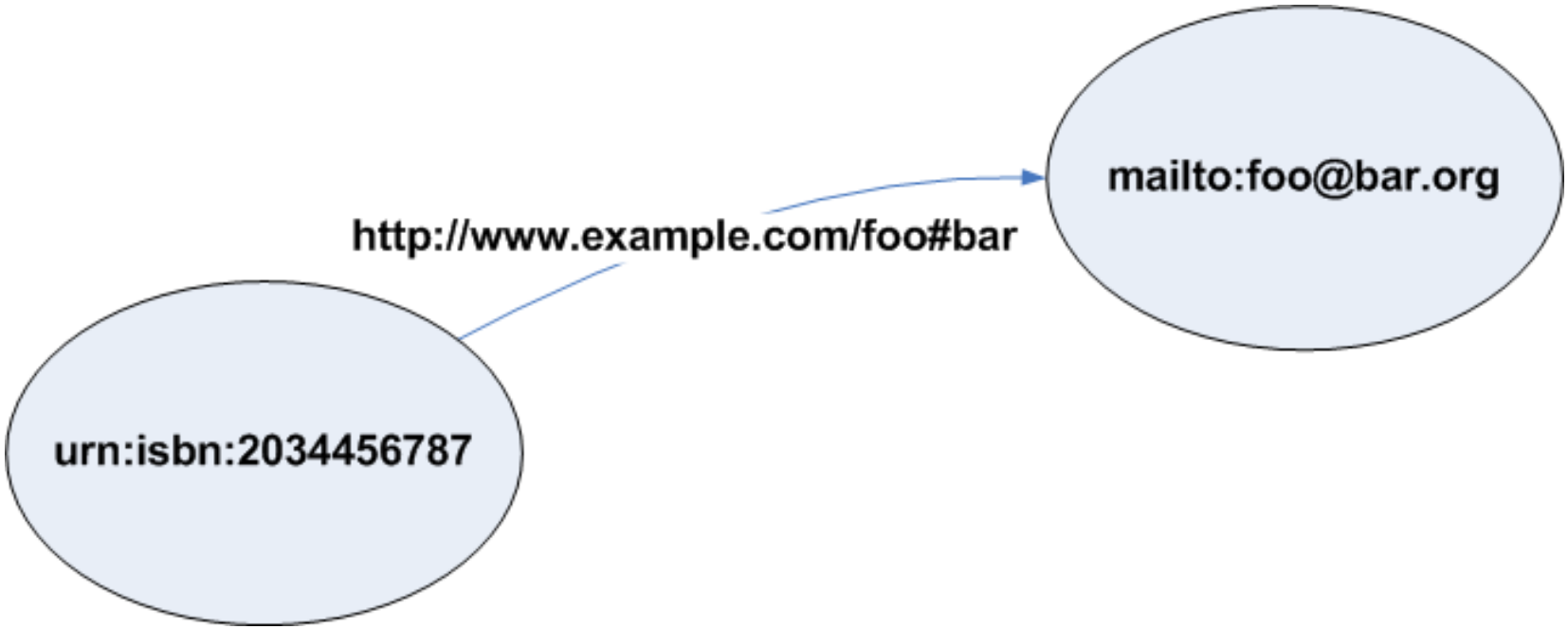


Data in RDF: Triples

"Triple" or "Statement"

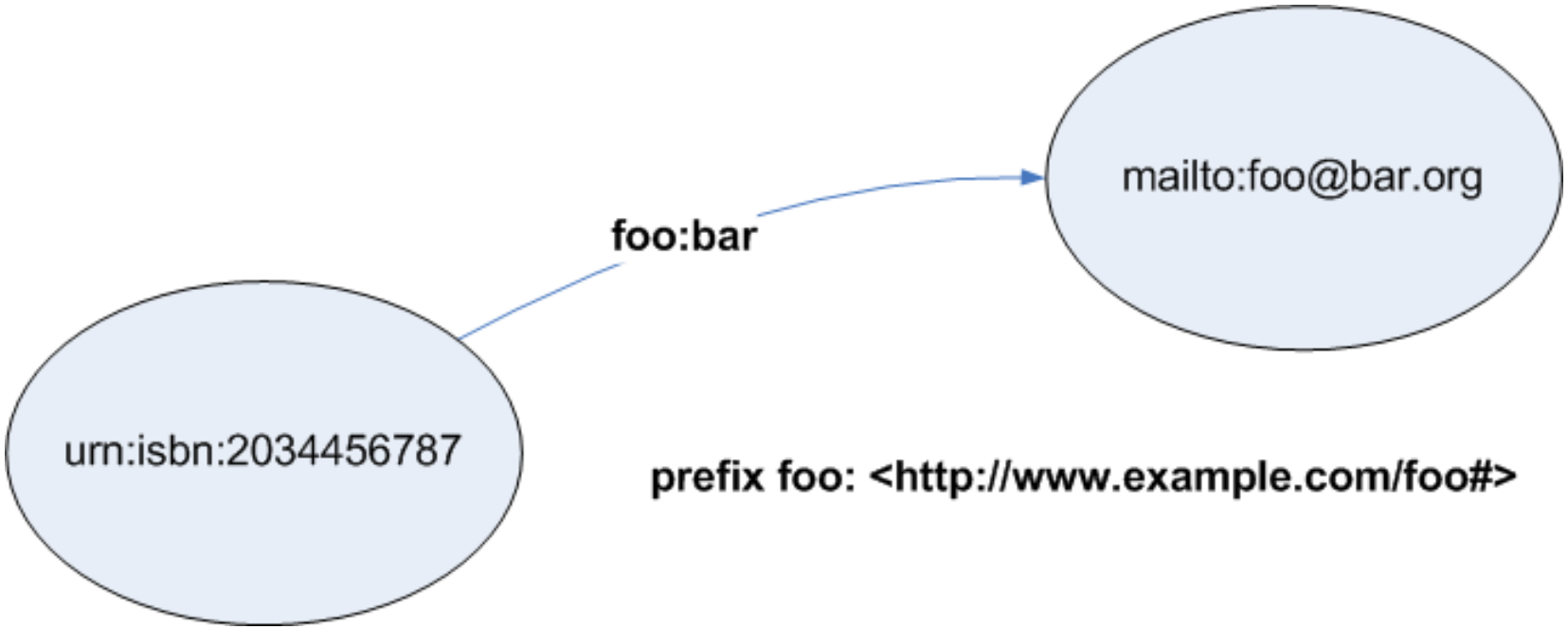


Data in RDF: Triples



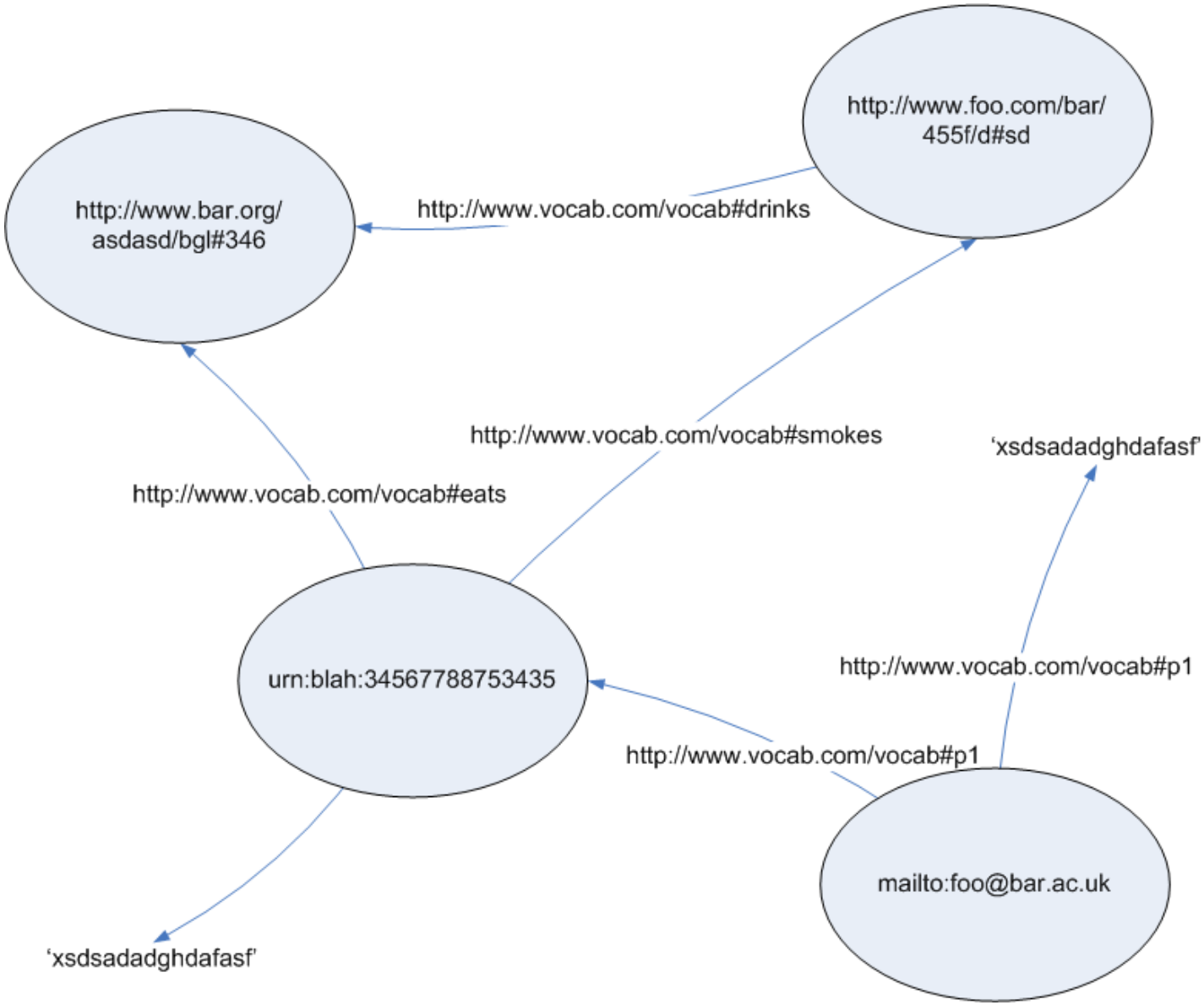
N.B. when distributing data, assume global context
(permits graceful, no hack scaling in unanticipated expansion scenarios)
⇒ Need suitable mechanism for establishing identity in a global context
⇒ URIs.

Data in RDF: Triples



prefix foo: <http://www.example.com/foo#>

Data in RDF


http://www.foo.com/bar/
455f/d#sd
http://www.bar.org/
asdasd/bgl#346
http://www.vocab.com/vocab#drinks
http://www.vocab.com/vocab#smokes
'xsdsadadghdafasf'
http://www.vocab.com/vocab#eats
urn:blah:34567788753435
http://www.vocab.com/vocab#p1
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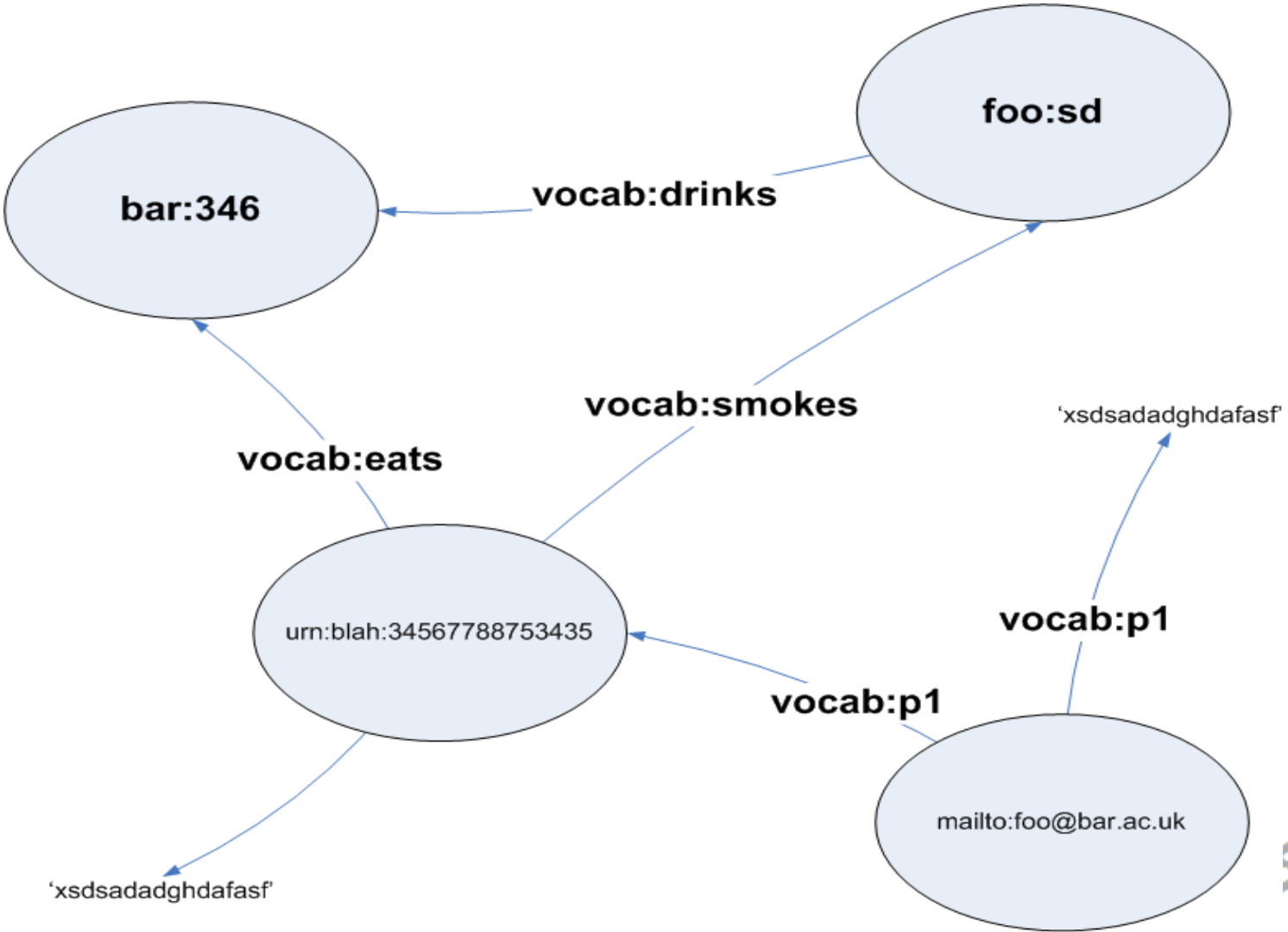
mailto:foo@bar.ac.uk
'xsdsadadghdafasf'

Data in RDF



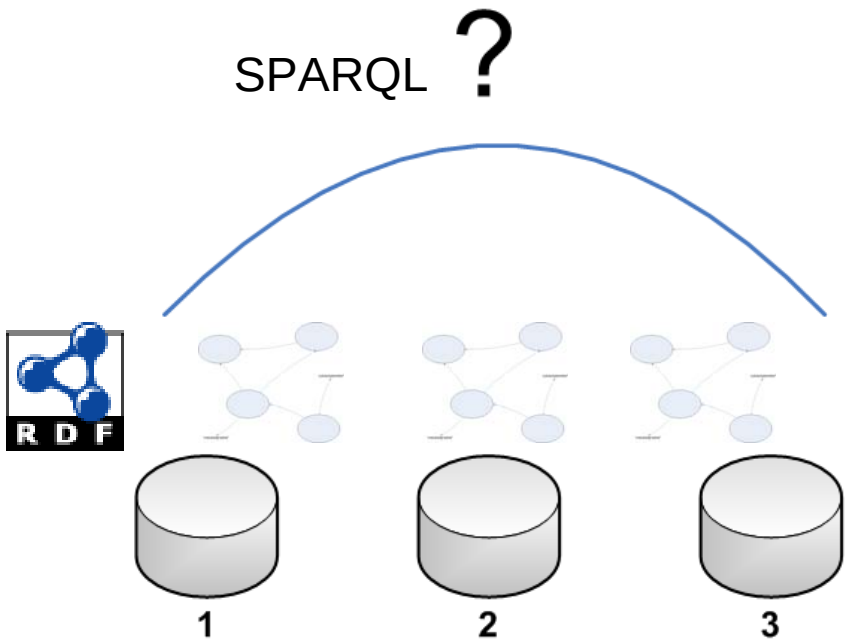
prefix bar: <http://www.bar.org/asdasd/bgl#>
prefix vocab: <http://www.vocab.com/vocab#>
prefix foo: <http://www.foo.com/bar/455f/d#>

RDF Serialisation

- Serialisation for point-to-point transfer of RDF data
- RDF has multiple serialisation syntaxes:
  - RDF/XML
  - Notation 3 (Turtle)
  - N-Triples
  - RDF/A (XHTML 2.0)
- N.B. parsers handle syntax, so you don’t have to worry about it.

RDF & SW

Semantic Web is machinery for distributing data …



… URI use allows multiple sources to refer to the same data (i.e. data linking) …

… RDF's graph model allows multiple sources to be sensibly merged (i.e. data integration) …

… SPARQL allows query of (aggregated) data.

So What Next … ?

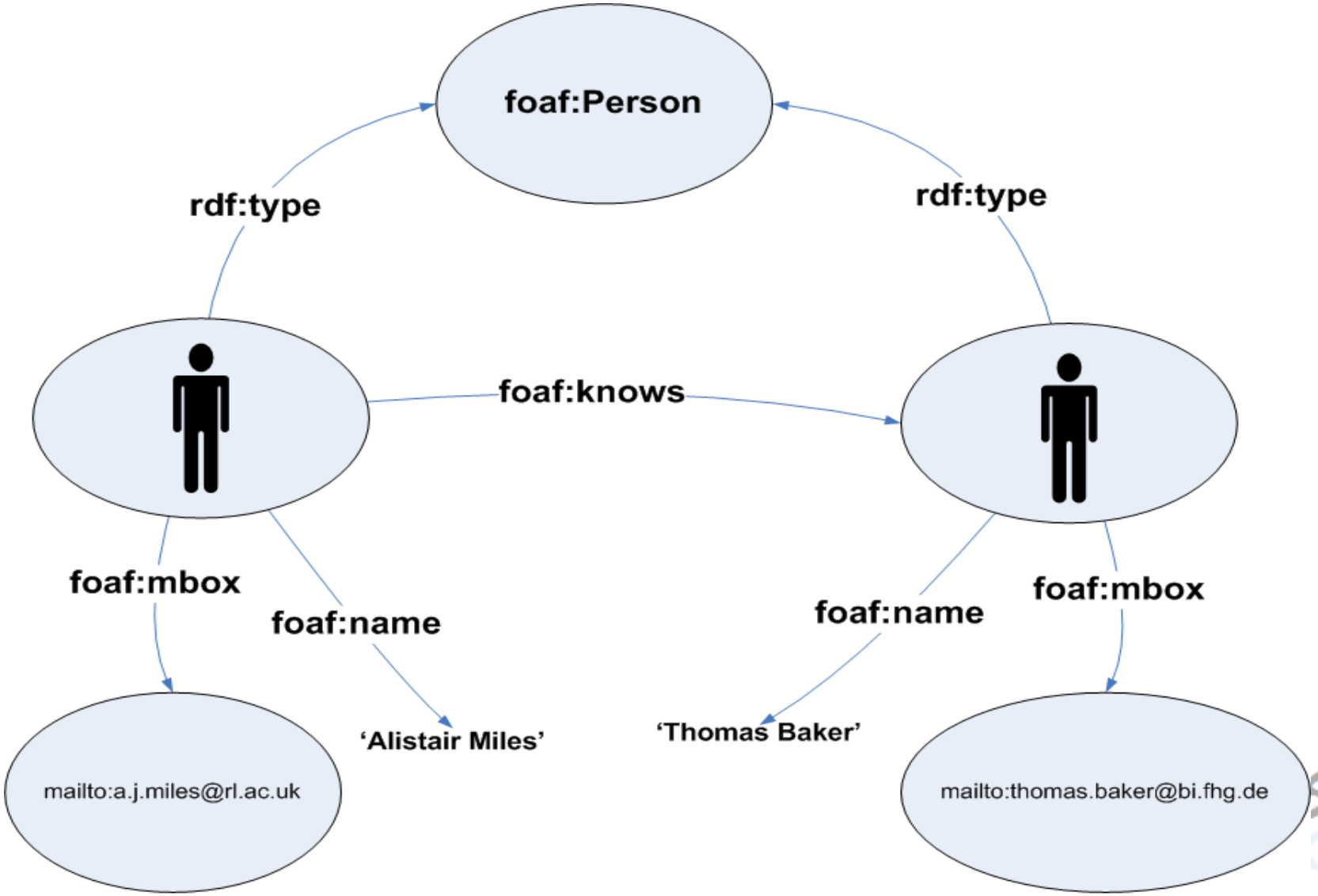
- I have some data and …
- I want to publish in RDF …
- … what do I do?

- You need suitable RDF vocabulary(ies) for expressing your data.

RDF Vocabularies

- Does a suitable RDF vocabulary(ies) exist?
  - E.g. **Dublin Core** for describing basic meta-properties of document-like resources.
  - E.g. Friend of a Friend (**FOAF**) for describing basic attributes of people and social networks.
  - E.g. **RDF-VCard** for personal contact information.
  - E.g. **RDF-iCal** for describing event and calendaring information.
  - E.g. **SKOS Core** for describing concepts & networks of concepts.
  - … and not forgetting **RDFS** and **OWL** for describing classes and properties (metamodelling languages).
- … if not, can I extend an existing vocabulary(ies)?
  - RDFS & OWL provide powerful & convenient functionality for extending existing vocabularies.
- … if not, define & publish your own.

Some Real Data in RDF



prefix foaf: <http://xmlns.com/foaf/0.1/>
prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>

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SKOS Core

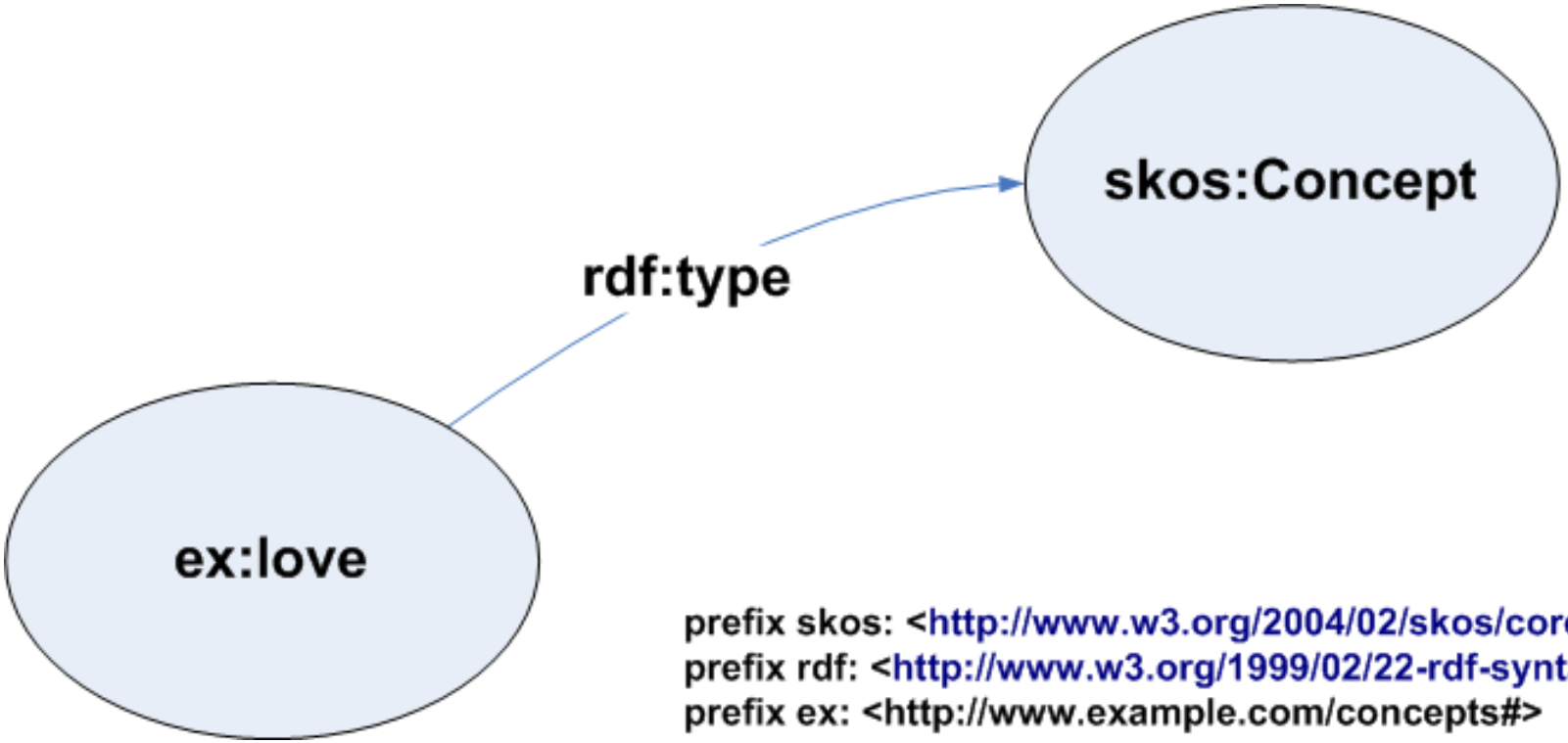
- Simple Knowledge Organisation System
- SKOS Core is a …

  … RDF vocabulary for expressing basic information about **concepts**.
- Some SKOS Core highlights …

SKOS Core: Concepts

- The skos:Concept class
  - A class that allows you to say ‘this resource is a concept.’

SKOS Core: Concepts

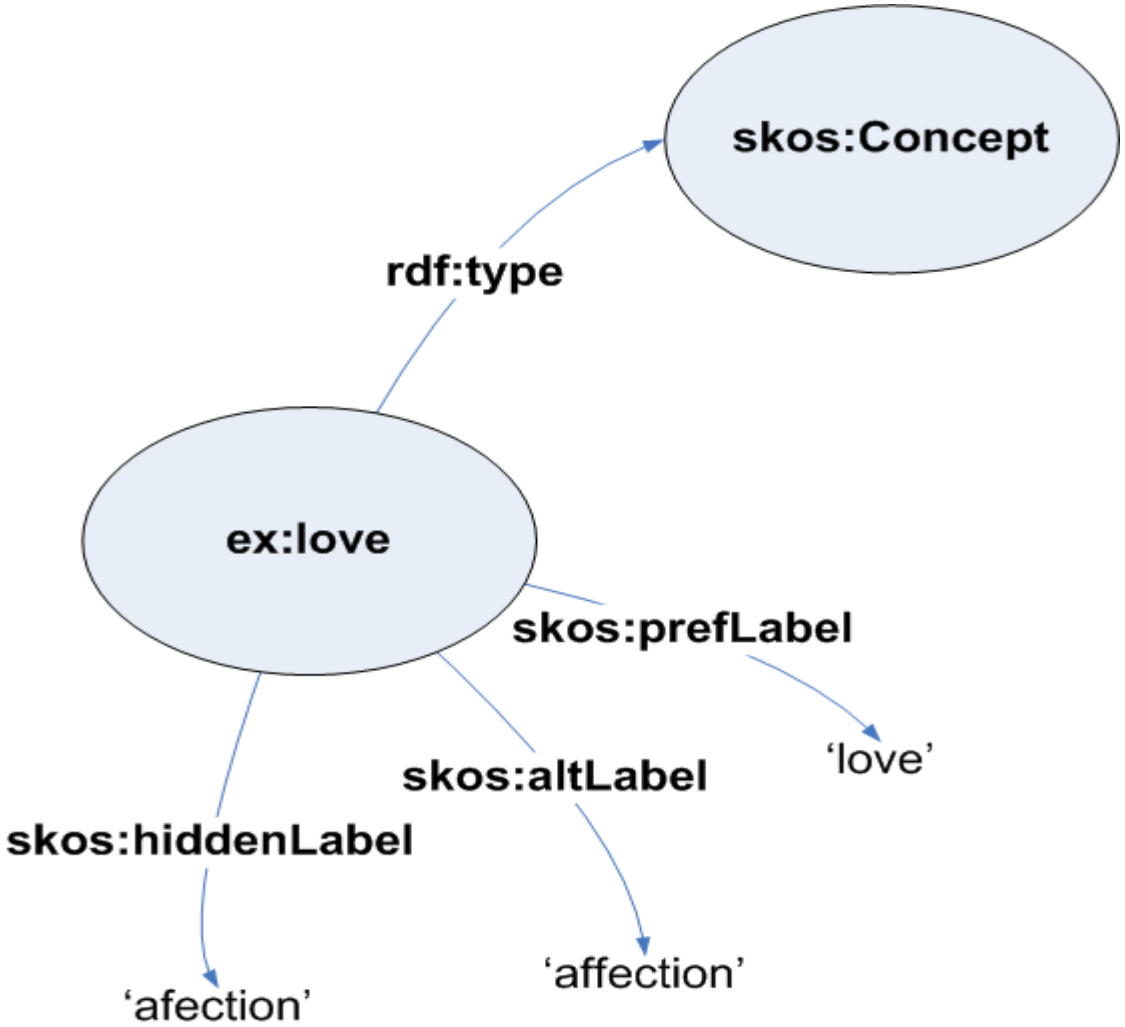


prefix skos: <http://www.w3.org/2004/02/skos/core#>
prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
prefix ex: <http://www.example.com/concepts#>

SKOS Core: Lexical Labelling

- SKOS Core lexical labelling properties
  - A set of properties for associating concepts with lexical representations (i.e. names)

SKOS Core: Lexical Labelling



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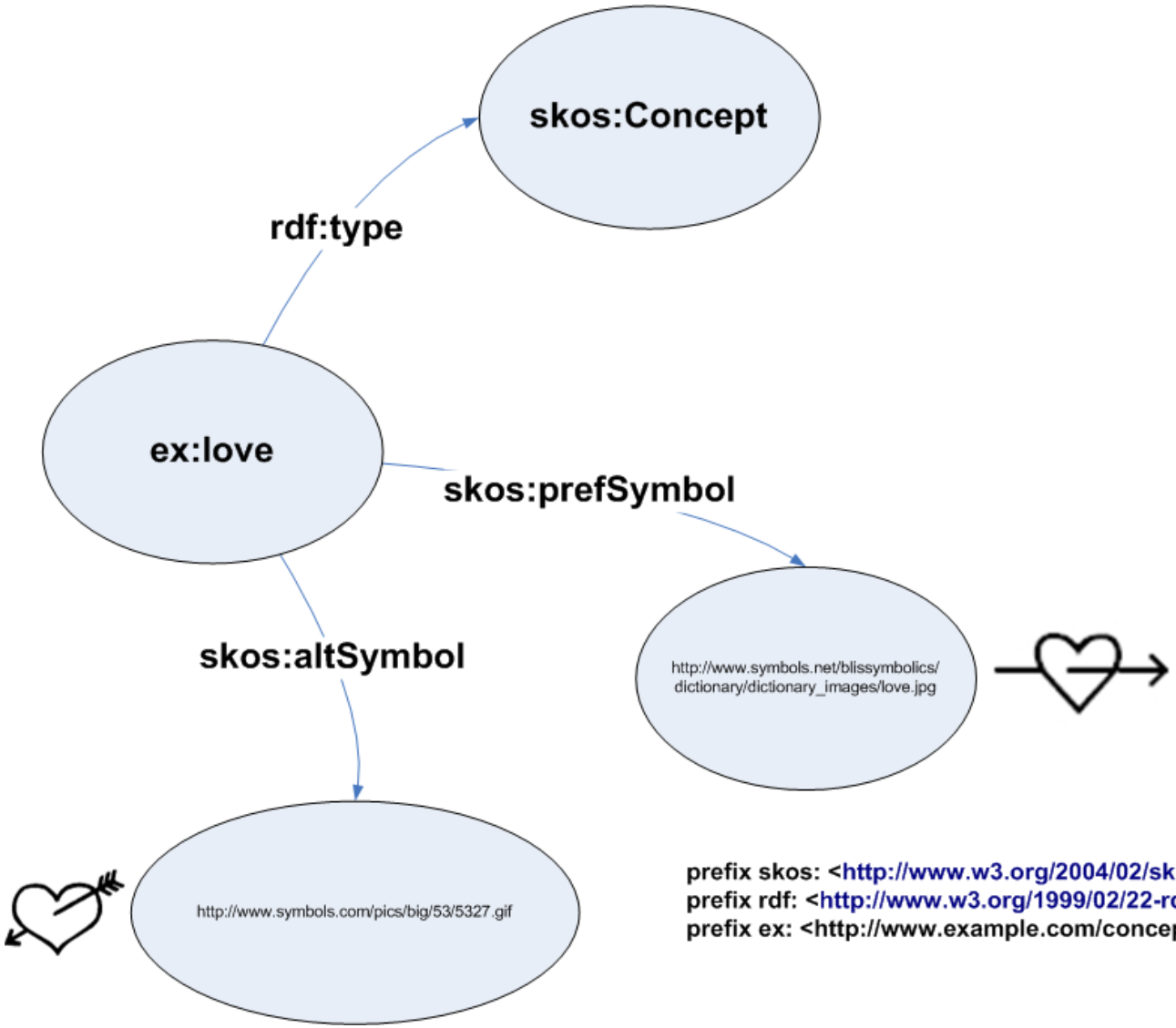
prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
prefix ex: <http://www.example.com/concepts#>

SKOS Core: Symbolic Labelling

- SKOS Core symbolic labelling properties
  - A set of properties for associating concepts with symbolic representations (i.e. symbolic ‘names’)

SKOS Core: Symbolic Labelling

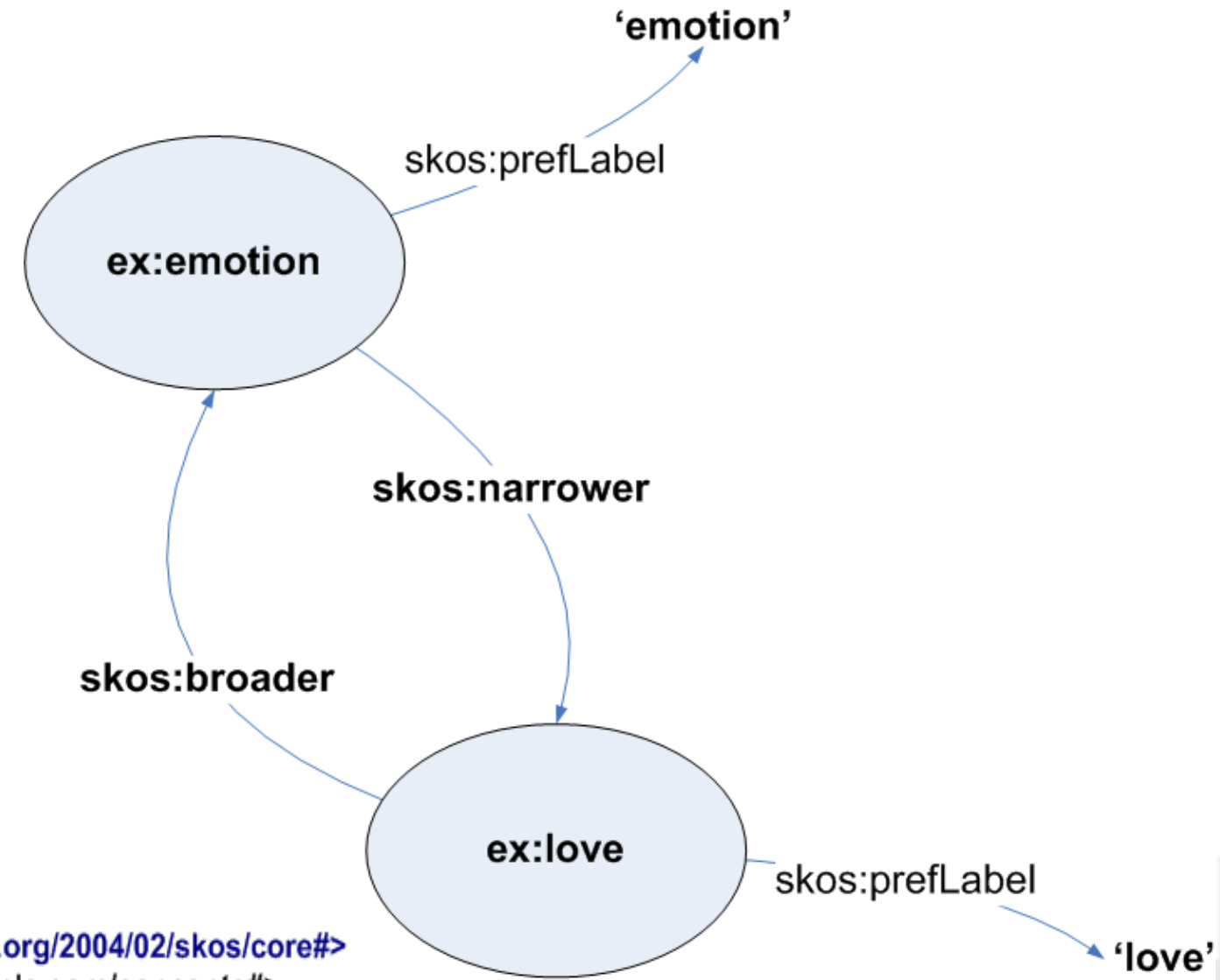


prefix skos: <http://www.w3.org/2004/02/skos/core#>
prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
prefix ex: <http://www.example.com/concepts#>

SKOS Core: Semantic Relations

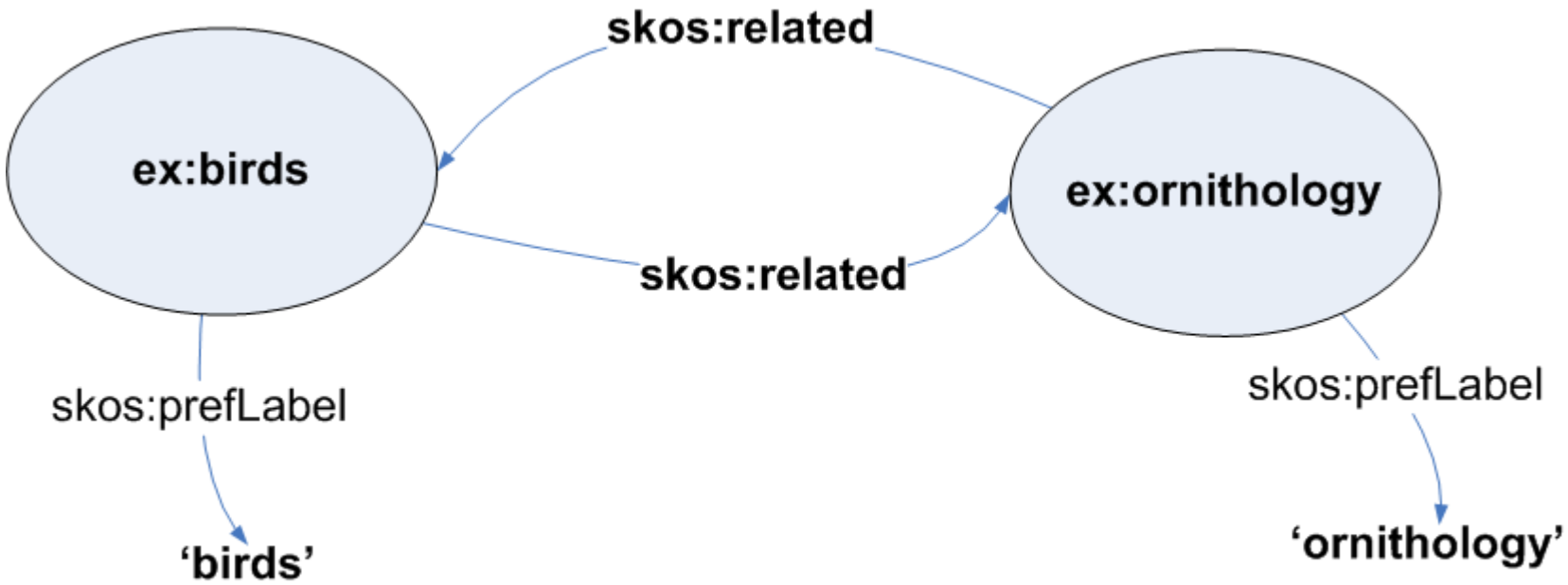
- SKOS Core semantic relation properties
  - A basic set of properties for asserting relationships of meaning between concepts.

SKOS Core: Semantic Relations



prefix skos: <http://www.w3.org/2004/02/skos/core#>
prefix ex: <http://www.example.com/concepts#>

SKOS Core: Semantic Relations

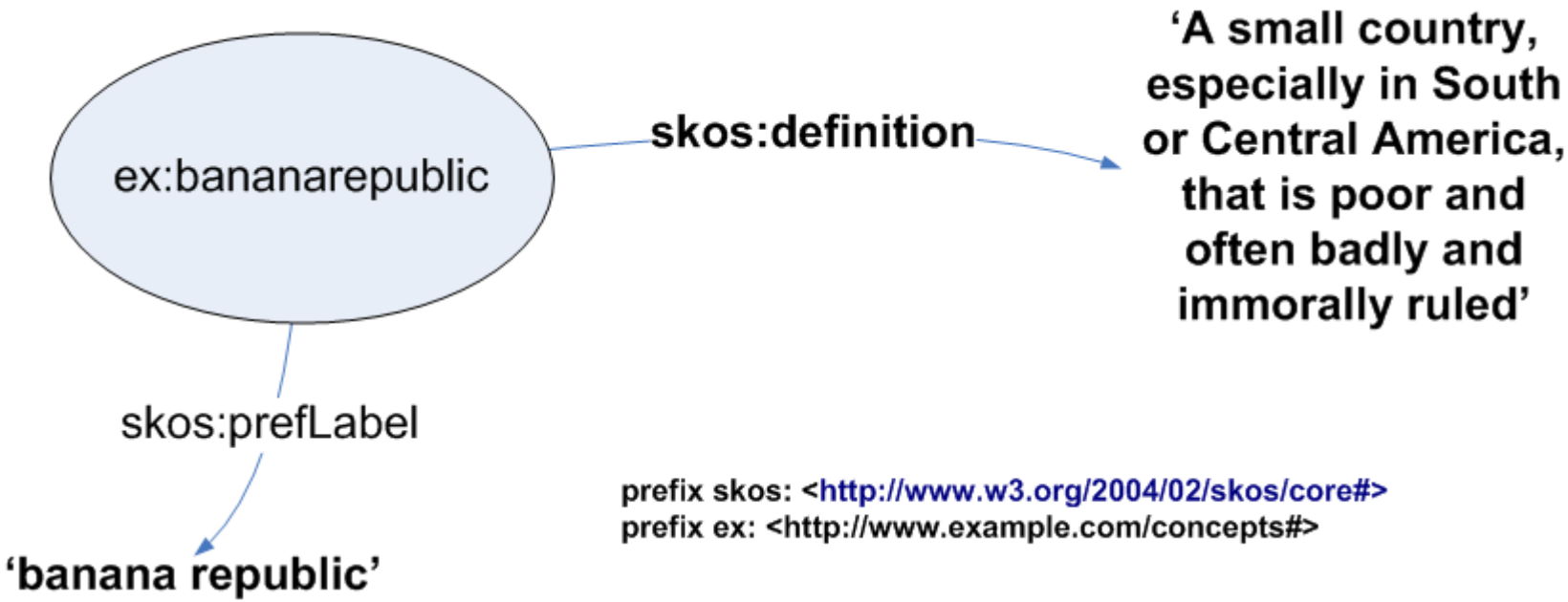


prefix skos: <http://www.w3.org/2004/02/skos/core#>
prefix ex: <http://www.example.com/concepts#>

SKOS Core: Documentation Properties

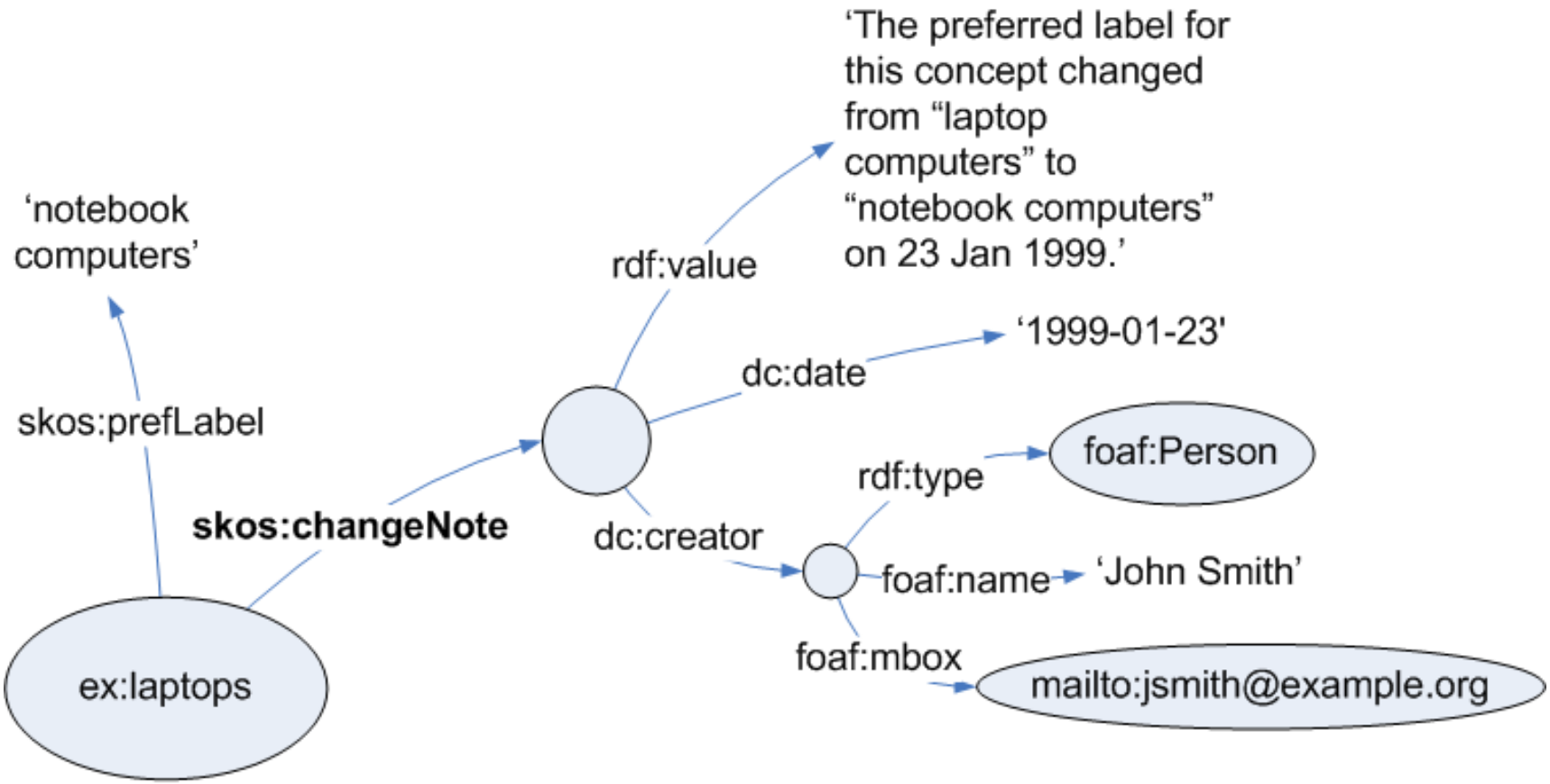
- SKOS Core documentation properties
  - A set of properties for associating concepts with human-readable documentation.

SKOS Core: Documentation Properties



prefix skos: <http://www.w3.org/2004/02/skos/core#>
prefix ex: <http://www.example.com/concepts#>

SKOS Core: Documentation Properties

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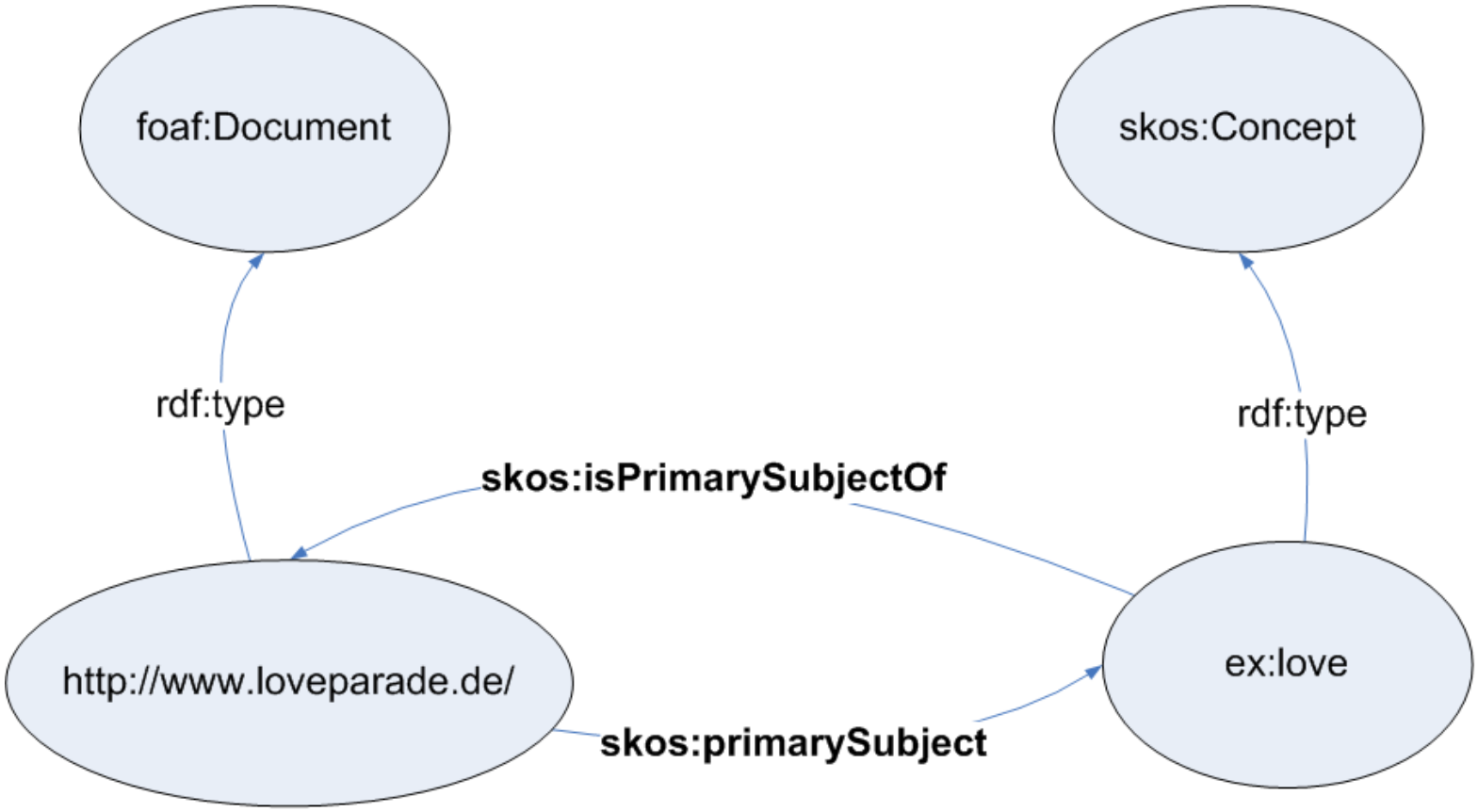
prefix ex: <http://www.example.com/concepts#>
prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
prefix skos: <http://www.w3.org/2004/02/skos/core#>
prefix dc: <http://purl.org/dc/elements/1.1/>
prefix foaf: <http://xmlns.com/foaf/0.1/>
```

SKOS Core: Subject Indexing

- SKOS Core subject indexing properties
  - Set of property extensions to the dc:subject property for asserting relationships between information resources and concepts.

SKOS Core: Subject Indexing



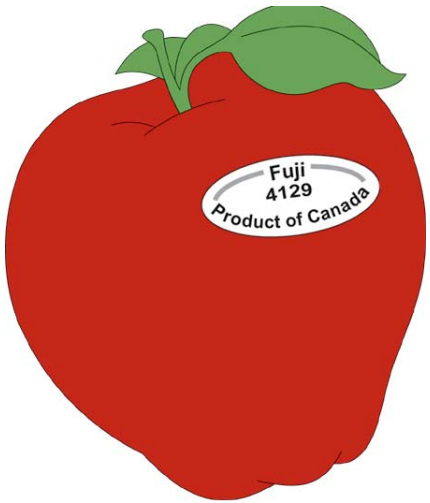
prefix skos: <http://www.w3.org/2004/02/skos/core#>
prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
prefix ex: <http://www.example.com/concepts#>

SKOS Core Overview

- Identify concepts
- Lexical labelling
- Symbolic labelling
- Documentation
- Semantic relations
- Subject indexing

… and more ☺

See http://www.w3.org/2004/02/skos/core/guide/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SKOS Core Development

- Development history
  - Development initiated 7/2003 by Semantic Web Advanced Development for Europe project (SWAD-E)
  - Public development process and open developer community
  - Since 9/2004 development driven by W3C Semantic Web Best Practices and Deployment Working Group
- SKOS Core status
  - Editor's draft
  - About to go to 1st Public Working Draft (WG review)
  - Seeking wider consensus
- Standardisation goal
  - W3C Working Group Note
  - W3C Recommendation track?

Multilinguality

Two patterns for multilinguality:

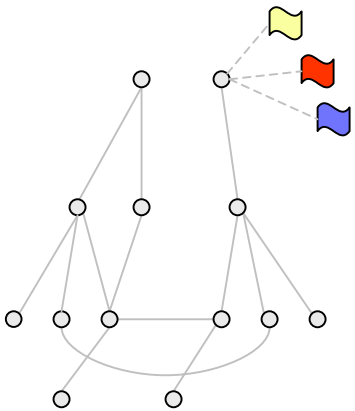
1. Multilingual Labelling

2. Interlingual Mapping

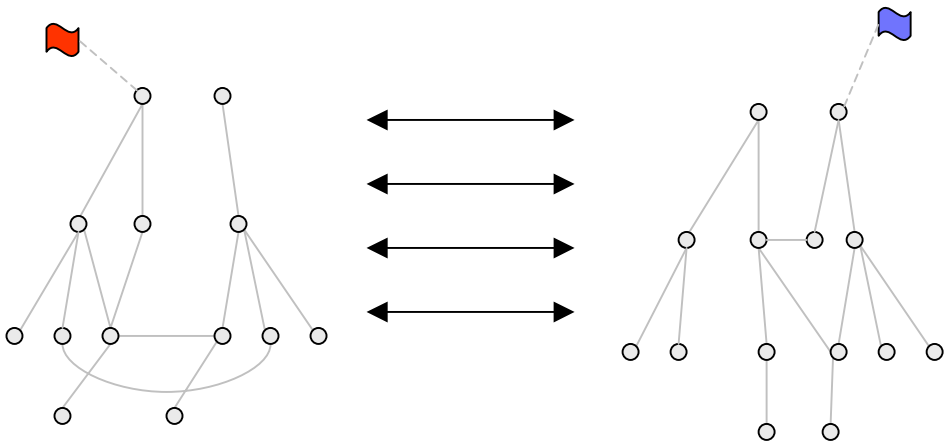
Multilinguality

Analyse each language component

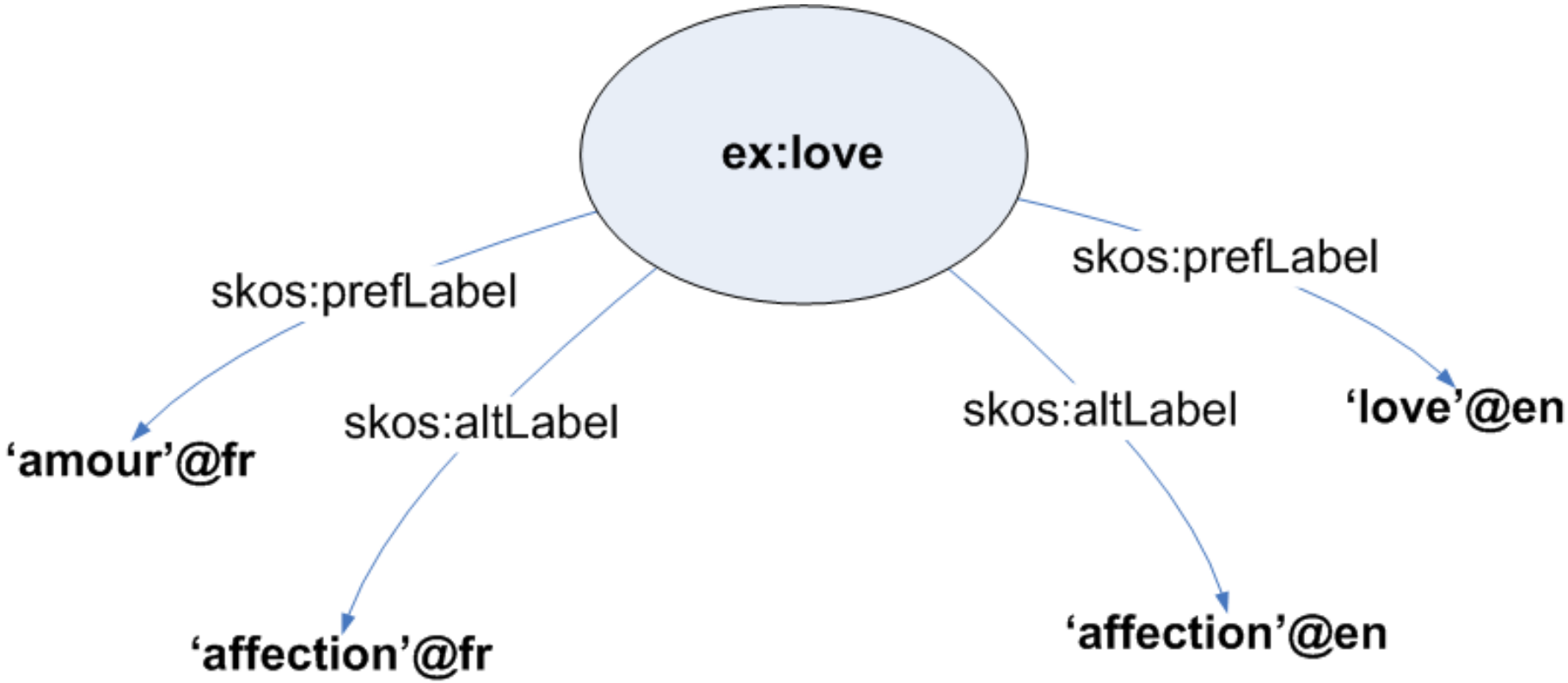
Multilingual Labelling



Interlingual Mapping



Multilingual Labelling



prefix skos: <http://www.w3.org/2004/02/skos/core#>
prefix ex: <http://www.example.com/concepts#>

Interlingual Mapping

- SKOS Mapping
  - An RDF vocabulary for describing semantic mappings
  - Interlingual mapping a special case of semantic mapping
  - SKOS Mapping less stable than SKOS Core

Extensibility

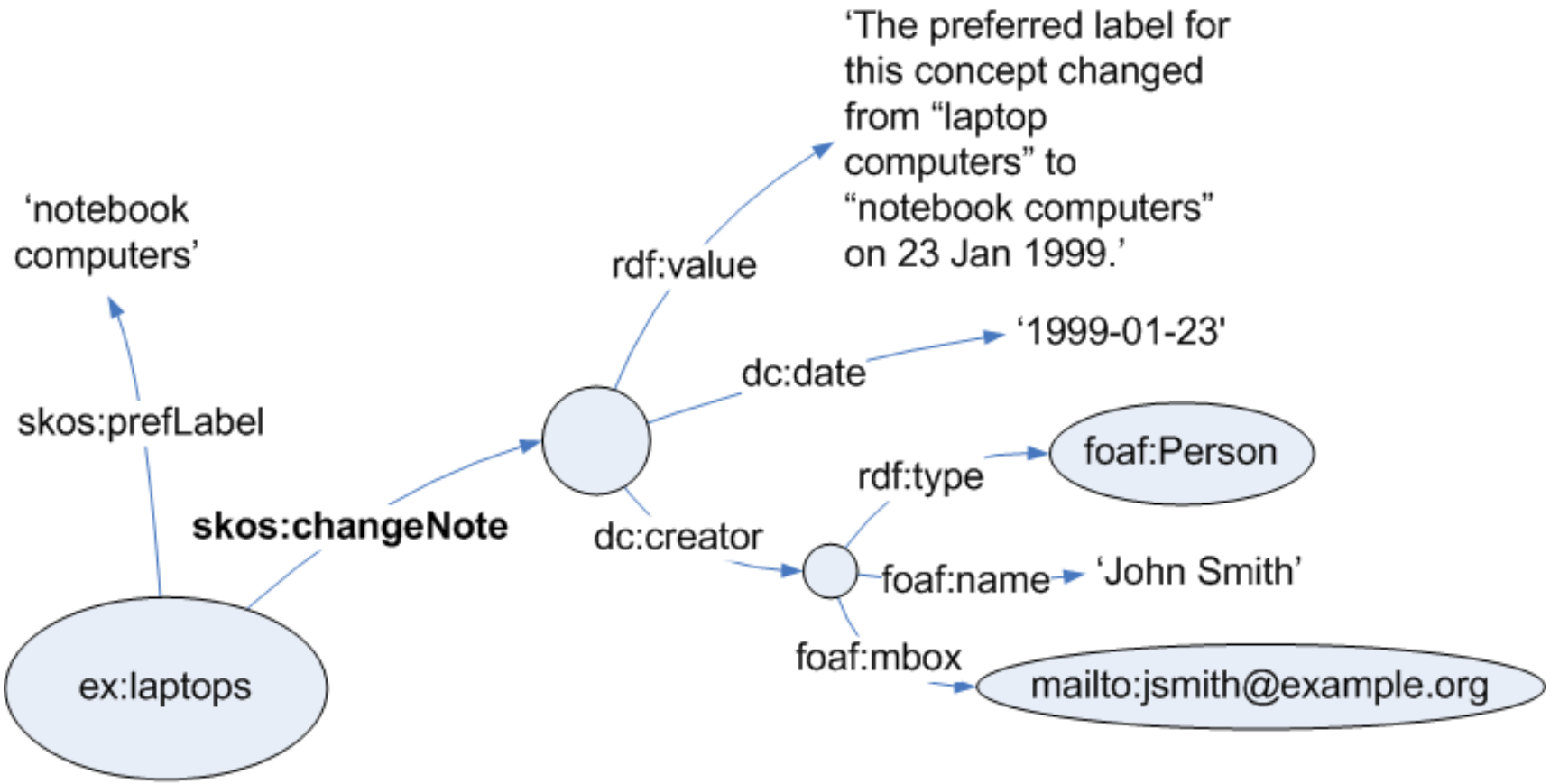
All RDF vocabularies are ‘extensible’ in that …

1. They can be used in part, and in combination with other RDF vocabularies (i.e. **‘pick’n’mix’**)
2. Sub-classes & sub-properties can be defined (I.e. ‘**semantic refinement**’)

[1] means that you can take only what you need, and fill in any gaps, maximising potential interoperability.

[2] means that you can satisfy precise local requirements without sacrificing interoperability **at all** (having your cake and eating it).

Combination Scenario




```
prefix ex: <http://www.example.com/concepts#>
prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
prefix skos: <http://www.w3.org/2004/02/skos/core#>
prefix dc: <http://purl.org/dc/elements/1.1/>
prefix foaf: <http://xmlns.com/foaf/0.1/>
```

Extensibility Scenarios

- Custom labelling properties
  - E.g. scientific name, common name
- Custom documentation properties
  - E.g. MARC 21
- Custom semantic relation properties
  - E.g. broader-generic, broader-instantive, broader-partitive …
- Custom classes of concept
  - E.g. fundamental facets

Summary

- Semantic Web is machinery for distributing data (URI, RDF, SPARQL, RDFS, OWL)
- SKOS Core is an RDF language for concept data
- SKOS Core complements OWL
- SKOS Core is flexible and extensible

Thank You

- SKOS home page

  http://www.w3.org/2004/02/skos/
- SKOS Core Guide (latest editor's draft)

  http://www.w3.org/2004/02/skos/core/guide/
- SKOS mailing list

  mailto:public-esw-thes@w3.org

  http://lists.w3.org/Archives/Public/public-esw-thes/

  Open to all.