SKOS
Simple Knowledge Organization System

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SKOS Simple Knowledge Organization System Primer

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Editors:
Antoine Isaac, Vrije Universiteit Amsterdam
Ed Summers, Library Of Congress

- There are many KOS models and formats
- But also common features and application requirements

  Lexical information, semantic links

- SKOS is a model to port KOSs to RDF in a *simple* way
  - Not aimed at fitting everything!
  - Not aimed at replacing existing (non-web) formats!

http://www.w3.org/2004/02/skos/

Representing semantics

The formal way: OWL Semantic Web ontology language

Used for ontologies that enable machine reasoning

- Mother is a class
- It is the intersection of the classes Woman and Parent
- Parent is the class of entities of type Person that are related to at least one other resource of type Person using the child property

…

SKOS is not for formal ontologies

- Turning KOSs into ontologies is possible, but KOSs
  - are large
  - have often a focus on terminological information

    Child **UsedFor** Offspring

- Softer semantics can be useful *as such* for many applications!

  Semantic search, annotation…

SKOS is not for formal ontologies

- Rob Styles (Talis): SKOS as a “stepping stone” into Semantic Web and Linked Data
- Allows straightforward conversion and re-use of existing knowledge
- Without some of the benefits granted by
  - Formal axioms (reasoning)
  - Cleaning data (high precision)

Thesaurus example

Animals

cats
- **UF (*used for*) domestic cats**
- **RT (*related term*) wildcats**
- **BT (*broader term*) animals**
- **SN (*scope note*) used only for domestic cats**

domestic cats
- **USE cats**

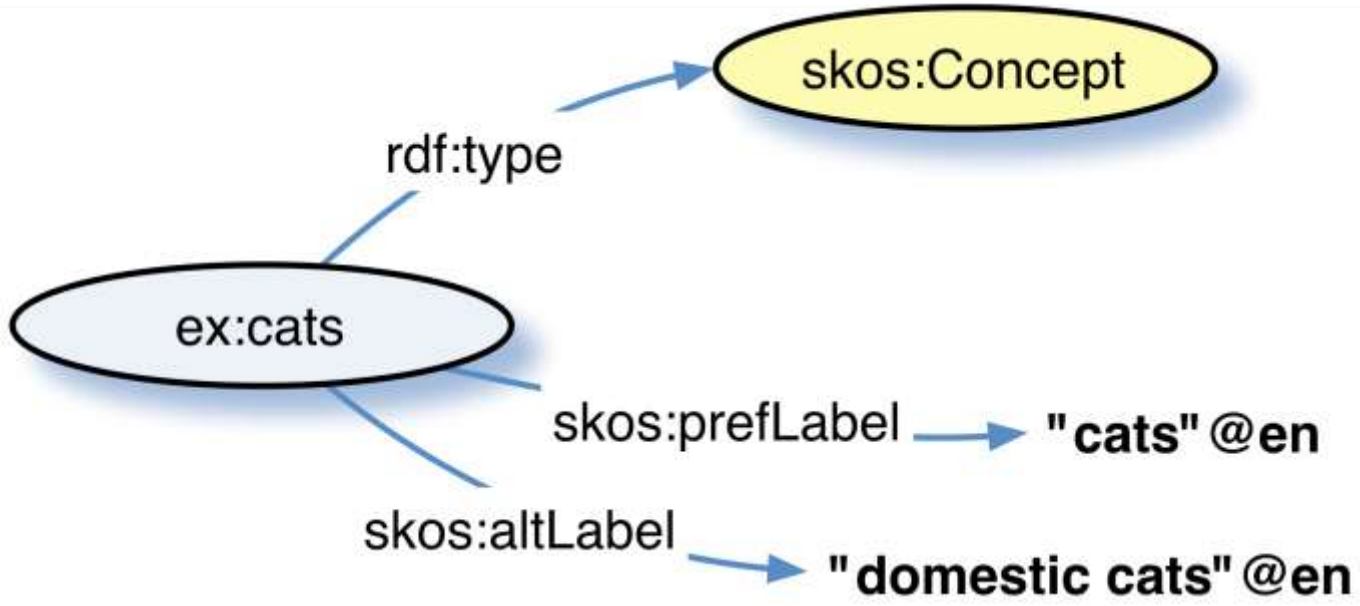
wildcats

ISO 2788 model

Concepts and labels

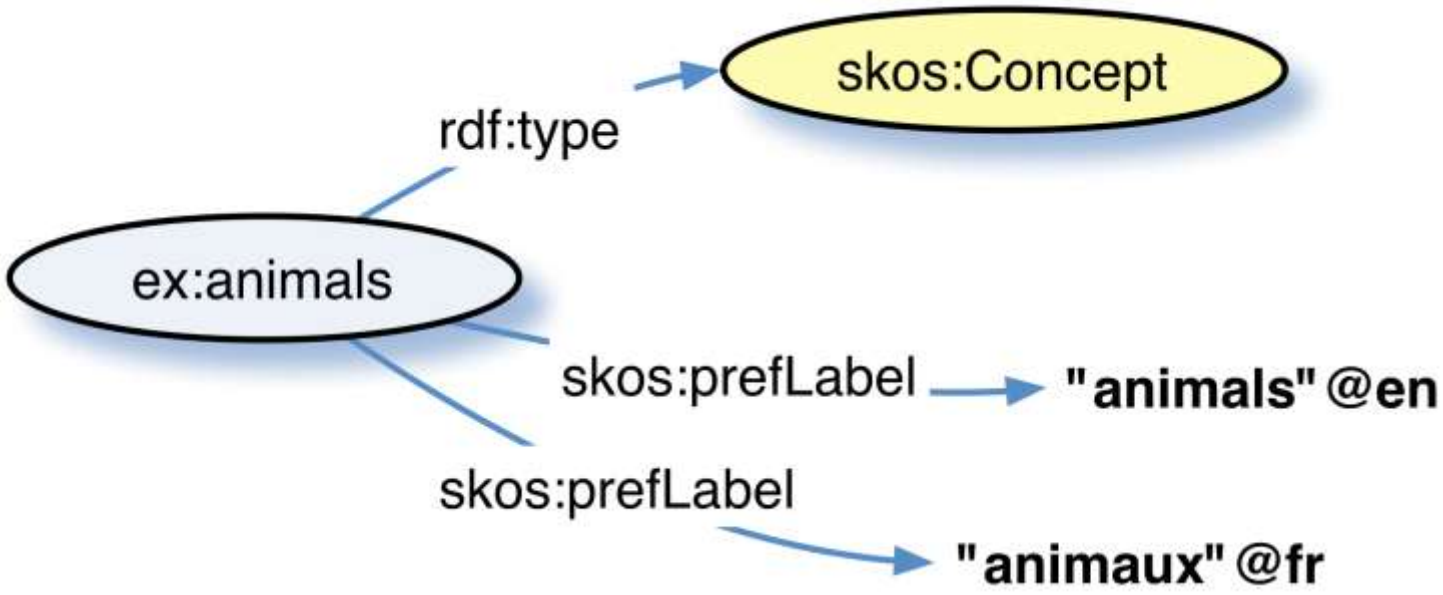
cats

UF (*used for*) domestic cats



skos: = http://www.w3.org/2004/02/skos/core#
rdf: = http://www.w3.org/1999/02/22-rdf-syntax-ns#
ex: = http://example.org/

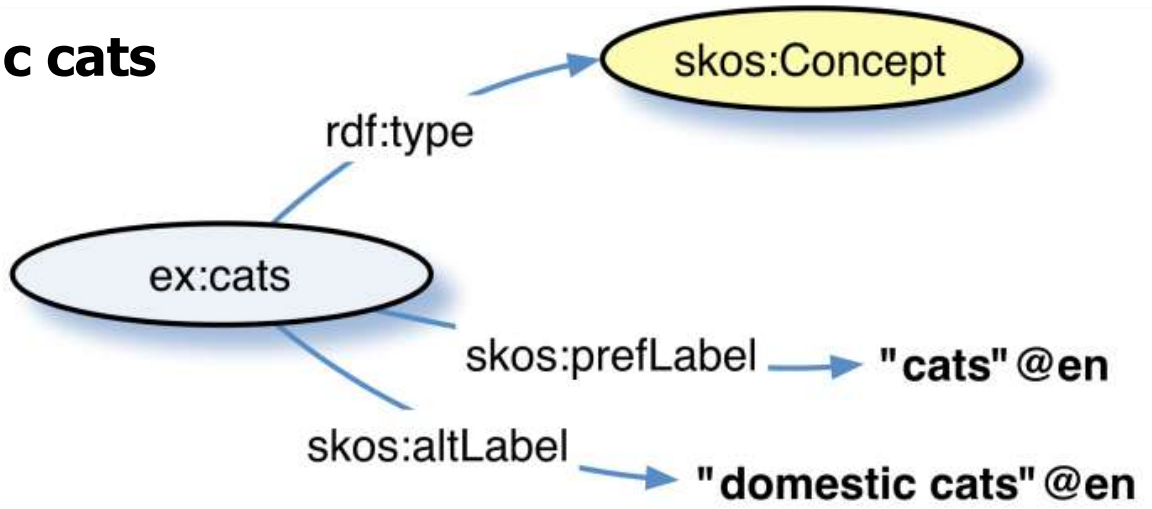
Note: multilingual labels



SKOS is concept-oriented

cats

UF (*used for*) domestic cats



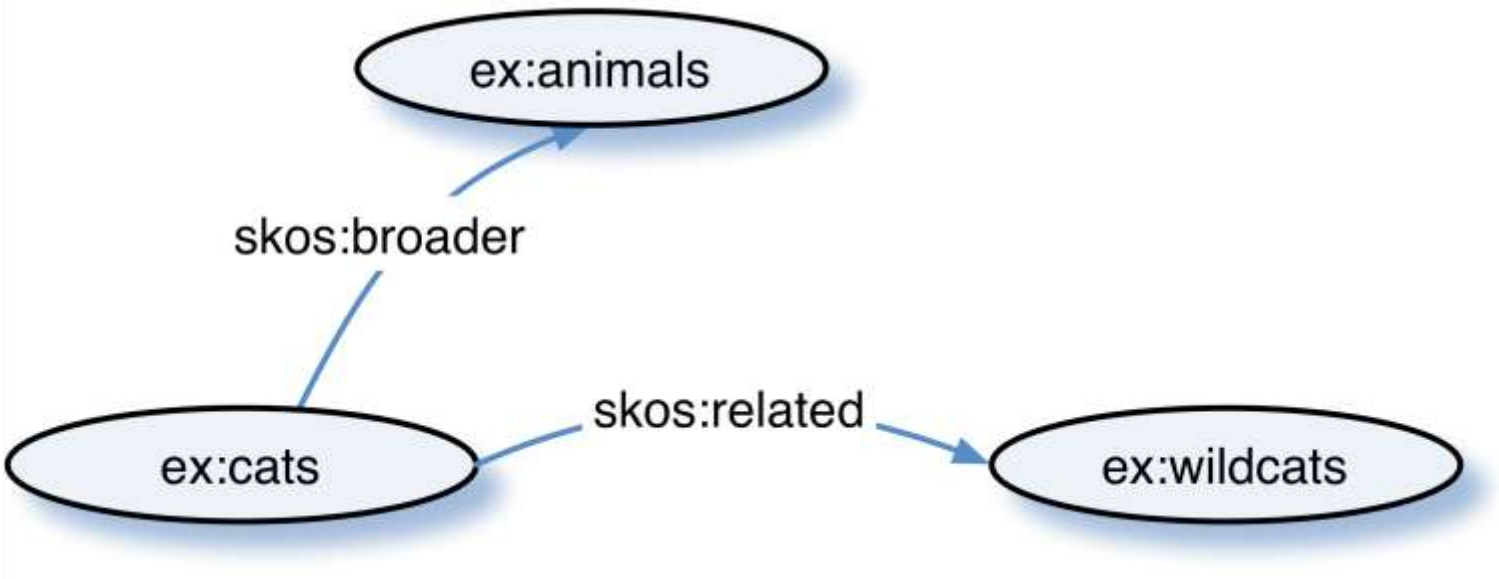
- USE/UF functions, as in ISO2788
- But:
  - Concepts are first-order (RDF) resources
  - Labels are RDF literals (simple string values)
  - Labels are linked via the concept resource

Semantic relations

cats

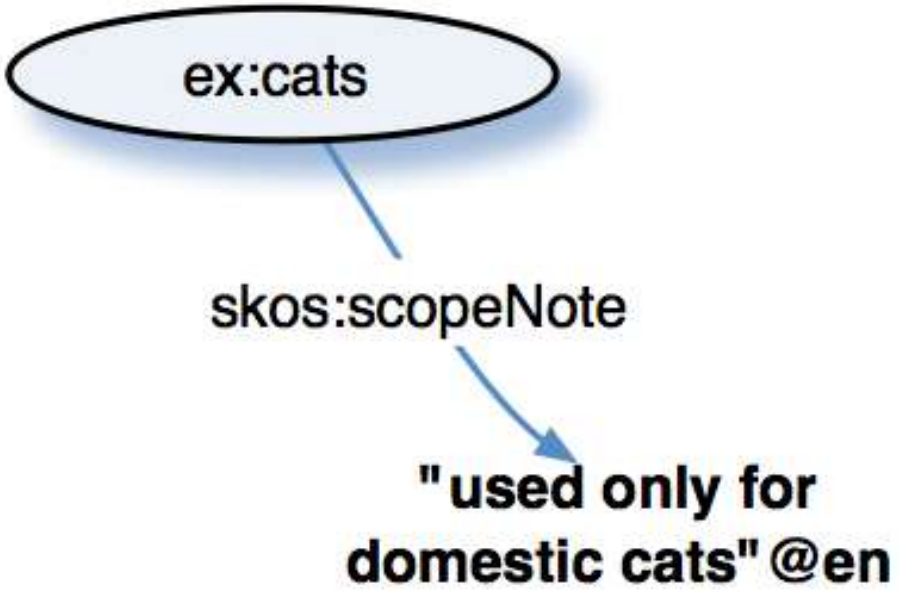
RT (*related term*) wildcats

BT (*broader term*) animals



Documenting concepts

skos:note
|
+-- skos:definition
|
+-- skos:scopeNote
|
+-- skos:example
|
+-- skos:historyNote
|
+-- skos:editorialNote
|
+-- skos:changeNote



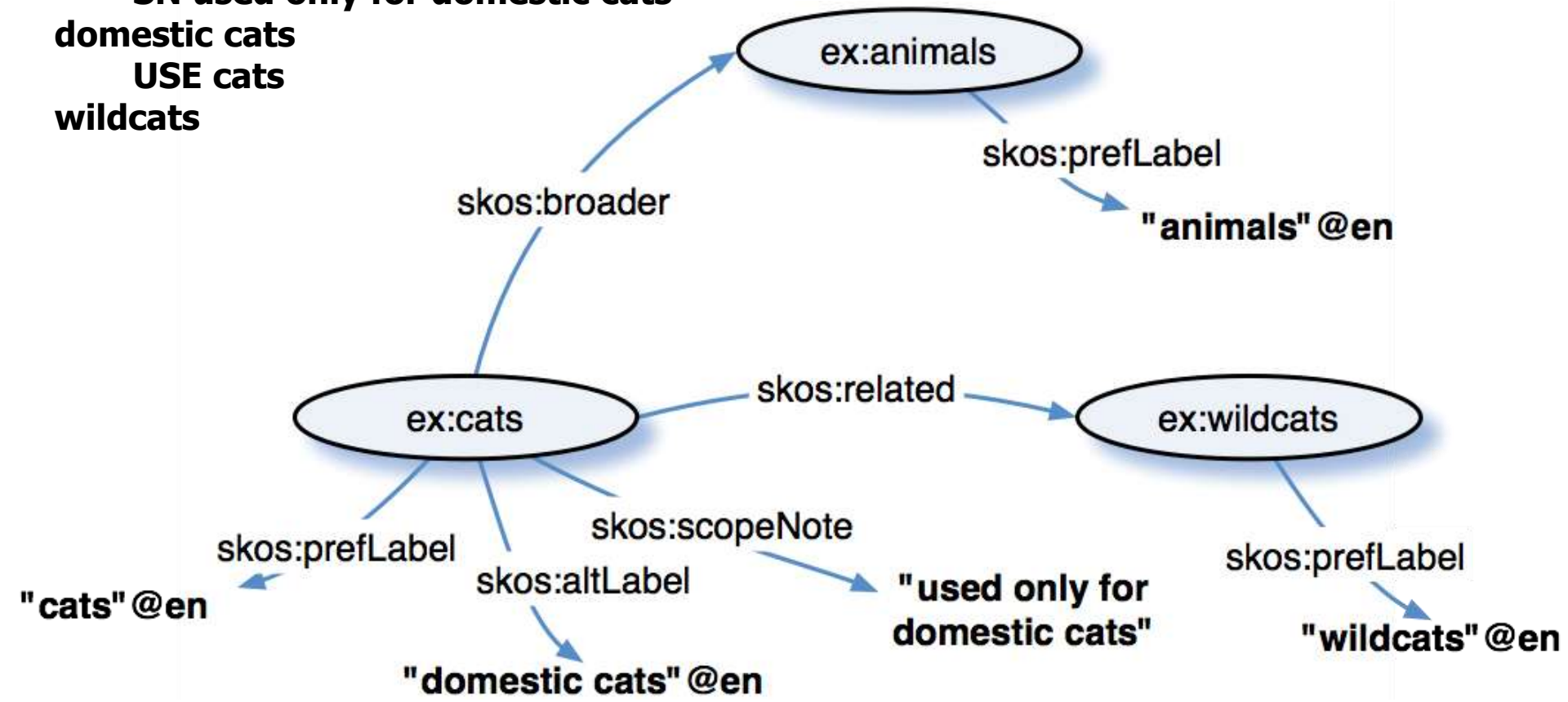
Alistair Miles

A SKOS graph

animals
cats
- **UF domestic cats**
- **RT wildcats**
- **BT animals**
- **SN used only for domestic cats**

domestic cats
- **USE cats**

wildcats



Example: RDF XML serialization

animals
cats
- **UF domestic cats**
- **RT wildcats**
- **BT animals**
- **SN used only for domestic cats**

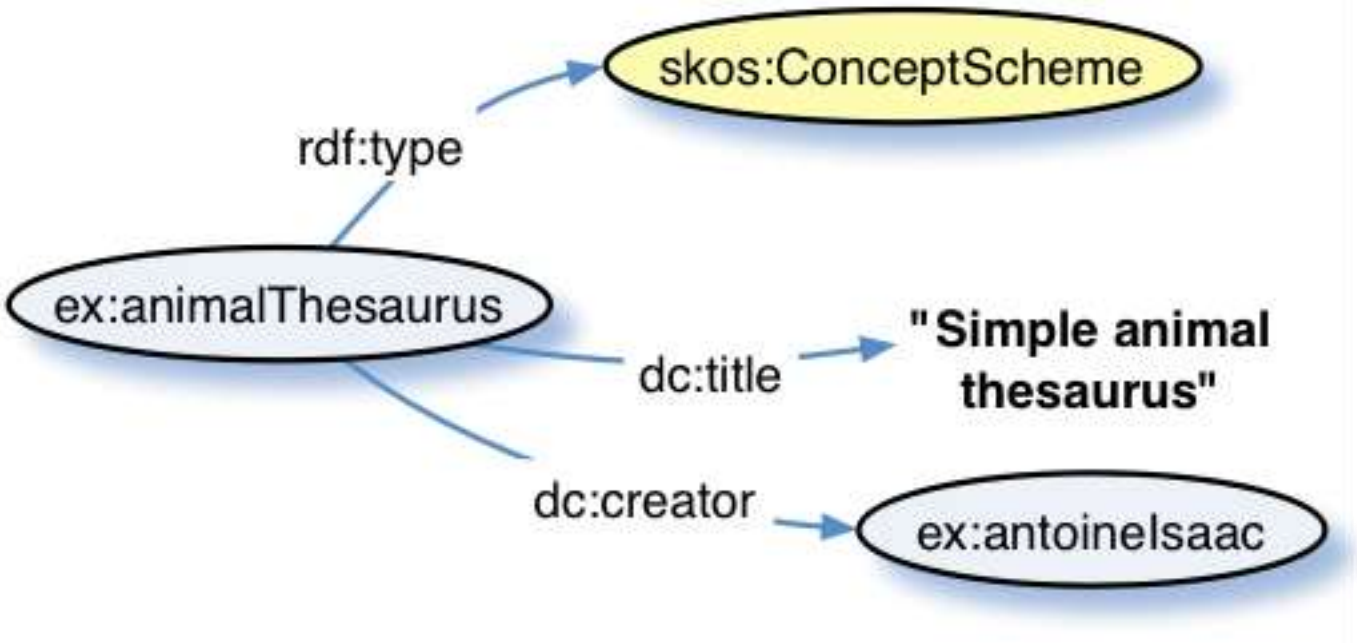
domestic cats
- **USE cats**

wildcats

```
<rdf:RDF>
<skos:Concept rdf:about="http://example.org/animals">
      <skos:prefLabel xml:lang="en">animals</skos:prefLabel>
</skos:Concept>
<skos:Concept rdf:about="http://example.org/cats">
     <skos:prefLabel xml:lang="en">cats</skos:prefLabel>
     <skos:altLabel xml:lang="en">domestic cats</skos:altLabel>
     <skos:scopeNote>used only for domestic cats</skos:scopeNote>
     <skos:broader rdf:resource="http://example.org/animals"/>
     <skos:related rdf:resource="http://example.org/wildcats"/>
</skos:Concept>
<skos:Concept rdf:about="http://example.org/wildcats">
     <skos:prefLabel xml:lang="en">wildcats</skos:prefLabel>
</skos:Concept>
</rdf:RDF>
```

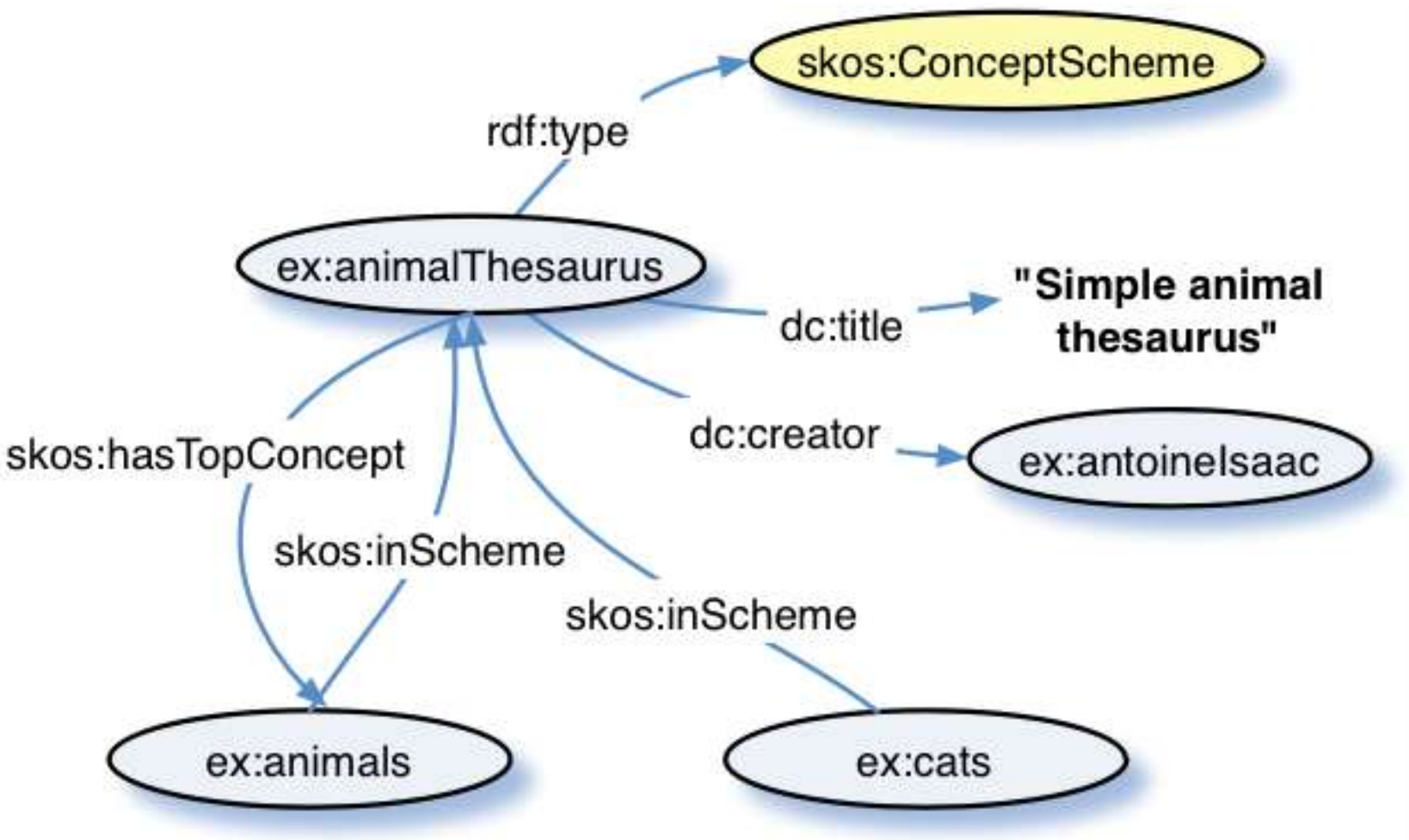
Concept Schemes

Explicit representation of vocabularies



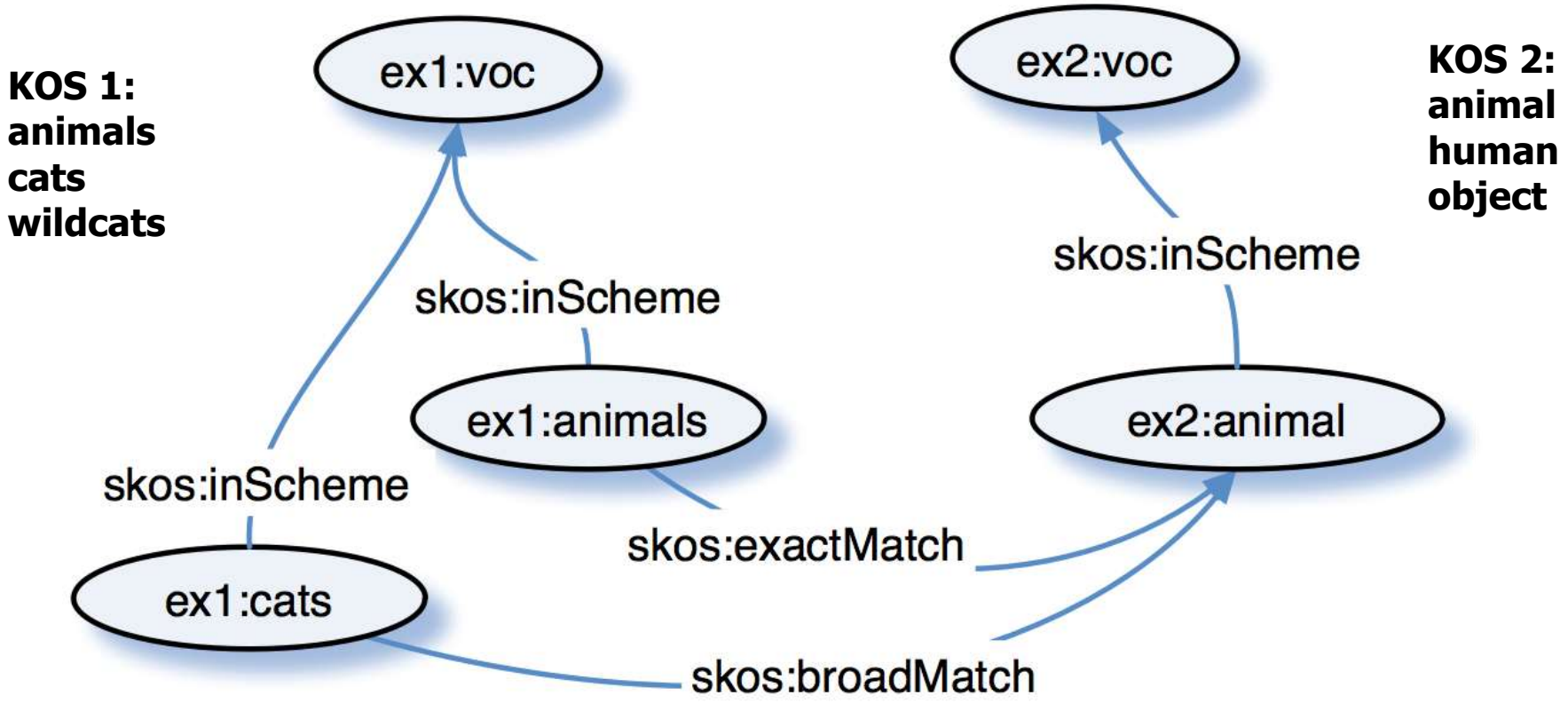
Concept Schemes

Linking concepts to concept schemes

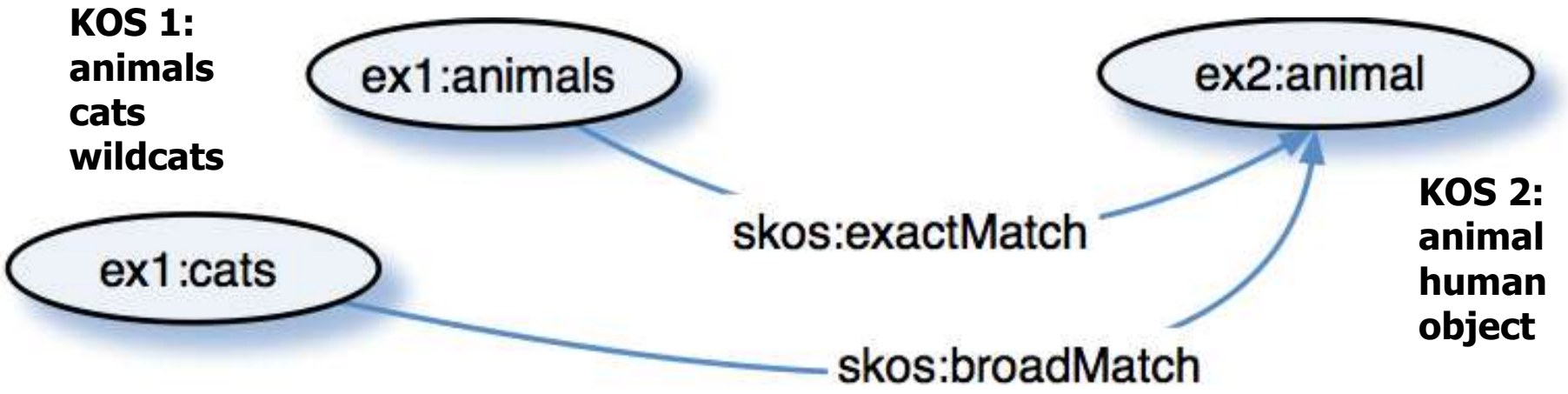


SKOS mappings

SKOS allows bridging across KOSs from different contexts



Networking controlled vocabularies in SKOS



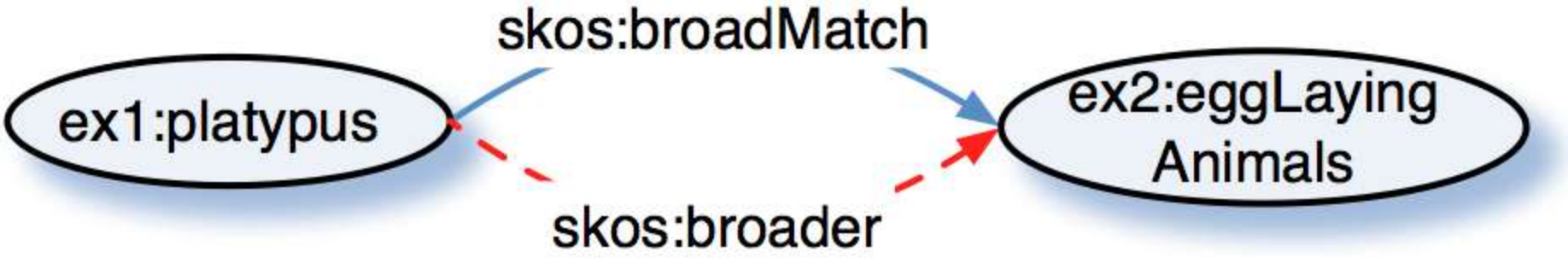
- **`closeMatch`** and **`exactMatch`** for equivalence
  - **`exactMatch`** is stronger and context-independent (transitive)
- **`broadMatch`** and **`narrowMatch`** for hierarchical links
- **`relatedMatch`** for other cases of interest

SKOS mappings

- A common way to represent important info for KOS use cases

  Focusing on types of mapping relationships

- Semantics
  - **`broadMatch`** is a sub-property of **`broader`**
  - Allows to seamlessly use mappings as basic KOS relationships
  - Still keeps the difference at the statement level



This tutorial

- Demo: SKOS data on the web
- SKOS Background
- Simple SKOS features
- More advanced SKOS – semantics
- Applications, tools & data

Semantics for SKOS?

- SKOS model enforces basic constraints on SKOS data
- SKOS must cope with existing information, and not infer new knowledge, beyond what KOS publishers intend
- Minimal semantic commitment

  Over-commitment harms interoperability
- SKOS is not a guideline to create KOS

  E.g., SKOS does not say how to create good labels

Semantics for SKOS - labels

- (Hard) A concept has only one prefLabel per language

- (Soft) No two concepts from a same concept scheme should have the same prefLabel in a given language

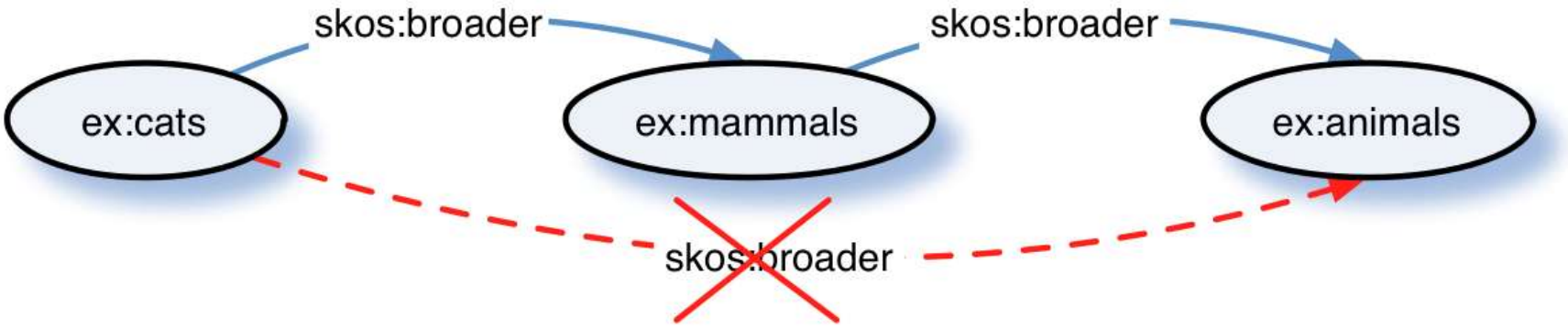
Semantics for SKOS

There are rules to infer new facts

E.g., broader and narrower are inverse of each other

Semantics of skos:broader

Is **`skos:broader`** "transitive"?



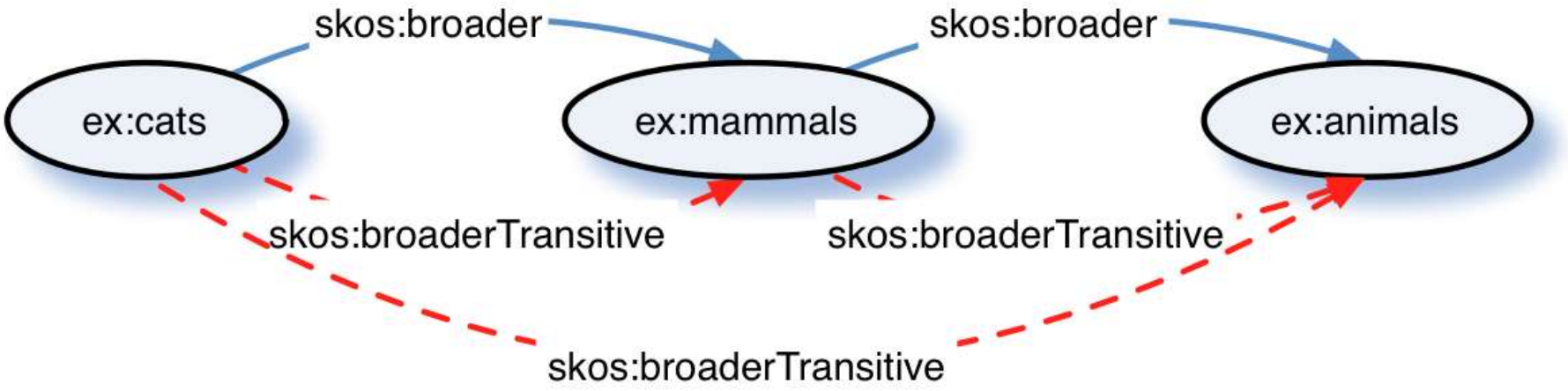
- Infering a new link can be wrong, sometimes!
  Some KOSs are not always hierarchically clean
- **`skos:broader`** is not transitive in general

Semantics of skos:broader

`skos:broader` has a super-property **`skos:broaderTransitive`** with semantics of "has ancestor"

1: every **`broader`** implies a **`broaderTransitive`**

2: **`broaderTransitive`** is transitive!



SKOS semantics

- SKOS is represented as an OWL ontology
- In total 46 axioms
- Axioms may be less rich than expected for OWL fans

See

http://www.w3.org/TR/skos-reference

http://www.w3.org/2004/02/skos/core#

SKOS and OWL -- again

"OWL is a Harley-Davison, SKOS is a mountain bike"
— Tom Baker

- SKOS and OWL are meant for quite different things

- SKOS = Model to represent KOSs in a *simple* way

  Ontology for **concepts** – the elements in (CH) vocabularies

Raising difficult issues: what counts as a "concept"?

- A concept is an artifact
  - used in descriptions, e.g., as subjects
  - used as a cluster for different labels with a similar meaning
  - in semantic relationships with other concepts

- Should a person name authority be represented using a class (foaf:Person) or a skos:Concept? Or both?

E.g., discussion at
http://efoundations.typepad.com/efoundations/2011/09/things-their-conceptualisations-skos-foaffocus-modelling-choices.html

Relationships between lexical labels

From SKOS Use Cases:

- **Use Case #3 — Semantic search service across mapped multilingual thesauri in the agriculture domain**

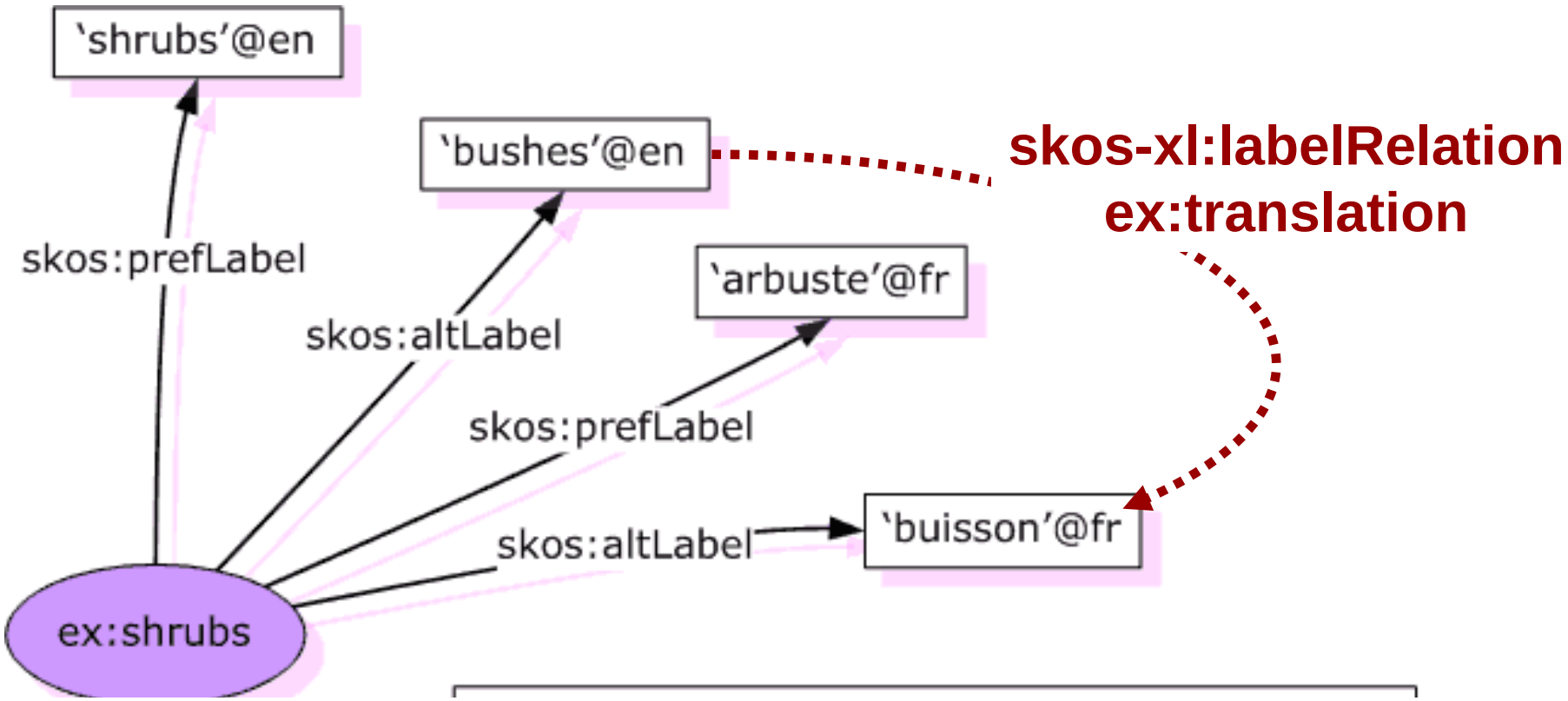
"The AIMS project includes String-to-String relationships"

acronym	Food and Agriculture Organization	FAO
spelling_variant	organisation	organization
translation	vache	cow

"Requires: R-RelationshipsBetweenLabels"

- In basic SKOS, labels are RDF literals and cannot be *subjects* of RDF statements

Relationships between lexical labels



- Done as an extension: SKOS-XL
  - **`skos-xl:Label`**
  - **`skos-xl:labelRelation`**

Other features

- Concept grouping

  skos:Collection, skos:member…

- Notations

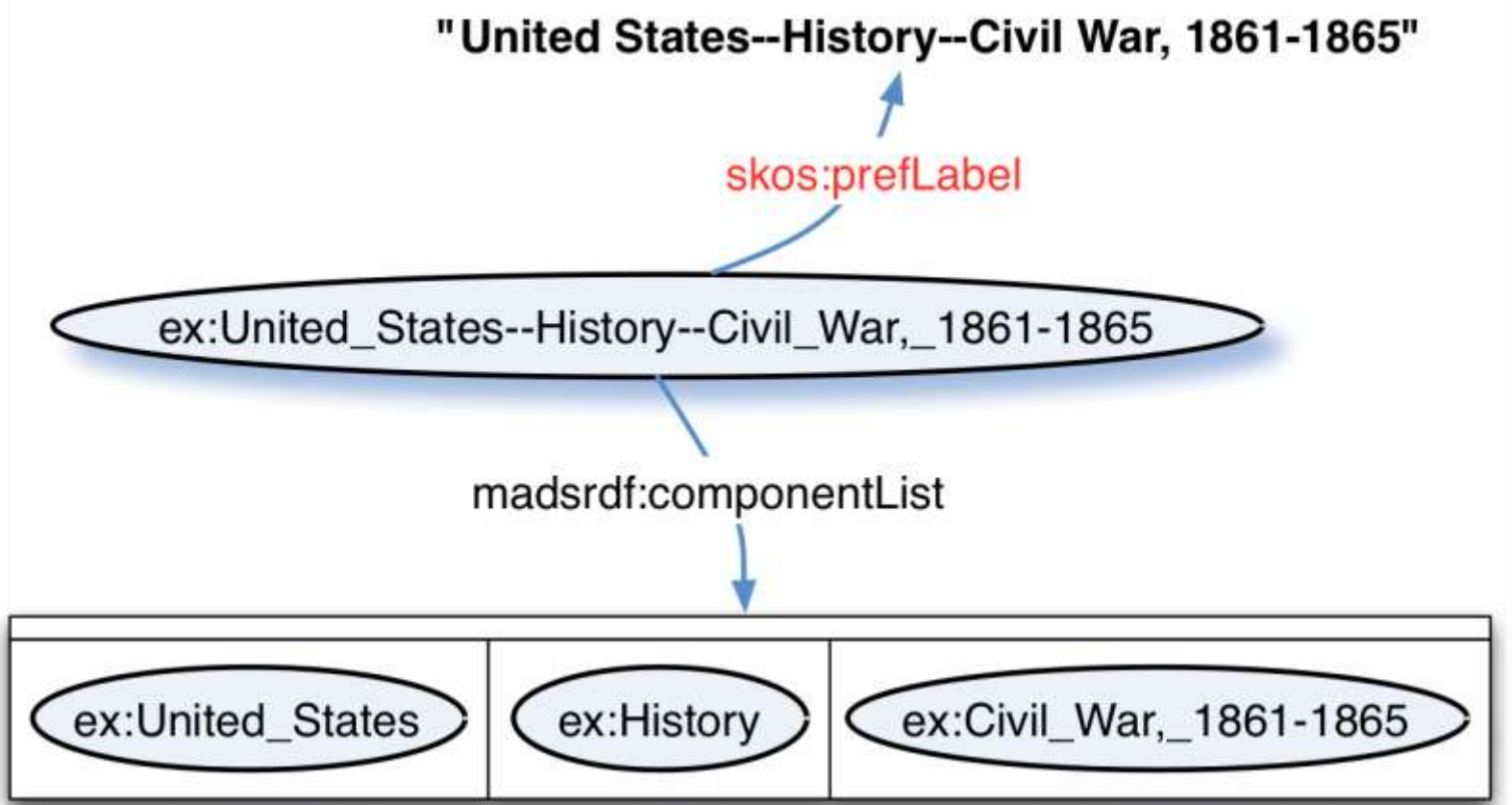
  skos:notations

Extending SKOS

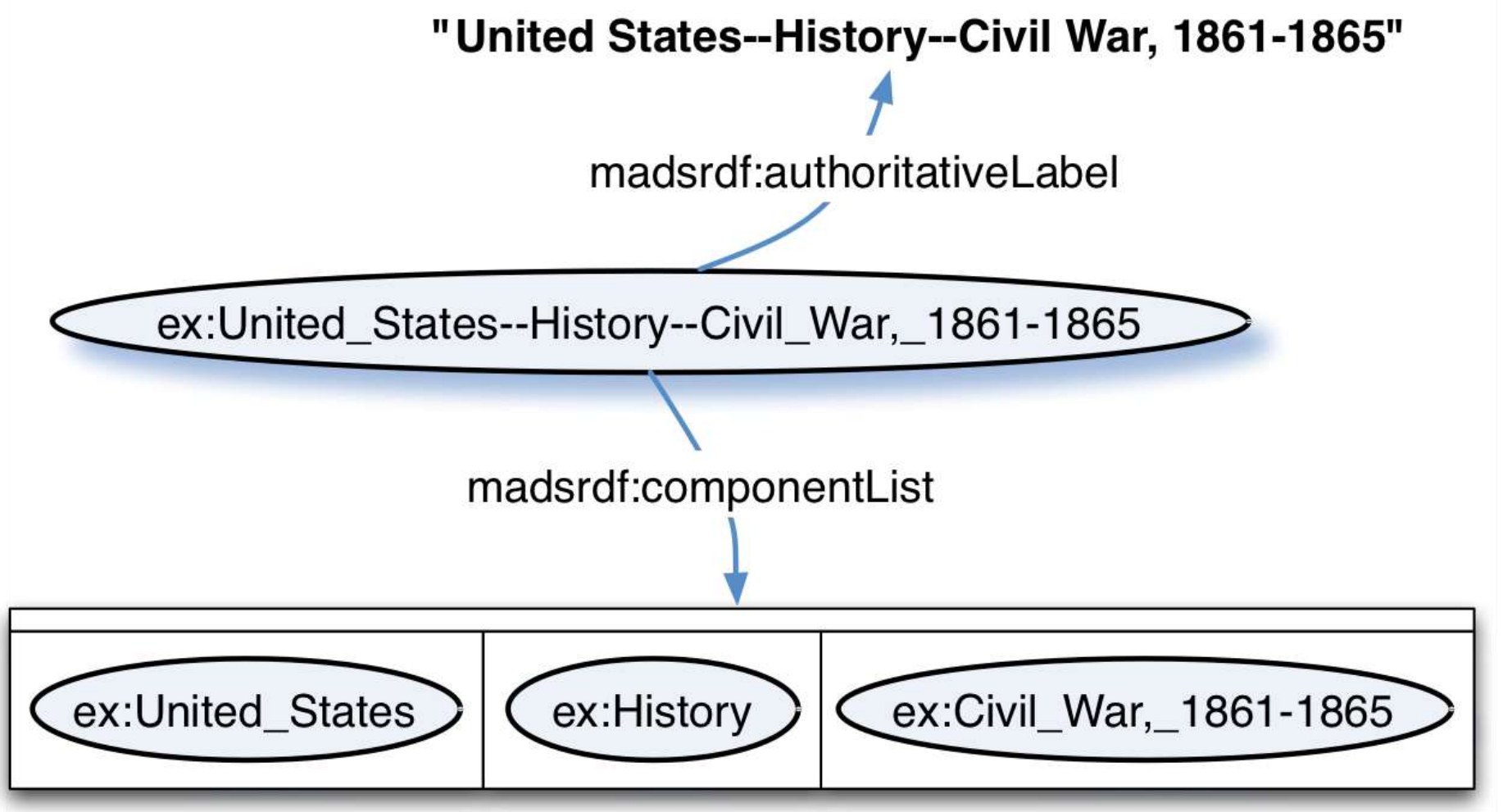
- Vocabularies dedicated to specific KOS aspects can be defined as extensions to SKOS

```
madsrdf:authoritativeLabel rdfs:subPropertyOf skos:prefLabel
```

- Ensures compatibility with tools that consume simple SKOS



Handled by MADS/RDF



http://www.loc.gov/standards/mads/rdf/, implemented at id.loc.gov

Benefits of SKOS?

Easily fitting KOSs into the Semantic Web & Linked Data vision

- Web-oriented representation
- Re-use & sharing of concepts and their descriptions
- Linking between concepts from different contexts
- Extensibility

Issue: inter-linking KOS data

- KOSs become valuable when they bring a “semantic layer” over other resources
  - E.g. books and the topics they are about
- Links between concept schemes are still scarce
- Links between objects and KOS are often only implicit in the data

More efforts on semantic annotation with KOS and KOS alignment are needed

Available data

- General SKOS data
  - W3C wiki page http://www.w3.org/2001/sw/wiki/SKOS/Datasets
  - Datasets on the Data Hub: http://ckan.net/dataset?q=format-skos
- Inventory of Library Linked Data resources
  - W3C LLD Incubator Deliverable on available value vocabularies coming very soon!
  - Datasets on the Data Hub: http://ckan.net/group/lld
  - (you can contribute!)

References

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SKOS wiki	http://www.w3.org/2001/sw/wiki/SKOS
SKOS mailing list	public-esw-thes@w3.org

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