Ambiguities in representing thesauri using extended SKOS

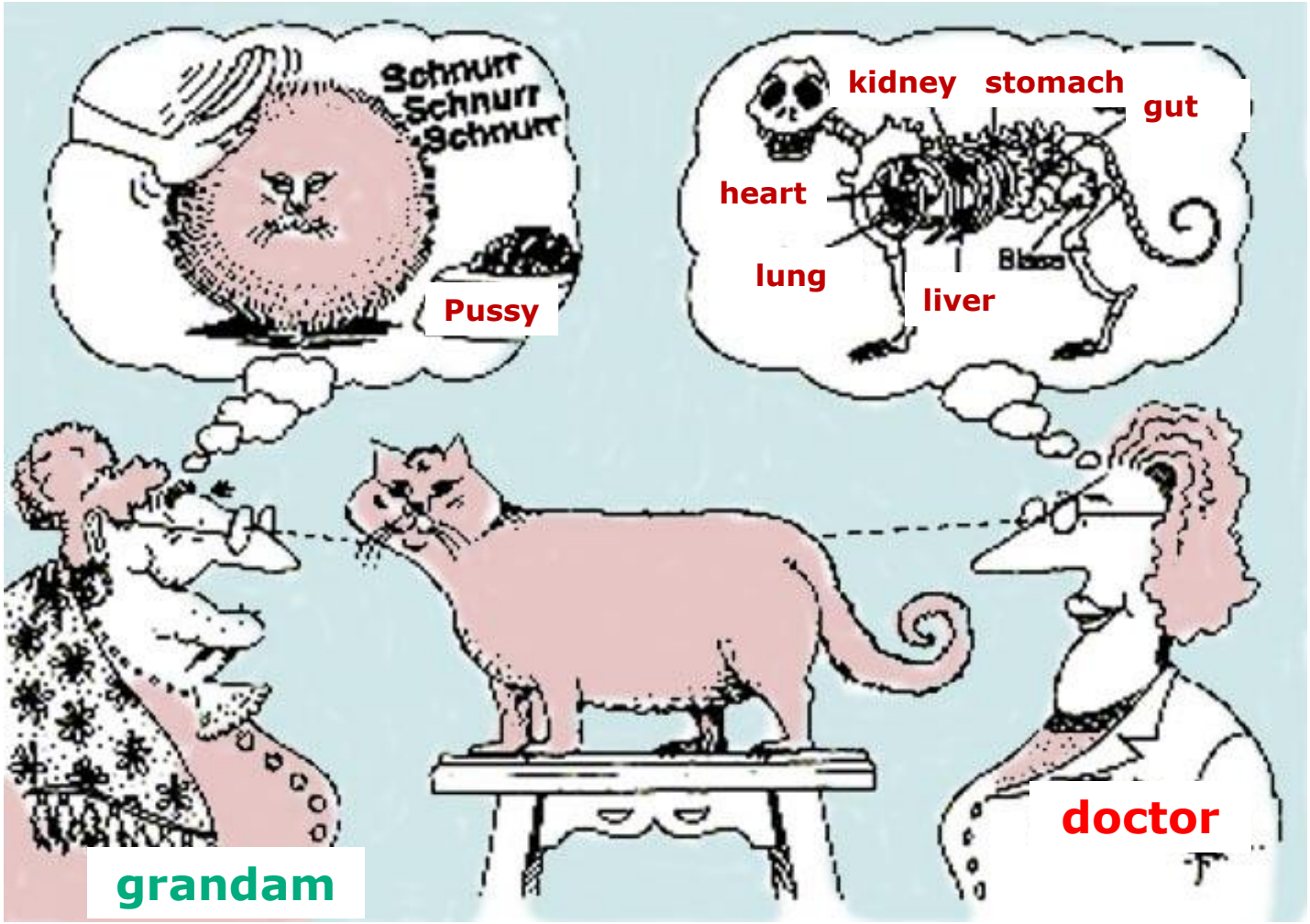
Examples from real life

Jutta Lindenthal

TPDL – 2012-09-27 – NKOS workshop

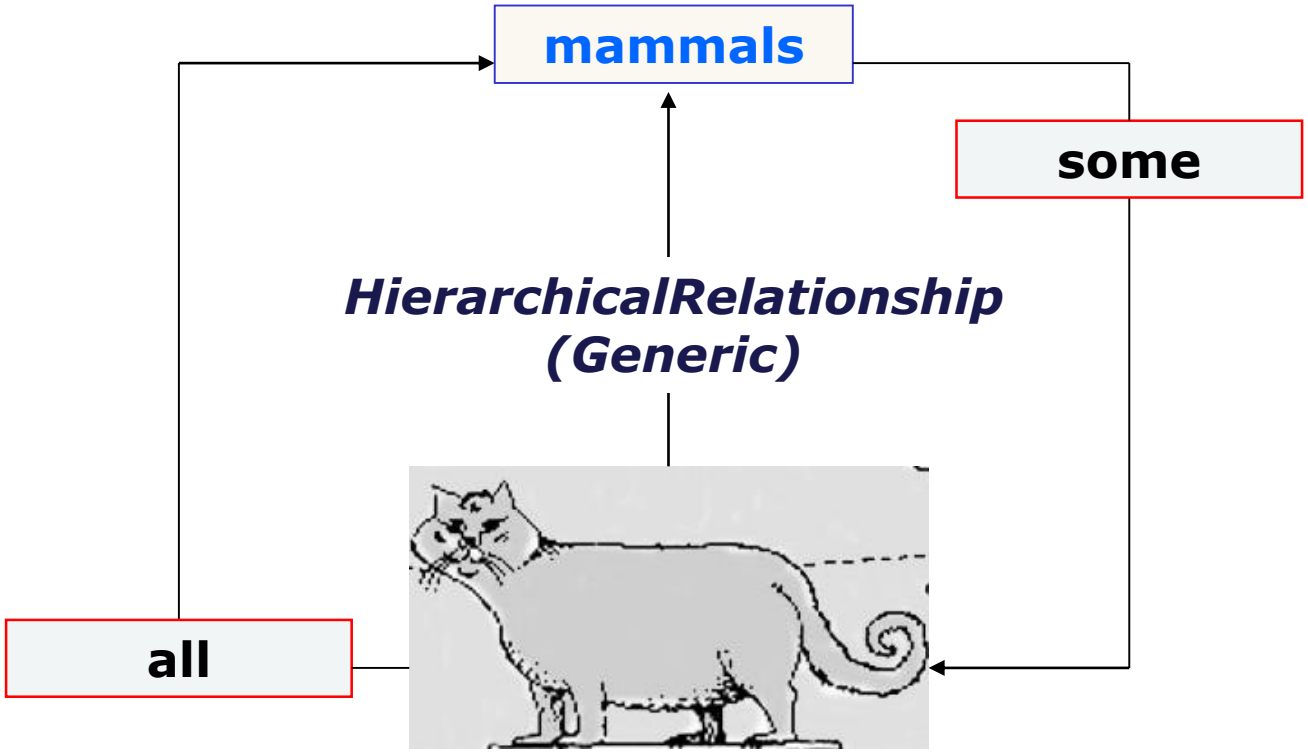
Presentation overview

- Concept hierarchies
- Node labels
  - labelling arrays of sibling concepts formed by characteristics of division
  - representing concepts not used for indexing
  - representing classification/like elements
- Concept groups
  - fields, themes, subject areas, miro-thesauri: classification-like structures for display and browsing

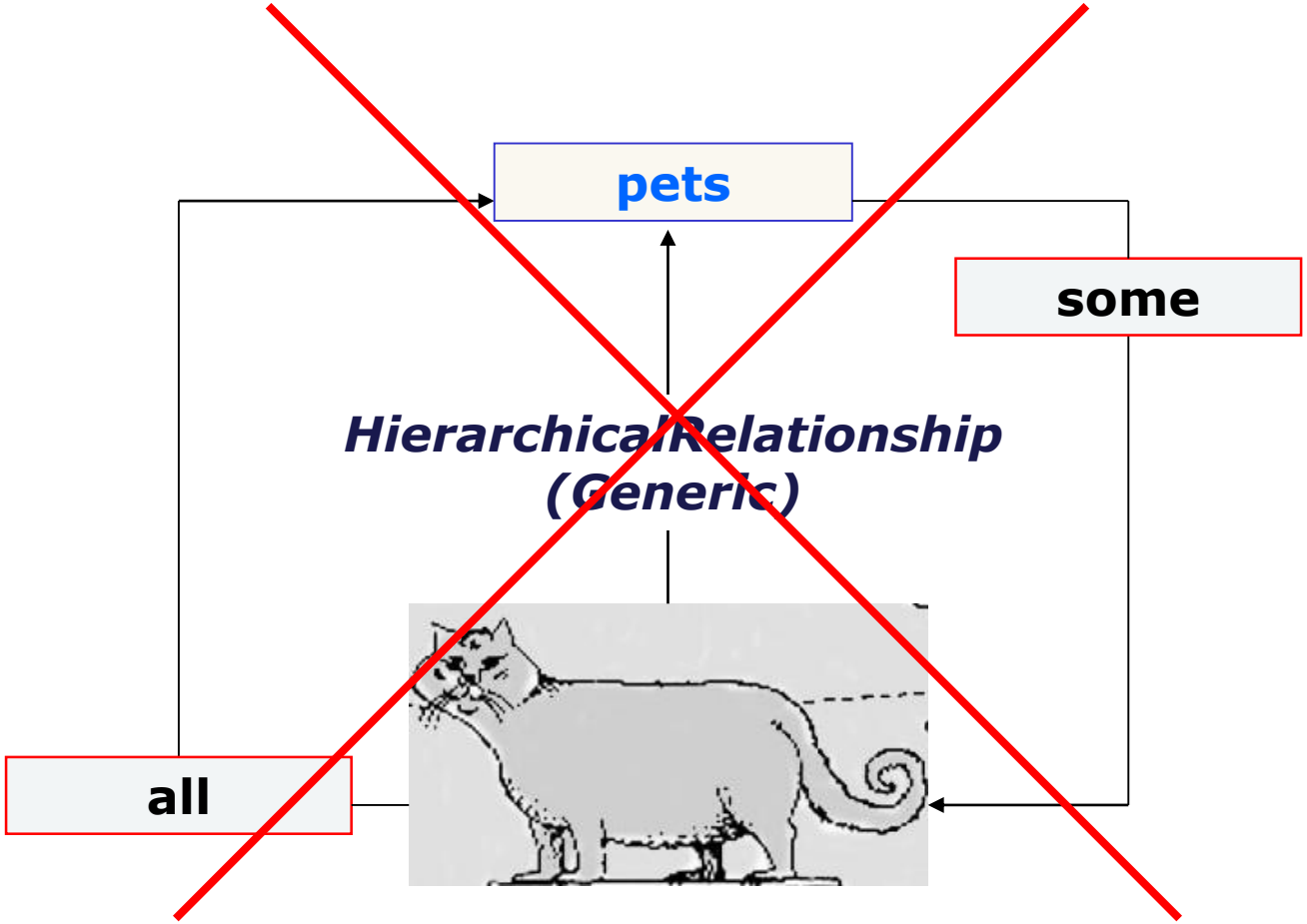


Beauty is in the eye of the beholder ...

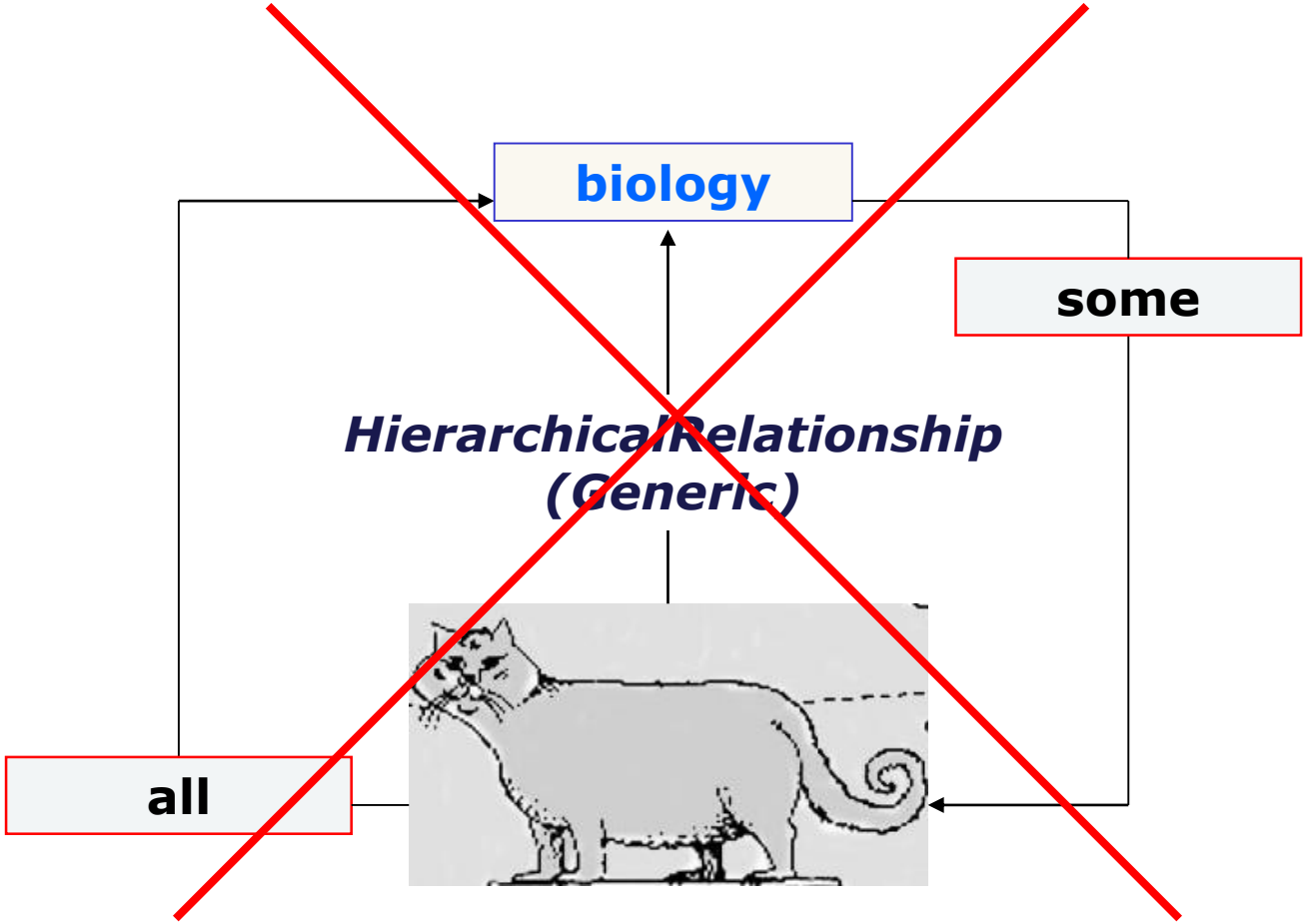
Concept hierarchy – All-and-some-test



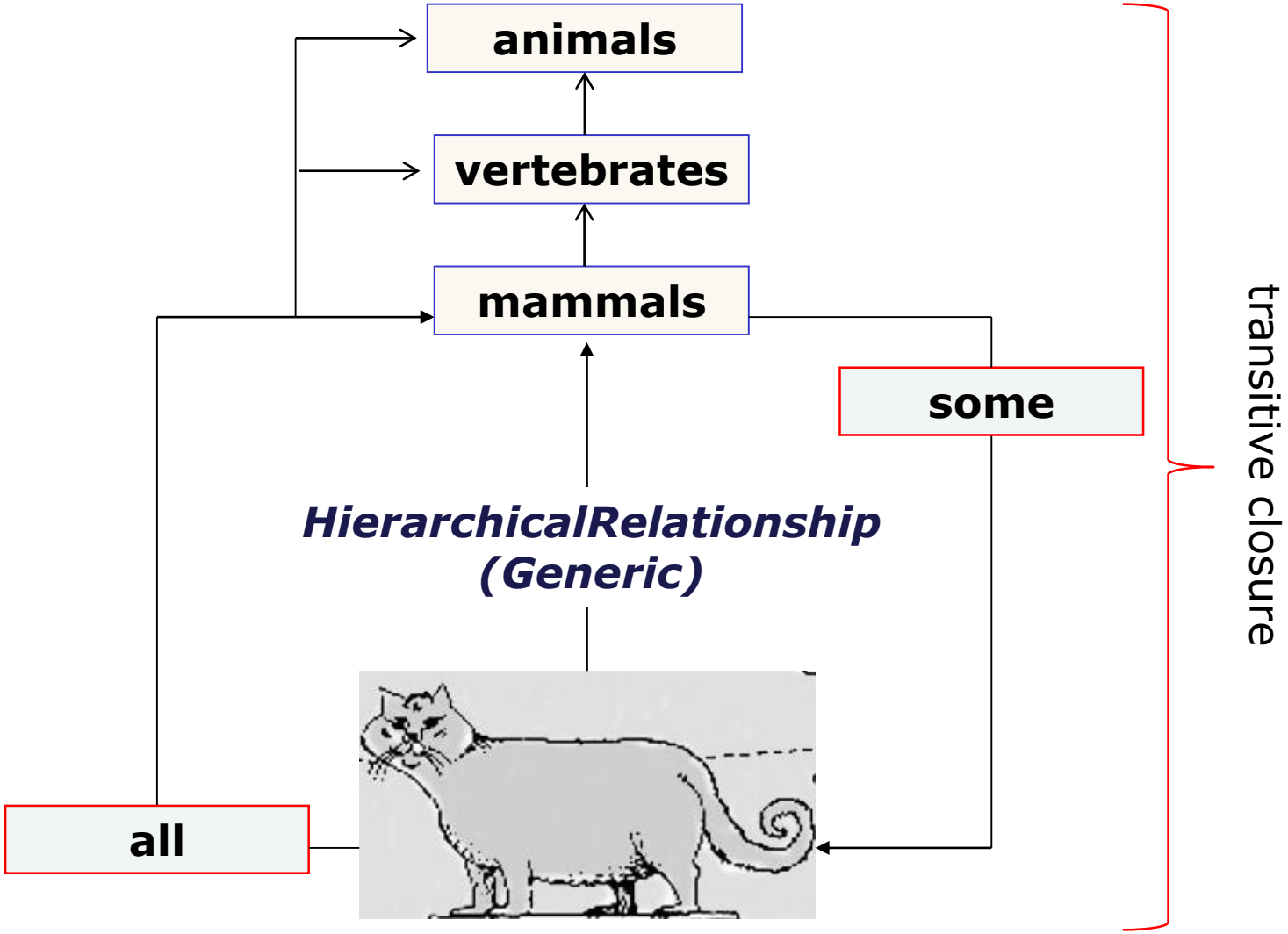
Concept hierarchy – All-and-some-test



Concept hierarchy – All-and-some-test



Concept hierarchy – transitive closure

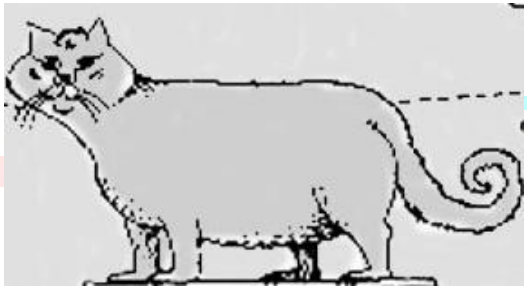


Concept hierarchy, thesaurus array and concept group

Generic Hierarchy

.... Agents Facet
..... Living Organisms
..... Eukaryota (domain)
..... Animalia (kingdom)
..... Chordata (phylum)
..... Vertebrata (subphylum)
..... Mammalia (class)
..... Carnivora (order)
..... Felidae (family)
..... Felis (genus)
..... Felis domesticus (species)
.....
.....
.....

Source: Art & Architecture Thesaurus



ThesaurusArrays

node label →

cats
. *(cats by degree of domestication)*
.. wild cats
.. semi-feral cats
.. domestic cats

array <ordered>

. *(cats by usage)*
.. laboratory cats
.. pet cats

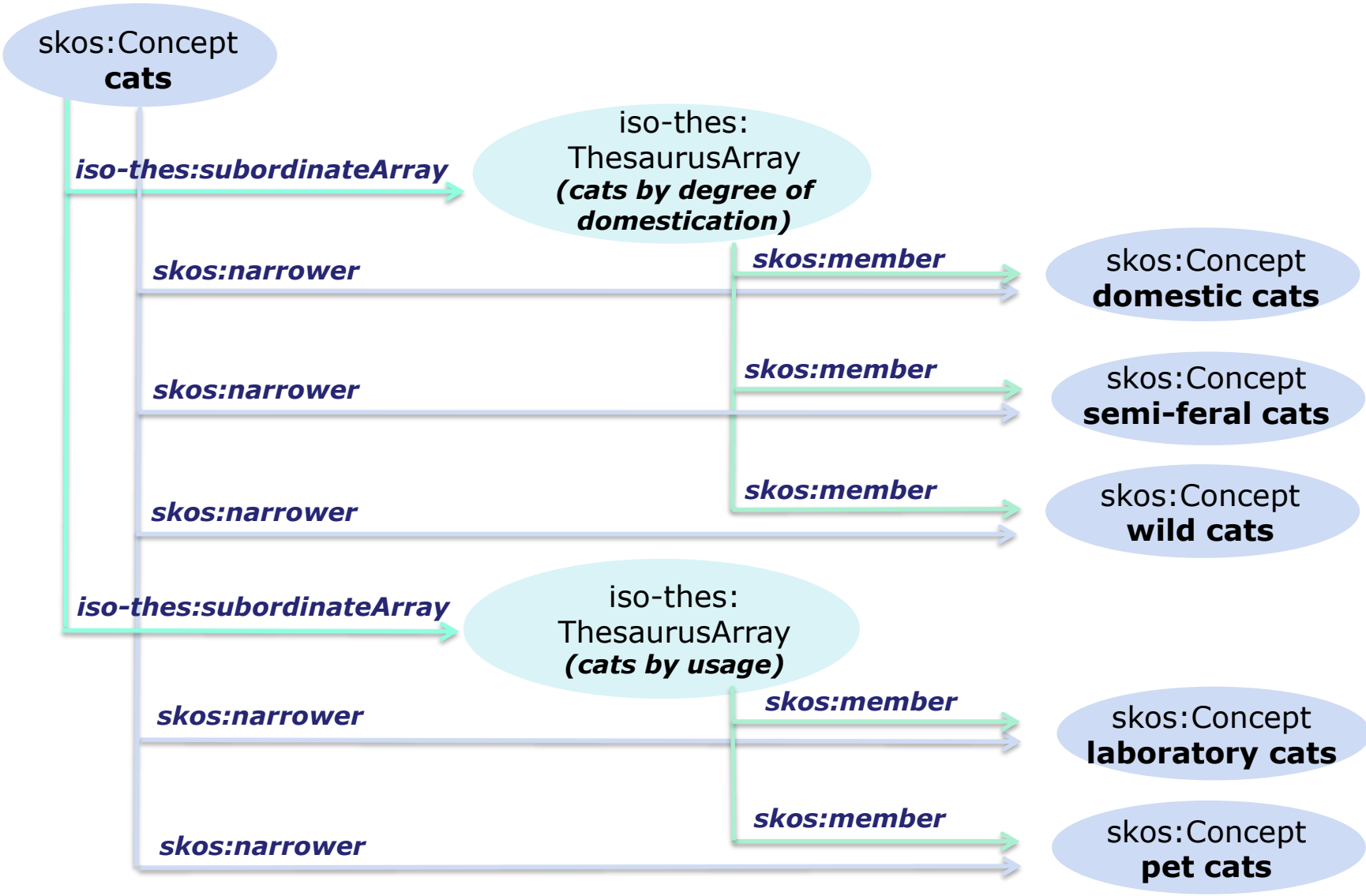
array

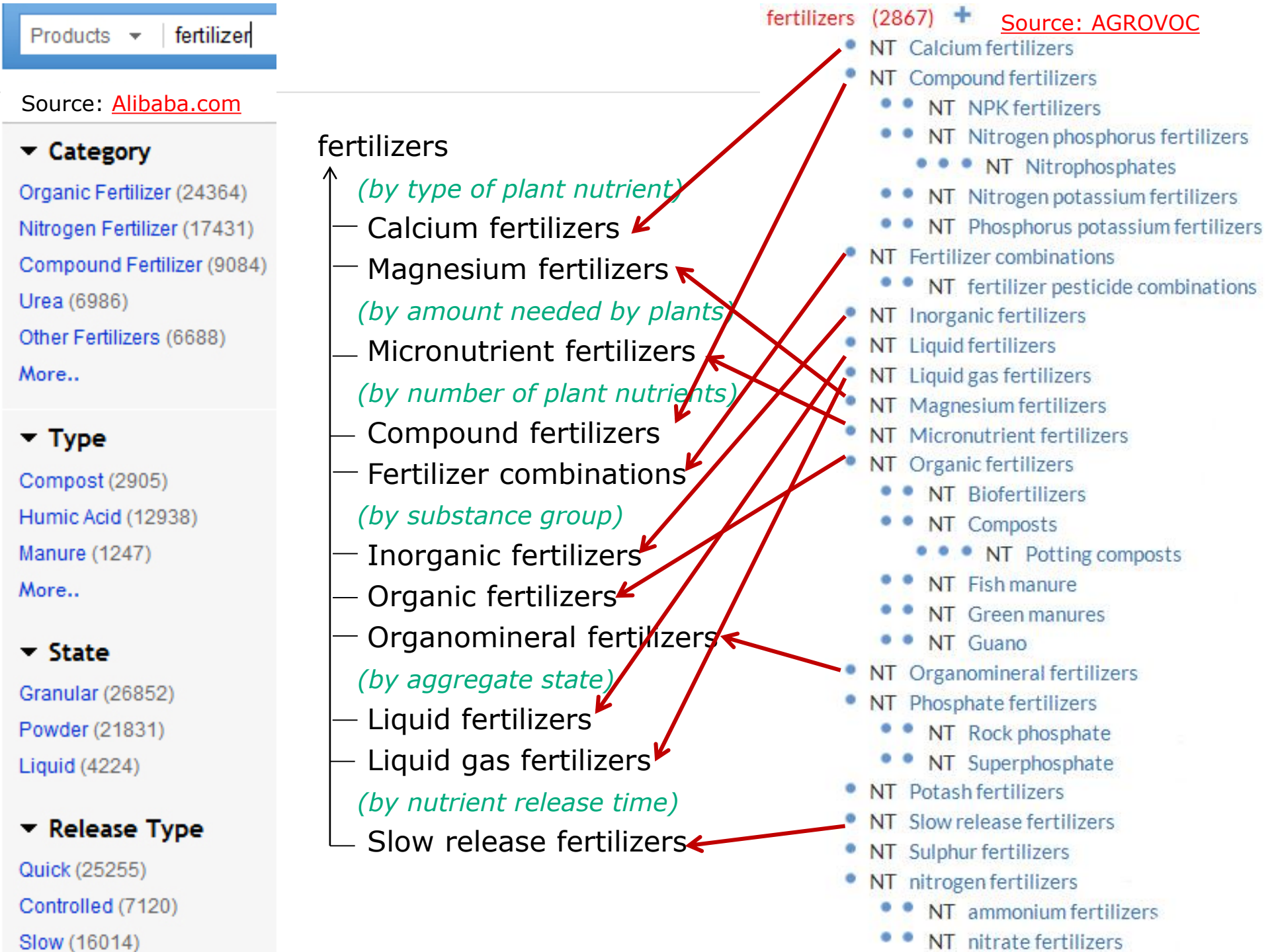
ConceptGroup

25.3 Spezific zoology

Source: Gemeinsame Normdatei

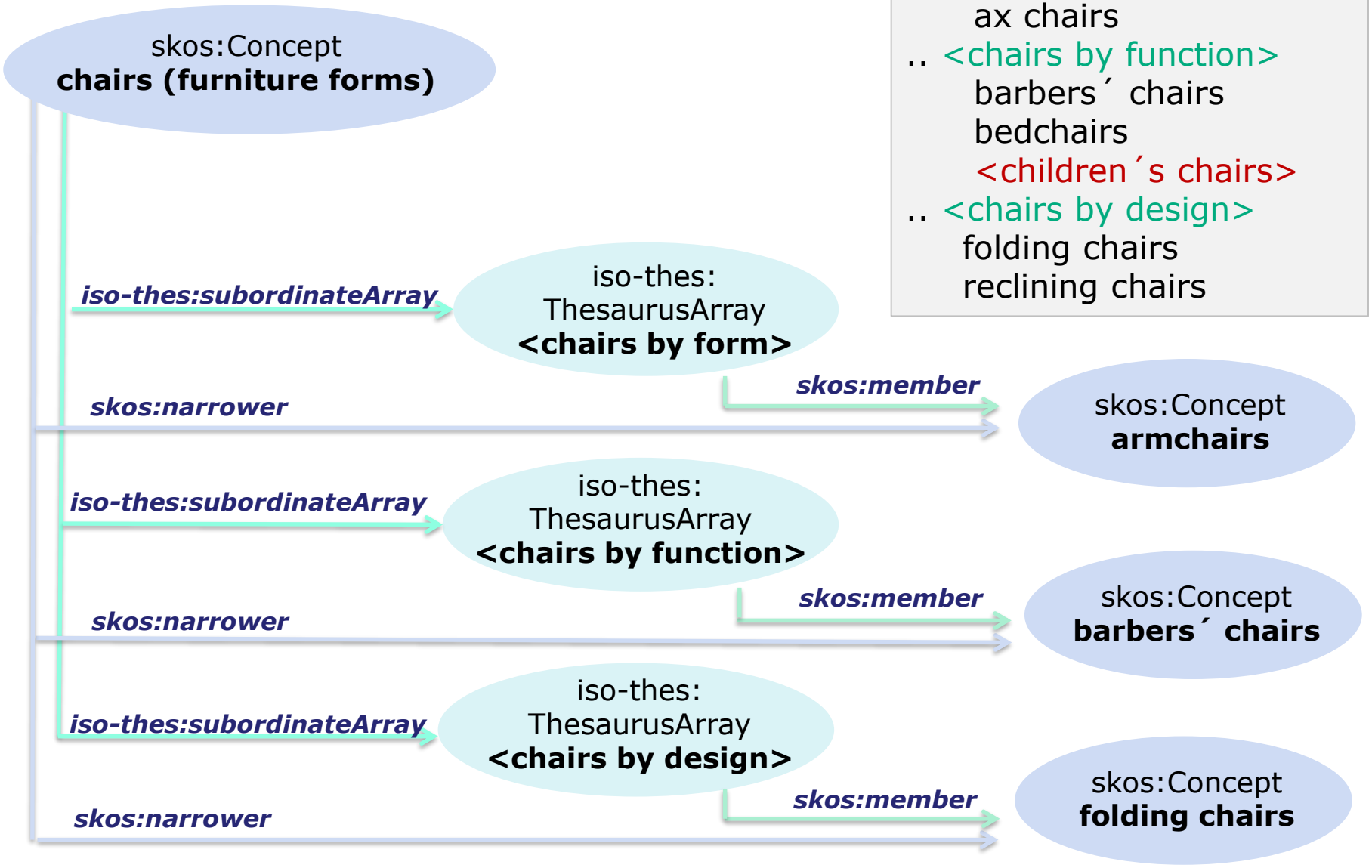
ThesaurusArrays and NodeLabels according to ISO 25964-1




Products
fertilizer
Source: Alibaba.com
Category
Organic Fertilizer (24364)
Nitrogen Fertilizer (17431)
Compound Fertilizer (9084)
Urea (6986)
Other Fertilizers (6688)
More..
Type
Compost (2905)
Humic Acid (12938)
Manure (1247)
More..
State
Granular (26852)
Powder (21831)
Liquid (4224)
Release Type
Quick (25255)
Controlled (7120)
Slow (16014)
fertilizers
(by type of plant nutrient)
Calcium fertilizers
Magnesium fertilizers
(by amount needed by plants)
Micronutrient fertilizers
(by number of plant nutrients)
Compound fertilizers
Fertilizer combinations
(by substance group)
Inorganic fertilizers
Organic fertilizers
Organomineral fertilizers
(by aggregate state)
Liquid fertilizers
Liquid gas fertilizers
(by nutrient release time)
Slow release fertilizers
fertilizers (2867)
Source: AGROVOC
NT Calcium fertilizers
NT Compound fertilizers
NT NPK fertilizers
NT Nitrogen phosphorus fertilizers
NT Nitrophosphates
NT Nitrogen potassium fertilizers
NT Phosphorus potassium fertilizers
NT Fertilizer combinations
NT fertilizer pesticide combinations
NT Inorganic fertilizers
NT Liquid fertilizers
NT Liquid gas fertilizers
NT Magnesium fertilizers
NT Micronutrient fertilizers
NT Organic fertilizers
NT Biofertilizers
NT Composts
NT Potting composts
NT Fish manure
NT Green manures
NT Guano
NT Organomineral fertilizers
NT Phosphate fertilizers
NT Rock phosphate
NT Superphosphate
NT Potash fertilizers
NT Slow release fertilizers
NT Sulphur fertilizers
NT nitrogen fertilizers
NT ammonium fertilizers
NT nitrate fertilizers

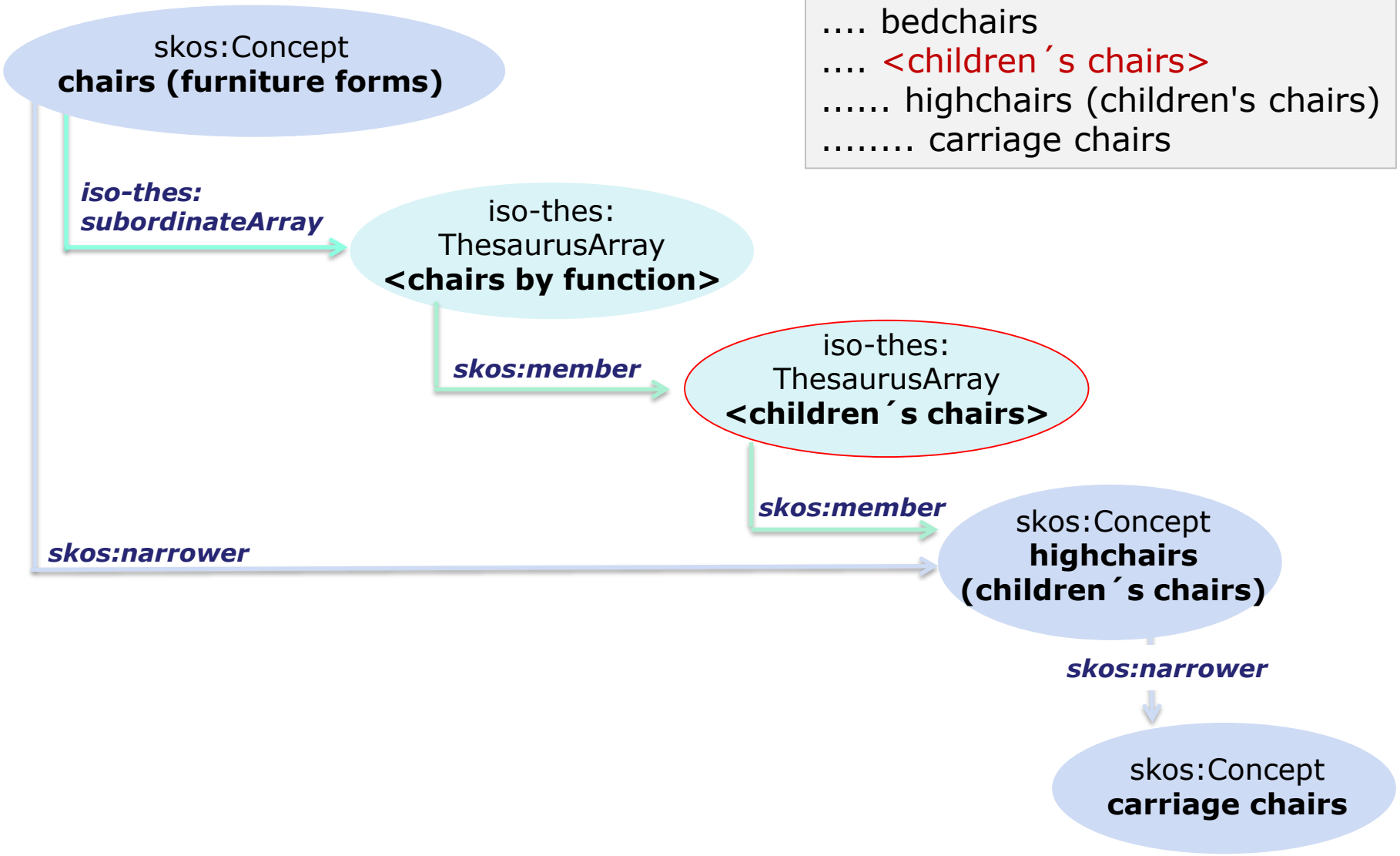
Guide Terms in the AAT Thesaurus (1)

chairs (furniture forms)
.. <chairs by form>
armchairs
ax chairs
.. <chairs by function>
barbers´ chairs
bedchairs
<children´s chairs>
.. <chairs by design>
folding chairs
reclining chairs



Guide Terms in the AAT Thesaurus (2)

chairs (furniture forms)
.. <chairs by function>
.... barbers´ chairs
.... bedchairs
.... <children´s chairs>
..... highchairs (children's chairs)
..... carriage chairs



Guide Terms in the AAT Thesaurus (3)

chairs (furniture forms)
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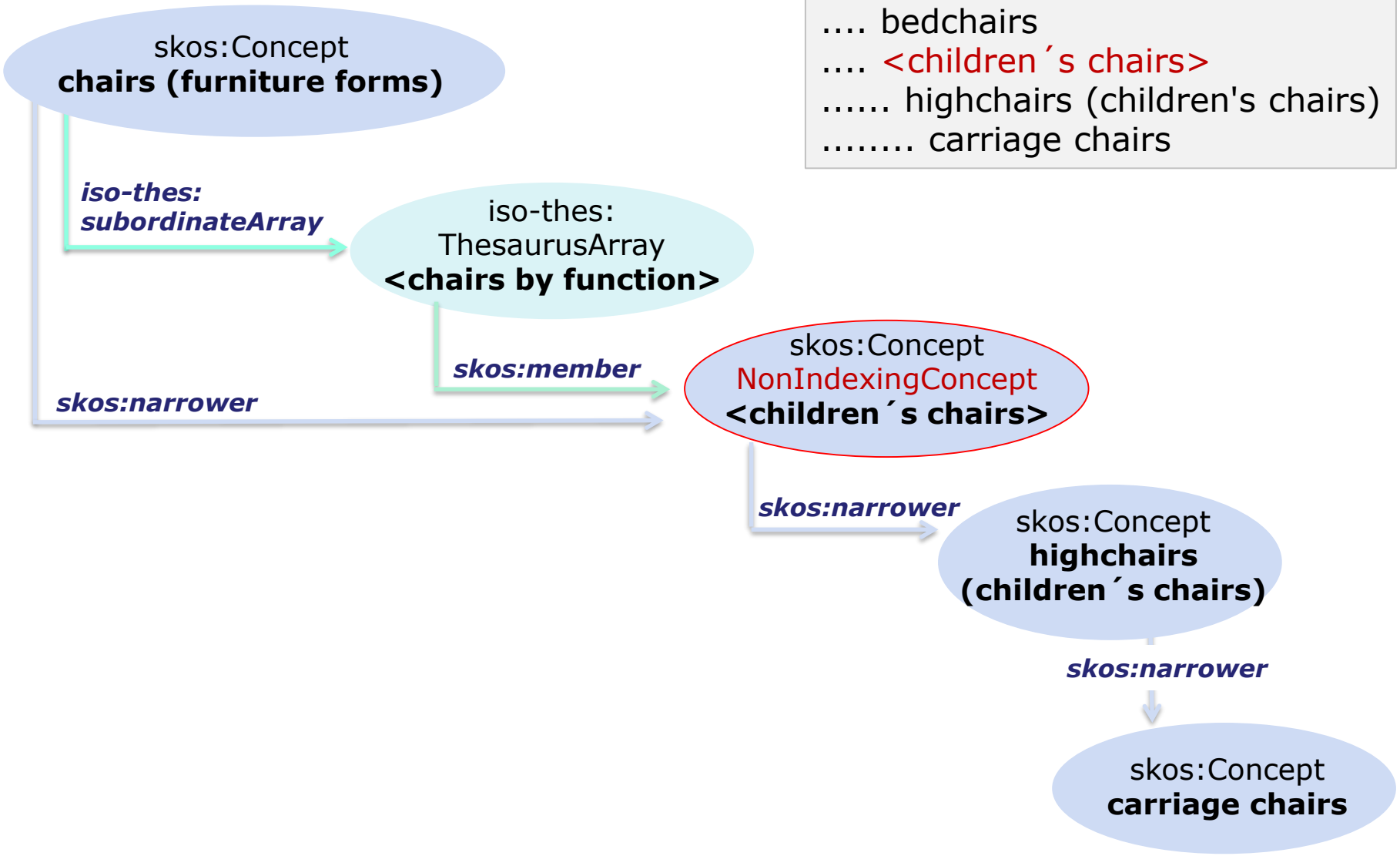
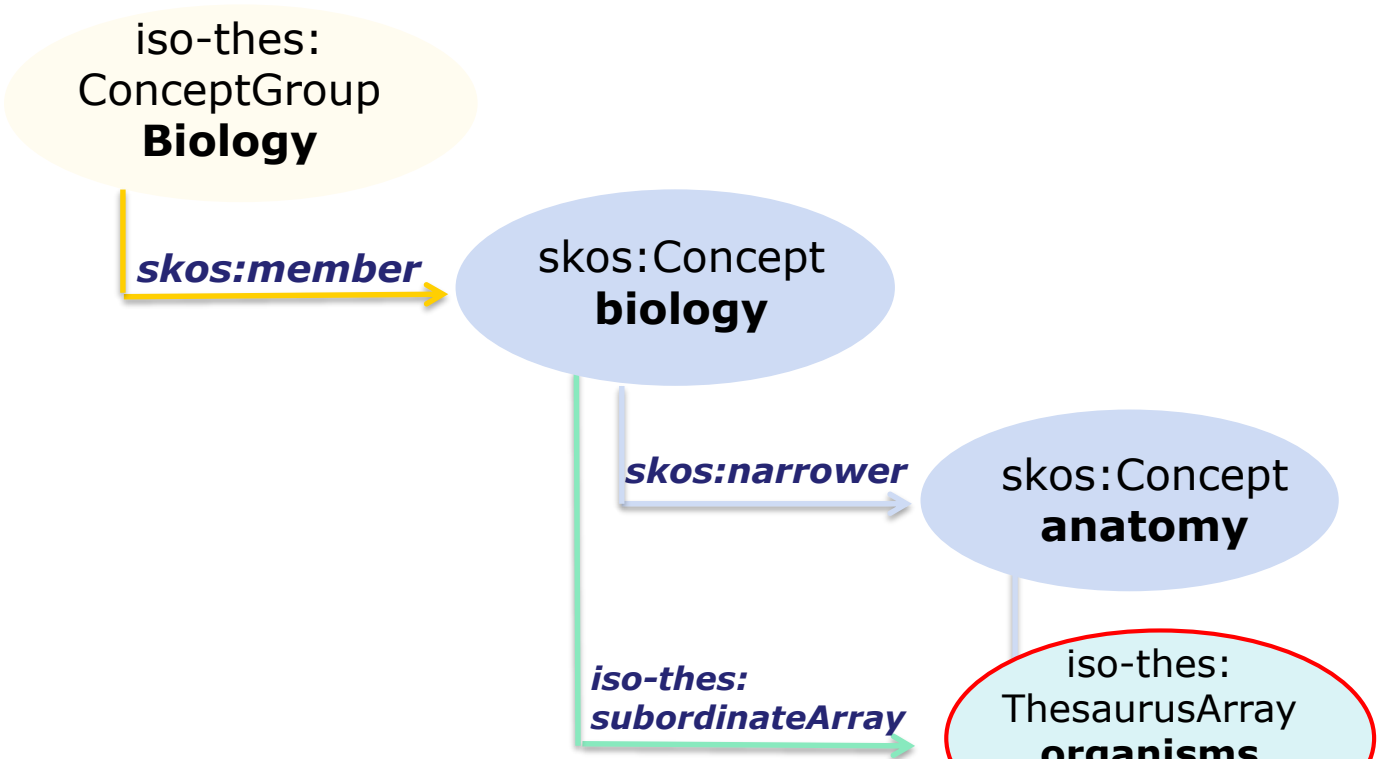
.... barbers´ chairs
.... bedchairs
.... <children´s chairs>
..... highchairs (children's chairs)
..... carriage chairs



„Node Labels“ in the Bioethic Thesaurus (1)



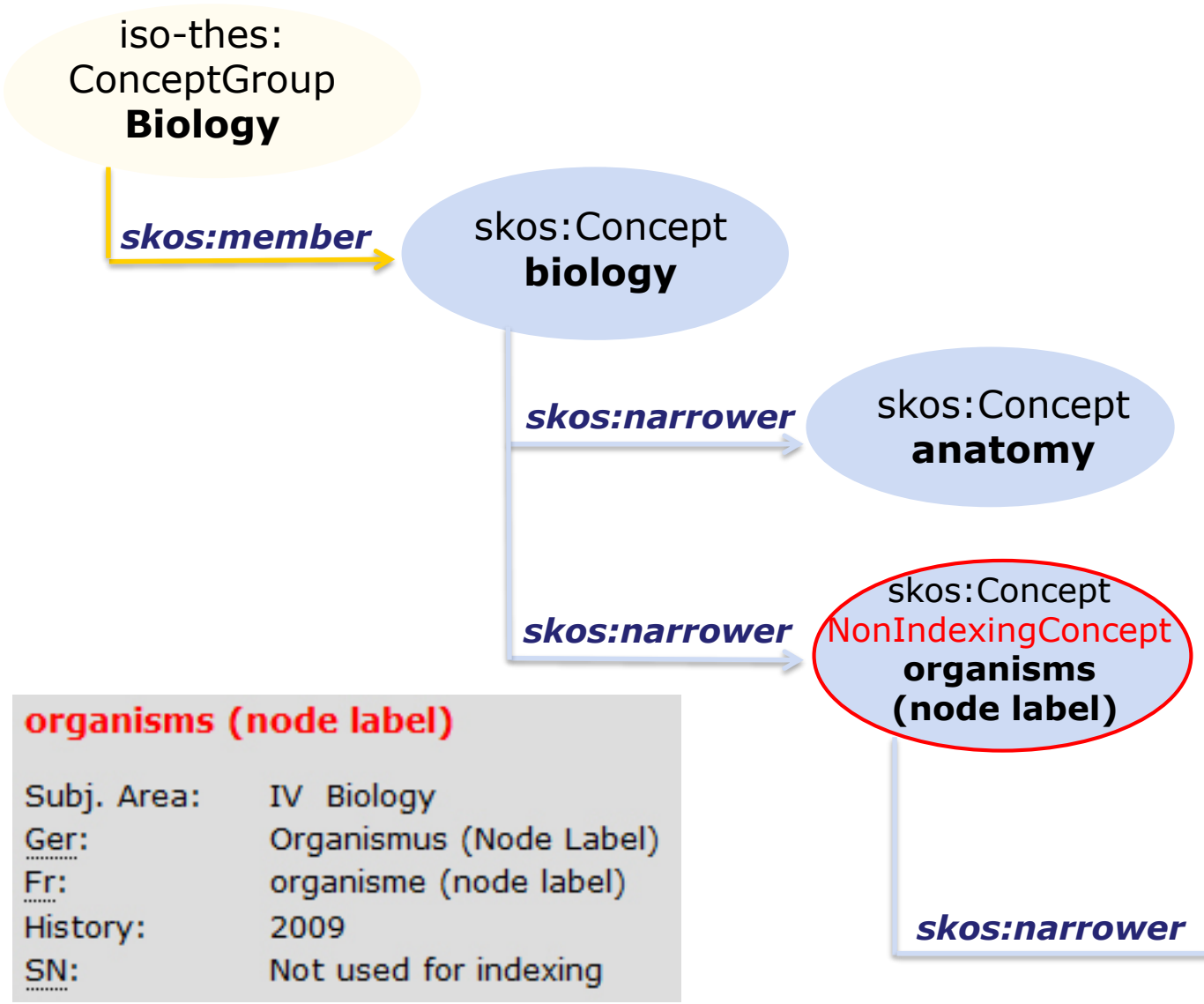
organisms (node label)

Subj. Area:	IV Biology
Ger:	Organismus (Node Label)
Fr:	organisme (node label)
History:	2009
SN:	Not used for indexing

Subject Area IV: Biology

biology
- anatomy
- anthropology [biology]
- behavioural biology +
- biochemistry
- biometry
- biophysics
- biosystematics +
- botany +
- cell biology +
- chronobiology
- developmental biology
- ecology +
- evolutionary biology +
- histology
- immunobiology +
- microbiology +
- molecular biology +
- morphology
- **organisms (node label)**
  - animals +
  - clones
  - fungi +
  - genetically modified organ
  - harmful organisms
  - introduced species +
  - renewable resources +
  - soil organisms
  - viruses +

„Node Labels“ in the Bioethic Thesaurus (2)



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- chronobiology
- developmental biology
- ecology +
- evolutionary biology +
- histology
- immunobiology +
- microbiology +
- molecular biology +
- morphology
- **organisms (node label)**
  - animals +
  - clones
  - fungi +
  - genetically modified organ
  - harmful organisms
  - introduced species +
  - renewable resources +
  - soil organisms
  - viruses +

„Node Labels“ in the Bioethic Thesaurus (3)

Subject Area I:
Ethics, Philosophy, Theology

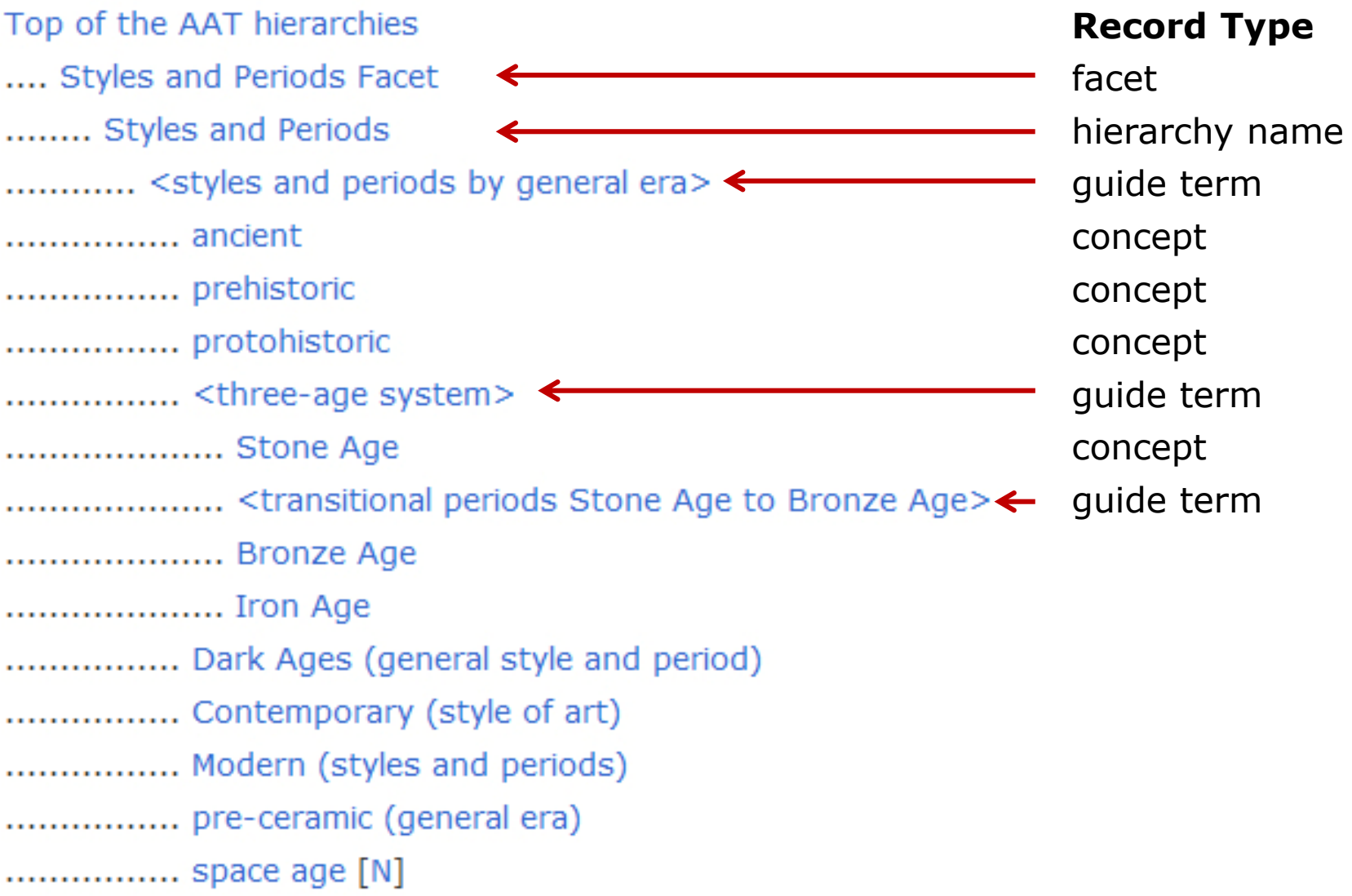
philosophy

approaches and schools in philosophy (node label) +
basic philosophical concepts (node label) +
philosophical disciplines [except ethics] (node label) +

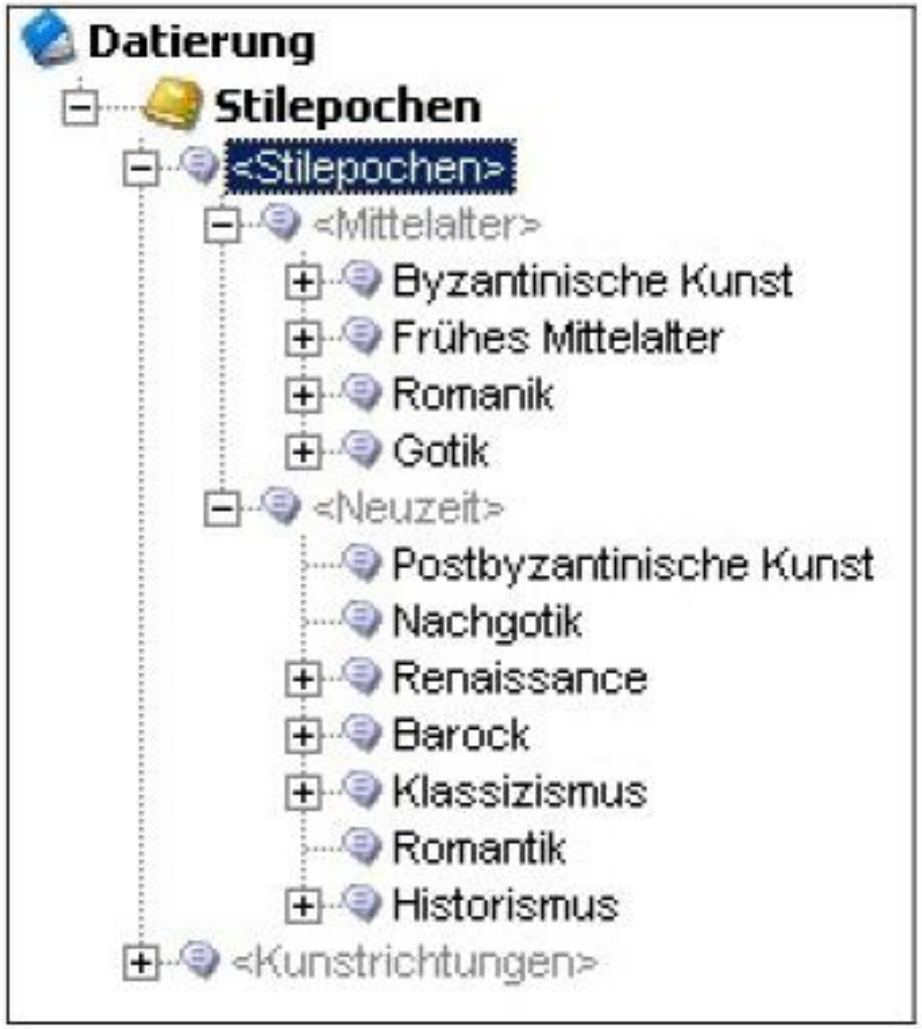
philosophical disciplines [except ethics] (node label)

aesthetics +
anthropology [philosophy]
epistemology
logic
metaphysics
neurophilosophy
philosophy of culture
philosophy of history
philosophy of language
philosophy of law
philosophy of nature
philosophy of religion
philosophy of science +
philosophy of technology +
political philosophy

Facet, Hierarchy names and Guide Terms in the AAT Thesaurus



Node Labels („Stützterme“) in the „Stylistic Eras“ thesaurus

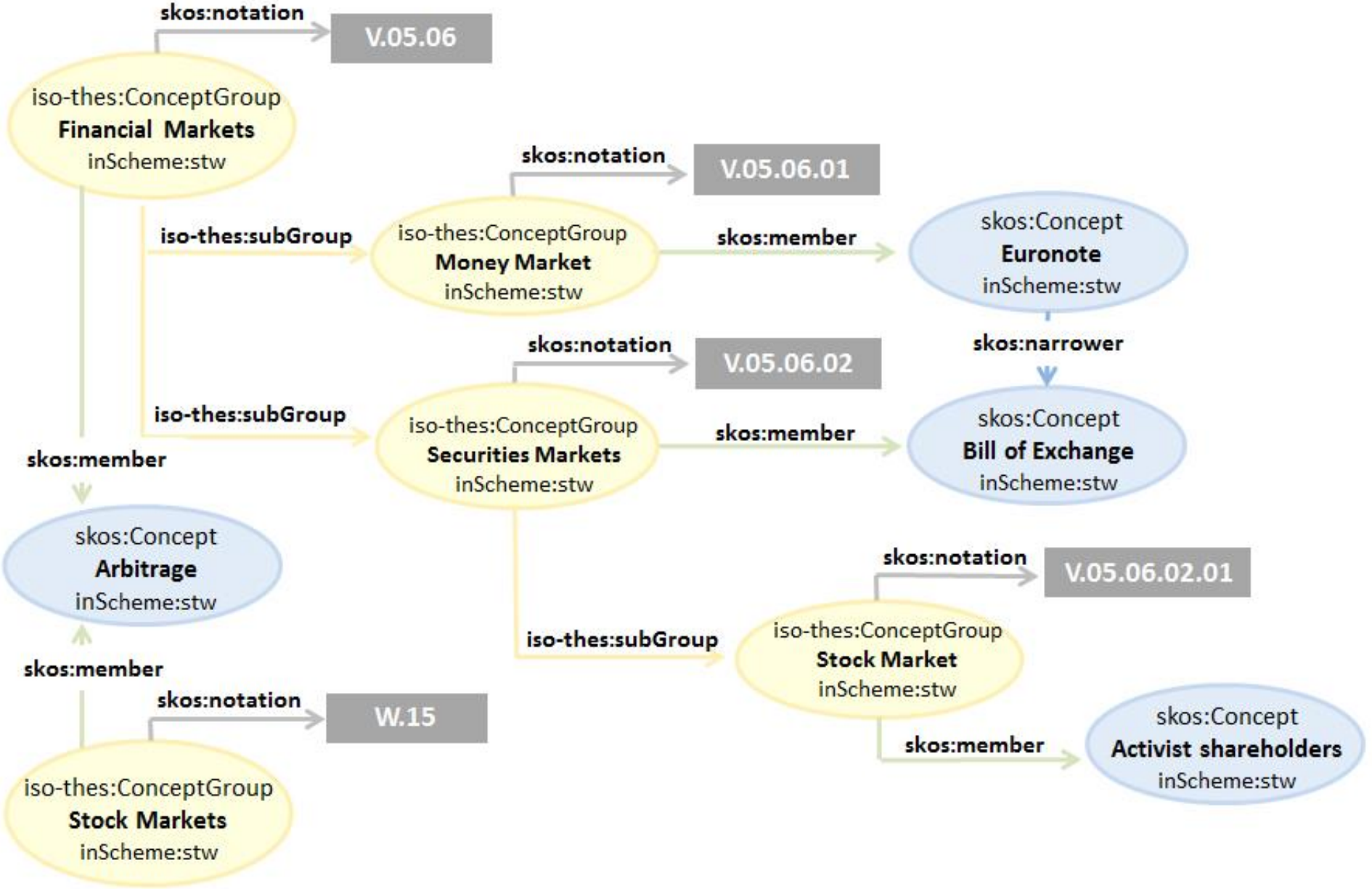


Dating
Stylistic Eras
<stylistic eras>
<Middle Ages>
Byzantine art
Early Middle Ages
Romanesque art
Gothic art
<Modern Age>

<art movements>

Abb. 3: Stützterm <Stilepochen> und untergeordnete Begriffe

„Classification“ of the STW Thesaurus for Economics



„Classification“ of the STW Thesaurus for Economics

- V Economics
  - V.00 Economy
  - V.01 Economic Theory
  - V.02 Microeconomics
  - V.03 Macroeconomics
  - V.04 Business Cycle, Growth, and Economic Structure
  - V.05 Money and Financial Markets
    - V.05.01 Monetary Theory
    - V.05.02 Monetary Policy
    - V.05.03 Inflation
    - V.05.04 Interest Rate
    - V.05.05 Credit
    - V.05.06 Financial Markets
      - V.05.06.01 Money Market
      - V.05.06.02 Securities Markets
      - V.05.06.03 Forward Market
      - V.05.06.04 Foreign Exchange Market
    - V.05.07 Payments

V.05.06 Financial Markets

V.05.06 Finanzmärkte (german)

broader

- V.05 Money and Financial Markets

narrower

- V.05.06.01 Money Market
- V.05.06.02 Securities Markets
- V.05.06.03 Forward Market
- V.05.06.04 Foreign Exchange Market

Descriptors

- Arbitrage
- Arbitrage pricing
- ...
- Yield

Persistent Identifier (for bookmarking and linking)

- http://zbw.eu/stw/thsys/70187

Standard-Thesaurus Wirtschaft

„Classification“ groups of the STW Thesaurus for Economics

```
@base <http://zbw.eu/stw/> .

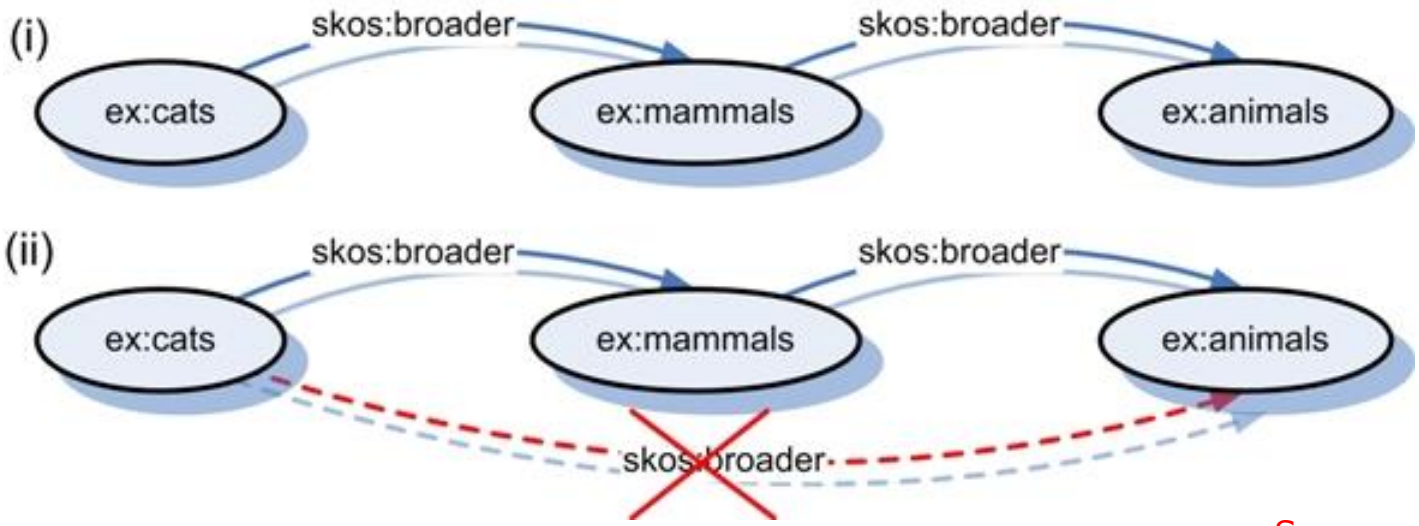
<thsys/71107>
   a skos:Concept, zbwext:Thsys ;
   rdfs:isDefinedBy <thsys/71107/about> ;
   rdfs:label "Securities Markets"@en, "Wertpapiermärkte"@de ;
   skos:notation "V.05.06.02"^^xsd:string ;
   skos:prefLabel "V.05.06.02  Securities Markets"@en,
                  "V.05.06.02  Wertpapiermärkte"@de .
   skos:broader    <thsys/70187> ; [Financial Markets]
   skos:narrower  <descriptor/...>,
                  <thsys/71105>,  [Bond Market]
                  <thsys/71106> ; [Stock Market]
   skos:inScheme <../stw> .
```

Source: STW Thesaurus for Economics

„Classification“ groups of the STW expressed in iso-thes

```
<STW/71107>
   a iso-thes:ConceptGroup ;
   rdfs:label  "Securities Markets"@en, "Wertpapiermärkte"@de ;
   skos:notation "V.05.06.02"^^xsd:string  ;
   skos:prefLabel "Securities Markets"@en,
                        "Wertpapiermärkte"@de .
   iso-thes:subGroup <STW/thsys/71105> ;
   iso-thes:subGroup <STW/thsys/ 71106> ;
   skos:member <STW/descriptor/...> ,
   [alternative iso-thes:groupMember <STW/descriptor/...>]  ,
   … ;
   skos:inScheme <STW>
   iso-thes:classificationOf<STW>  .
```

Hierarchies in SKOS



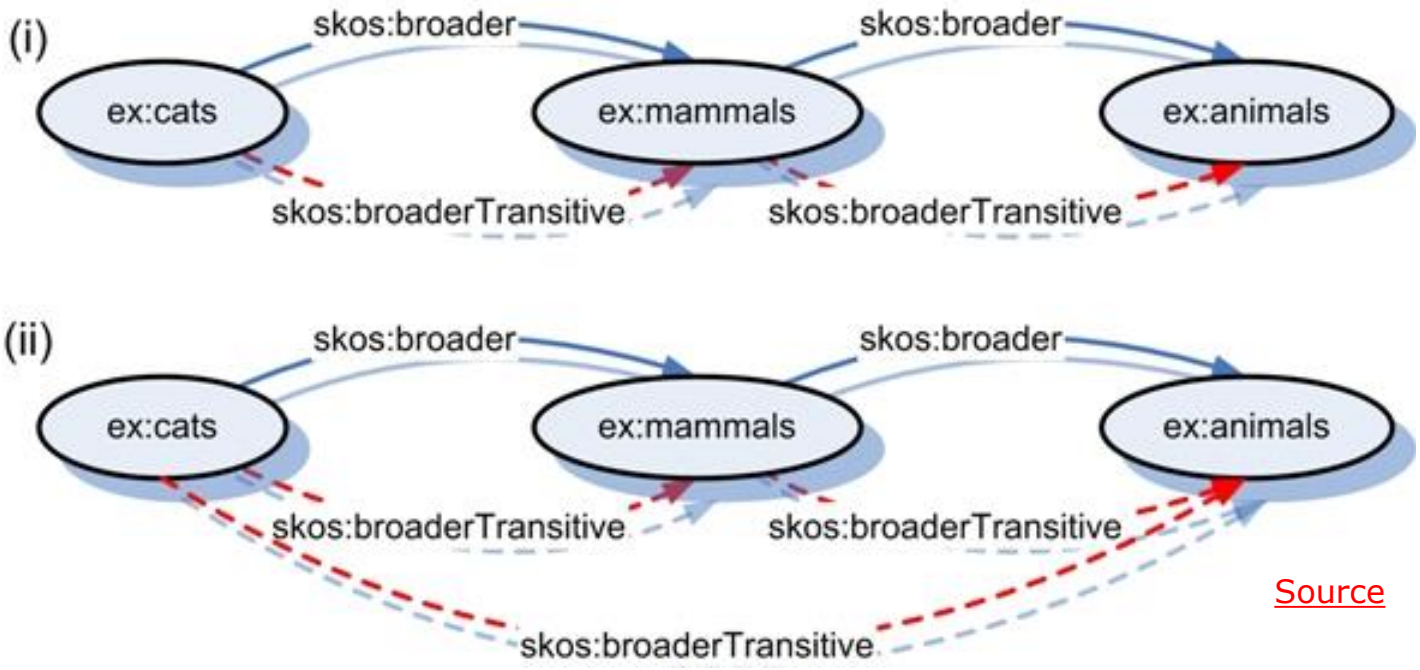
Source

skos:broader and skos:narrower

- are **only** used to assert a **direct** (i.e., immediate) hierarchical link between two SKOS concepts.
- are **not** declared as transitive properties.

http://www.w3.org/TR/2009/NOTE-skos-primer-20090818

Transitive Hierarchies in SKOS



Source

skos:broaderTransitive and skos:narrowerTransitive

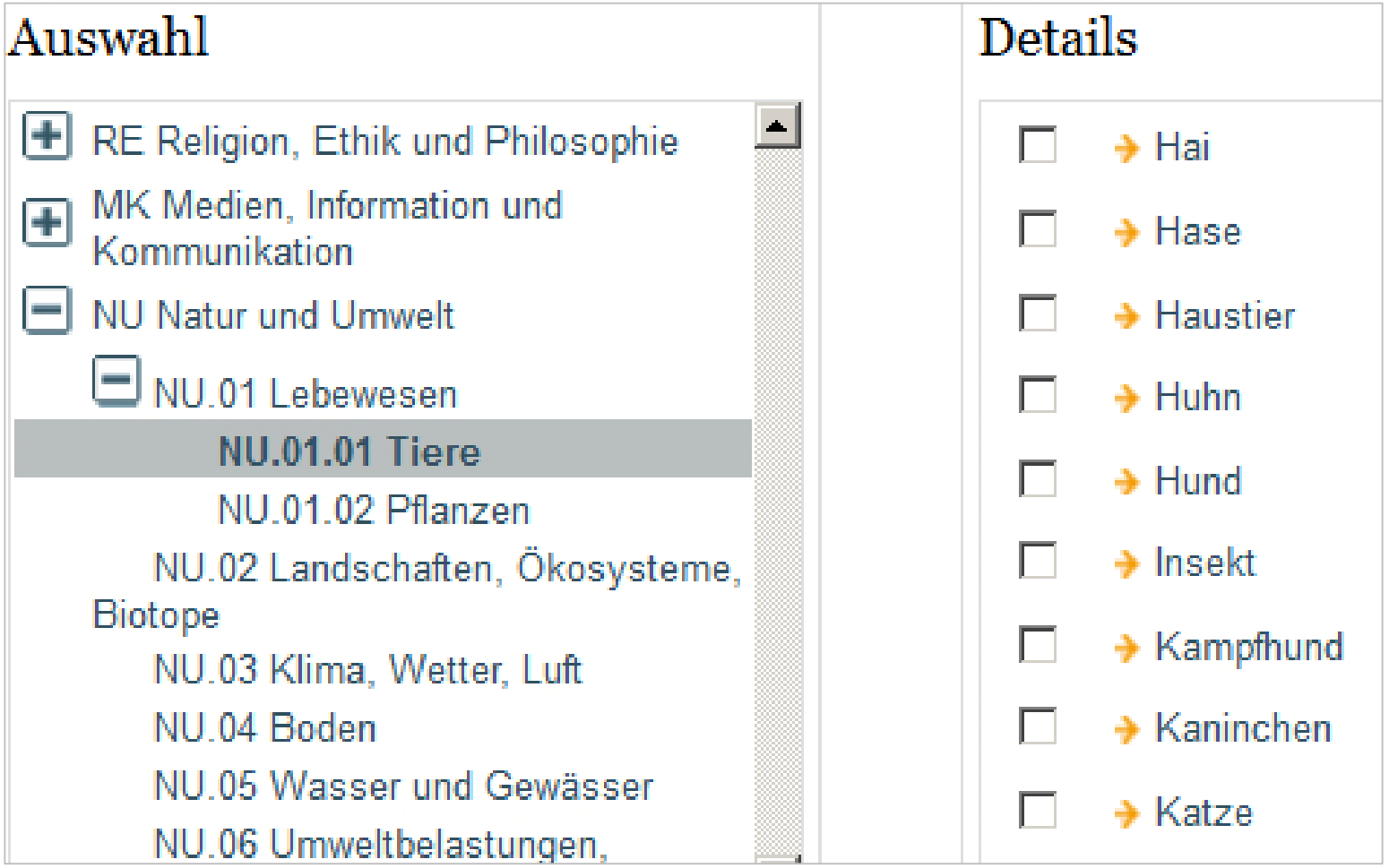
- are provided to express **both direct and indirect** hierarchical links between concepts, for instance to improve search recall through query expansion.
- are **not** used to make assertions.
- are used to infer the transitive closure of the hierarchical links, which can then be used to access direct or indirect hierarchical links between concepts.

http://www.w3.org/TR/2009/NOTE-skos-primer-20090818/

Descriptor display of German Parliament Thesaurus PARTHES

Schlagwort: ☑	**Haustier**
Thesaurus:	Sachbegriffe
Definition:	NUR VERWENDEN für Heimtiere (z. B. Hauskatzen, Hunde)
Benutzt für:	
	Heimtier
Oberbegriffe:	
☐	→ Nutztier
Unterbegriffe:	
☐	→ Hund
☐	→ Katze
Verwandte Begriffe:	
☐	→ Tierhaltung
☐	→ Tierhandel
☐	→ Tierheim
Zuordnung:	
	→ NU.01.01 - Tiere
	→ LE.05 - Tierhaltung, Tierzucht, Tierschutz

Systematic display of German Parliament Thesaurus PARTHES



Thesaurus für Parlamentsmaterialien PARTHES

Hierarchical display of German Parliament Thesaurus PARTHES

Thesaurus für Parlamentsmaterialien PARTHES

AHAJOKES.COM

A000 general terms

(objects)

A001 . equipment

. . *<equipment by portability>*

A002 . . . fixed equipment

A003 . . . portable equipment

. . *<equipment by power source>*

A004 . . . electrically-powered equipment

A005 . . . human-powered equipment

. . *<equipment by application>*

. . . diving equipment (D001)

. . . photographic equipment (H001)

. . . physics equipment (P001)

(people)

A100 . people

. . *<people by age>*

A101 . . . infants

A102 . . . children

A103 . . . adults

. . *<people by profession>*

. . . divers (D008)

. . . models (people) (H025)

. . . photographers (H026)

. . . physicists (P005)

(properties)

A200 . properties

A201 . . chemical properties

A202 . . physical properties

A203 . . . optical properties

A204 . . . . colour

A205 . . . . contrast

A206 . . . . luminance

A207 . . . . luminosity

A208 . . . pressure

A209 . . . temperature

H000 photography

(objects)

. equipment (A001)

H001 . . photographic equipment

H002 . . . camera accessories

H003 . . . . flash guns

. . . . light meters (P003)

H004 . . . . tripods

H005 . . . cameras and camera components

H006 . . . . camera components

H007 . . . . . camera lenses

H008 . . . . . camera viewfinders

H009 . . . . cameras

. . . . . *<cameras by imaging technique>*

H010 . . . . . digital cameras

H011 . . . . . film cameras

. . . . . *<film cameras by film size>*

H012 . . . . . 35 mm cameras

H013 . . . . . medium format cameras

H014 . . . . . miniature cameras

H015 . . . . . instant picture cameras

H016 . . . . . plate cameras

. . . . . *<cameras by viewing method>*

H017 . . . . . reflex cameras

H018 . . . . . single lens reflex cameras

H019 . . . . . twin lens reflex cameras

H020 . . . . . viewfinder cameras

H021 . . . . . special-purpose cameras

H022 . . . . . stereo cameras

H023 . . . . . underwater cameras

H024 . . . . . high pressure underwater cameras

(people)

. people (A100)

H025 . . models (people)

H026 . . photographers

GEMET: Classification Scheme – Supergroups and Groups

Groups list

NATURAL ENVIRONMENT, ANTHROPIC ENVIRONMENT

ANTHROPOSPHERE (built environment, human settlements, land setup)

ATMOSPHERE (air, climate)

BIOSPHERE (organisms, ecosystems)

ENVIRONMENT (natural environment, anthropic environment)

HYDROSPHERE (freshwater, marine water, waters)

LAND (landscape, geography)

LITHOSPHERE (soil, geological processes)

SPACE

TIME (chronology)

EIONET GEMET Thesaurus

Groups List

GEMET: Classification Scheme – Themes

Themes list

- administration
- agriculture
- air
- animal husbandry
- biology
- building
- chemistry
- climate
- disasters, accidents, risk
- economics
- energy
- environmental policy
- fishery
- food, drinking water
- forestry
- general
- geography
- human health
- industry
- information
- legislation
- materials
- military aspects
- natural areas, landscape, ecosystems
- natural dynamics
- noise, vibrations
- physics
- pollution
- radiations
- research
- resources
- social aspects, population
- soil
- space
- tourism
- trade, services
- transport
- urban environment, urban stress
- waste
- water

GEMET: Classification Scheme – Supergroups and Groups

4. List of Groups

No.*	Abbreviation	Name of the Super-group/Group
Supergroup 1		NATURAL ENVIRONMENT, ANTHROPIC ENVIRONMENT
1	ENV	ENVIRONMENT (natural environment, anthropic environment)
2	TIM	TIME
3	SPA	SPACE
4	ATM	ATMOSPHERE (air, climate)
5	HYD	HYDROSPHERE (freshwater, marine water, waters)
6	LIT	LITHOSPHERE (soil, geological processes)
7	LAN	LAND (landscape, geography)
8	BIO	BIOSPHERE (organisms, ecosystems)
9	ANT	ANTHROPOSPHERE (built environment, human settlements)
Supergroup 2		HUMAN ACTIVITIES AND PRODUCTS, EFFECTS ON THE ENVIRONMENT
10	CHE	CHEMISTRY, SUBSTANCES, PROCESSES
11	PHY	PHYSICAL ASPECTS, NOISE, VIBRATIONS, RADIATIONS
12	ENE	
13	RSC	RESOURCES (utilisation of resources)
14	PRD	PRODUCTS, MATERIALS
15	AGR	AGRICULTURE, FORESTRY; ANIMAL HUSBANDRY; FISHERY
16	IND	INDUSTRY, CRAFTS; TECHNOLOGY; EQUIPMENTS
17	SER	TRADE, SERVICES
18	TRA	TRAFFIC, TRANSPORTATION
19	REC	RECREATION, TOURISM
20	WAS	WASTES, POLLUTANTS, POLLUTION
21	EFF	EFFECTS, IMPACTS
Supergroup 3		SOCIAL ASPECTS, ENVIRONMENTAL POLICY MEASURES
22	ECO	ECONOMICS, FINANCE
23	LEG	LEGISLATION, NORMS, CONVENTIONS
24	ADM	ADMINISTRATION, MANAGEMENT, POLICY
25	ENP	ENVIRONMENTAL POLICY
26	INF	INFORMATION, EDUCATION, CULTURE, E
27	RES	RESEARCH, SCIENCES
28	HEA	HEALTH, NUTRITION
29	SAF	RISKS, SAFETY
30	SOC	SOCIETY

EIONET GEMET Thesaurus

Groups List

SOCIAL ASPECTS, ENVIRONMENTAL POLICY MEASURES

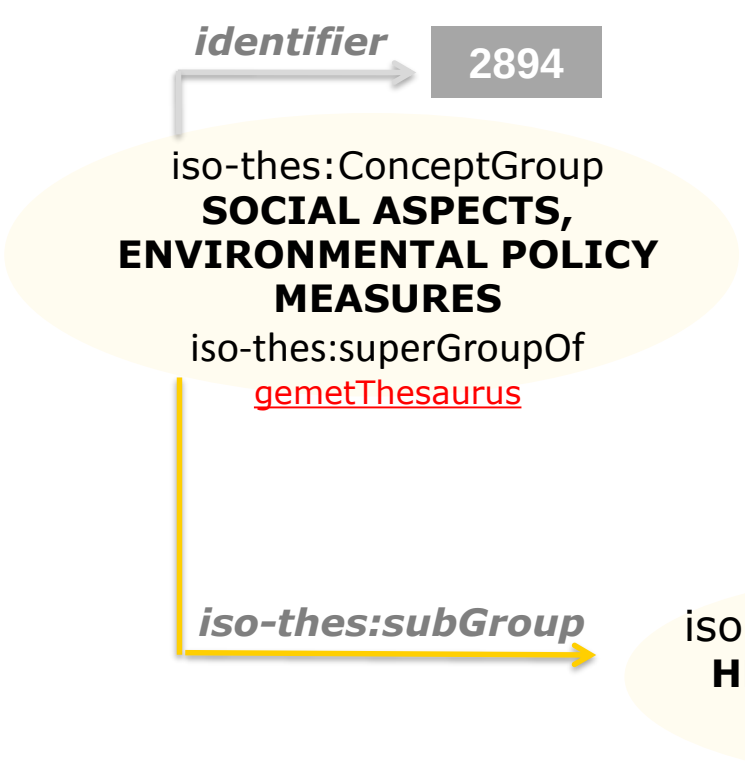
ADMINISTRATION, MANAGEMENT, POLICY, POLITICS, INSTITUTIONS, PLANNING

ECONOMICS, FINANCE

ENVIRONMENTAL POLICY

HEALTH, NUTRITION

Gemet: Supergroups and Groups



SOCIAL ASPECTS, ENVIRONMENTAL POLICY MEASURES

ADMINISTRATION, MANAGEMENT, POLICY, POLITICS, INSTITUTIONS, PLANNING

ECONOMICS, FINANCE

ENVIRONMENTAL POLICY

HEALTH, NUTRITION

Gemet Groups List

```
- <skos:Collection rdf:about="group/3875">
    <rdf:type rdf:resource="http://www.eionet.europa.eu/gemet/2004/06/gemet-schema.rdf#Group"/>
  - <gemet:subGroupOf>
    - <rdf:Description rdf:about="supergroup/2894">
        <skos:member rdf:resource="group/3875"/>
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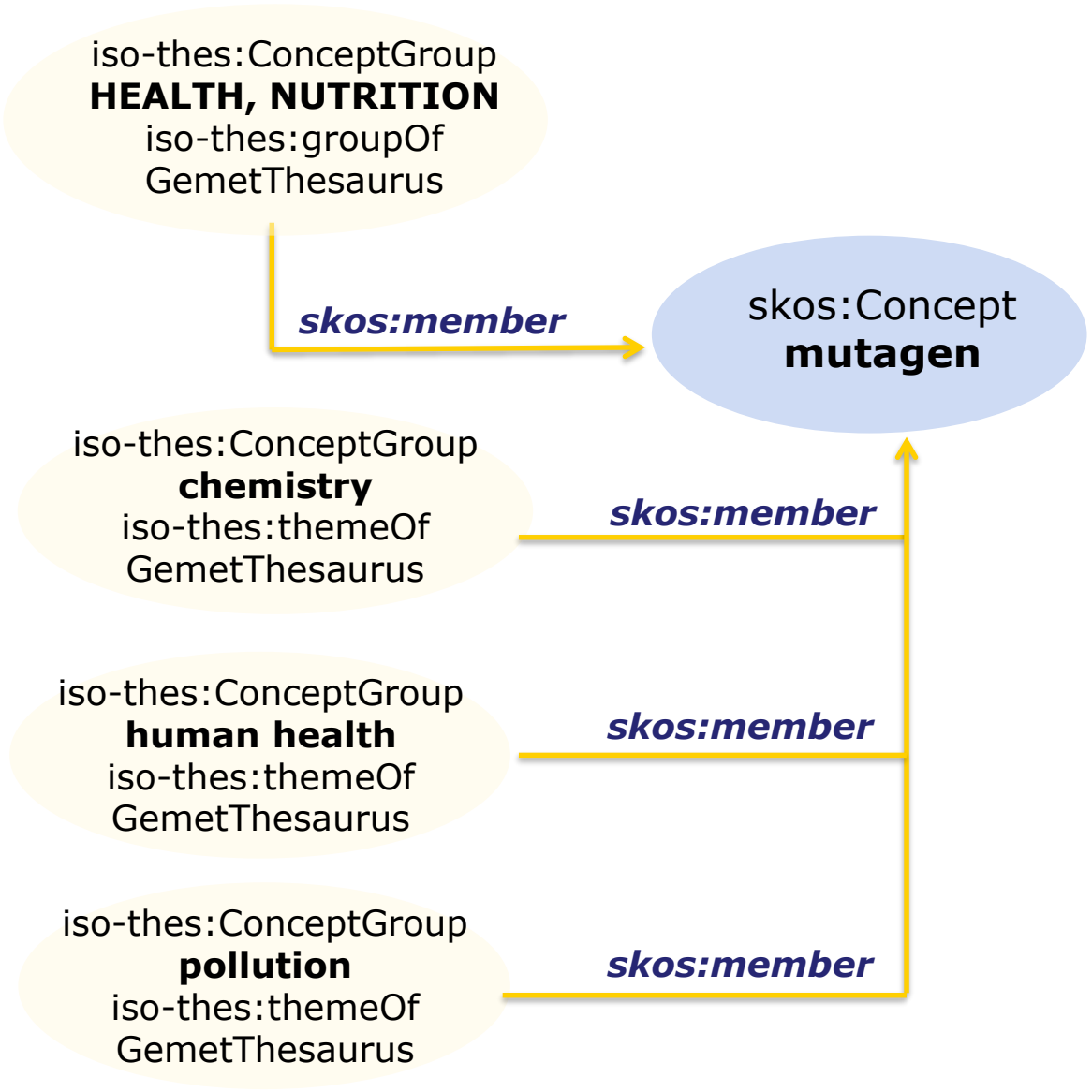
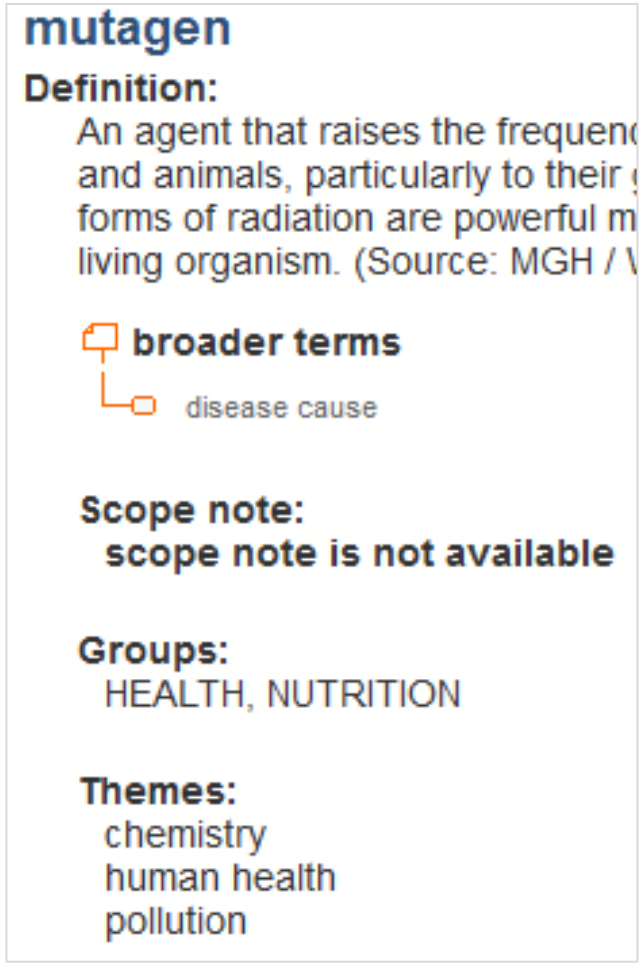
EIONET Gemet Thesaurus

Gemet: Groups and Themes





Bioethics Thesaurus: Multiple Subject Areas

Subject Area IV: Biology

biology
- organisms (node label)
  - animals
    - vertebrates
      - mammals
        - **dogs**
        - primates +

domestic animals

Subj. Area:	IV Biology XI Agriculture and Forestry, Animal Husbandry and Food
Ger:	Haustier
Fr:	animal domestique
UF:	pets
RT:	**domestication**

Subject Area IV: Biology

biology
- organisms (node label)
  - animals
    - domestic animals
      - **dogs**
      - livestock +

Subject Area XI: Agriculture and Forestry, Animal Husbandry and Food

animal husbandry
- domestic animals
  - **dogs**
  - livestock +

EuroVoc: Fields and micro-thesauri

Eurovoc (Top Level and Detail)

- 04 Politics
- 08 International Relations
- 10 European Communities
- 12 Law
- 16 Economics
- 20 Trade
- 24 Finance
- 28 Social Questions
- 32 Education and Competition
- 36 Science
- 40 Business and Competition
- 44 Employment and Working Conditions
- 48 Transport
- 52 Environment
- 56 Agriculture, Forestry and Fisheries
- 60 Agri-Foodstuffs
- 64 Production, Technology and Research
- 66 Energy
- 68 Industry
- 72 Geography
- 76 International Organisations

28 SOCIAL QUESTIONS

- 2806 family
- 2811 migration
- 2816 demography and population
- 2821 social framework
- 2826 social affairs
- **2831 culture and religion**
  - arts
  - cultural policy
  - **culture**
    - acculturation
    - civilization
    - cultural difference
    - **cultural identity**
      - RT: protection of minorities (1236)
      - RT: socio-cultural group (2821)
    - cultural pluralism
    - popular culture
    - regional culture
  - religion
- 2836 social protection
- 2841 health
- 2846 construction and town planning

Eurovoc-Structure

UKAT: Fields and micro-thesauri

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<skos:ConceptScheme rdf:about="http://www.ukat.org.uk/thesaurus/micro/105">
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   <dc:description>A microthesaurus within the UK Archival Thesaurus.</dc:description>
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UKAT Thesaurus

ELSST: Top Terms

Preferred Term

EDUCATIONAL LEVELS

Scope Note

THE DEFINITIONS FOR THE LEVELS OF EDUCATION ARE BASED ON

Synonyms/UFs

Broader Terms

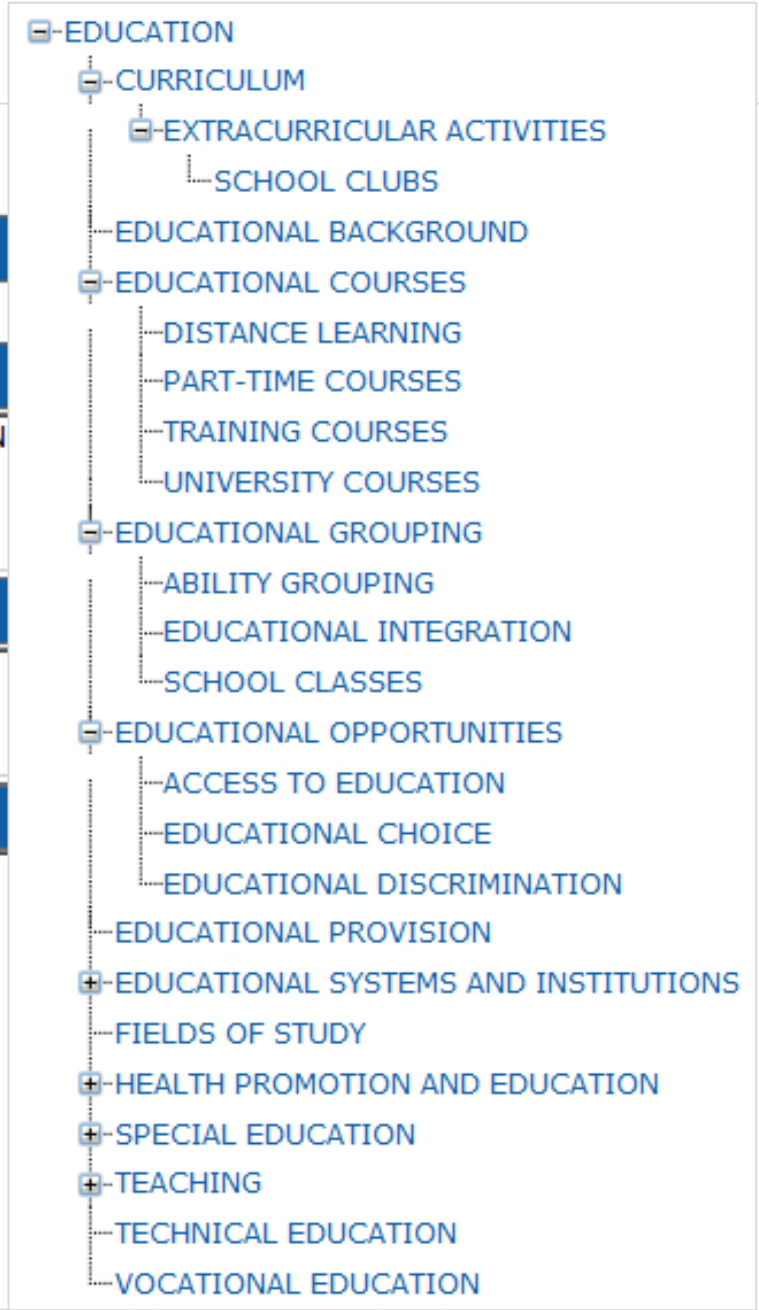
EDUCATIONAL SYSTEMS

Narrower Terms

PRE-PRIMARY EDUCATION
PRIMARY EDUCATION
SECONDARY EDUCATION
TERTIARY EDUCATION

Top Terms(Click for hier Display)

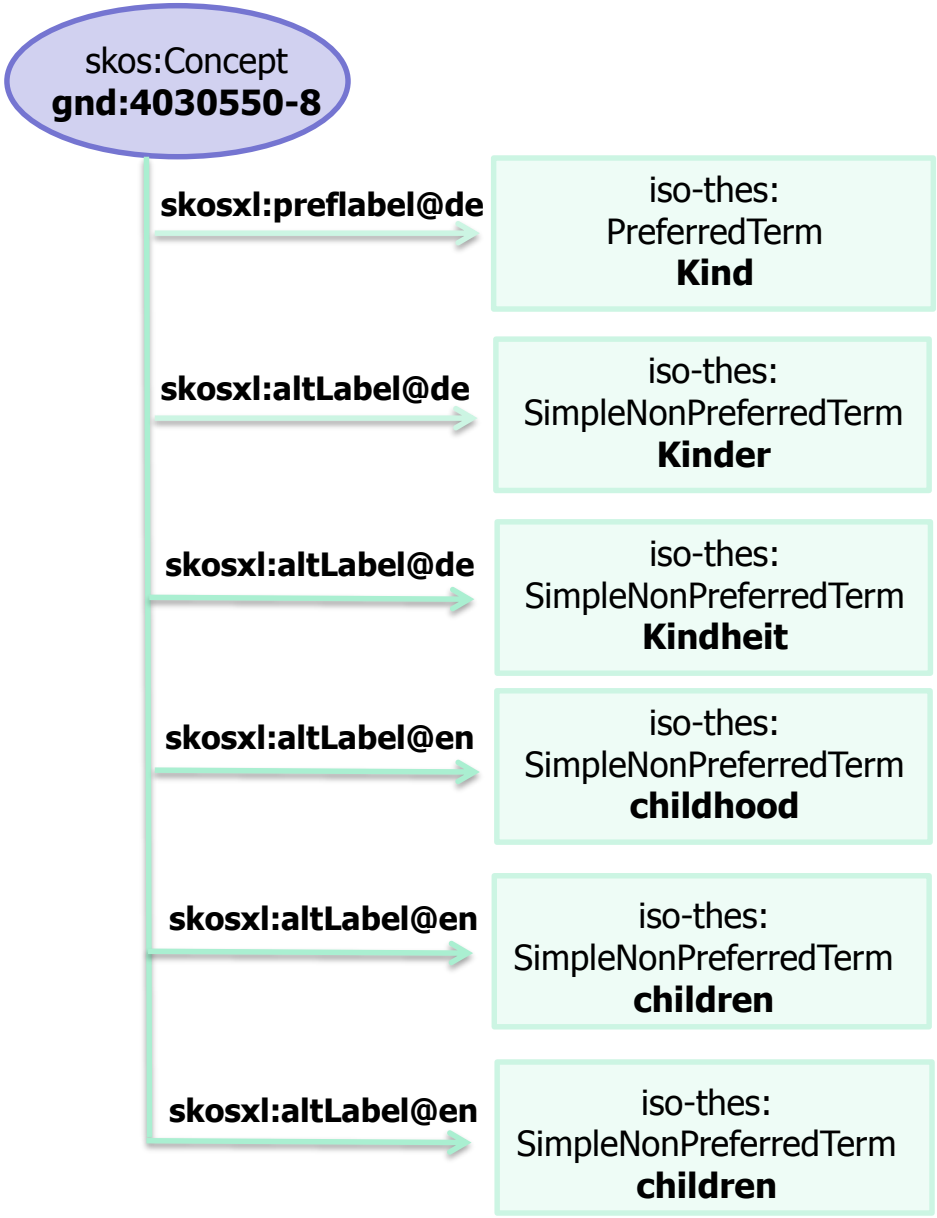
EDUCATION (TT)



ELSST European Language Social Science Thesaurus

Equivalence multilingual

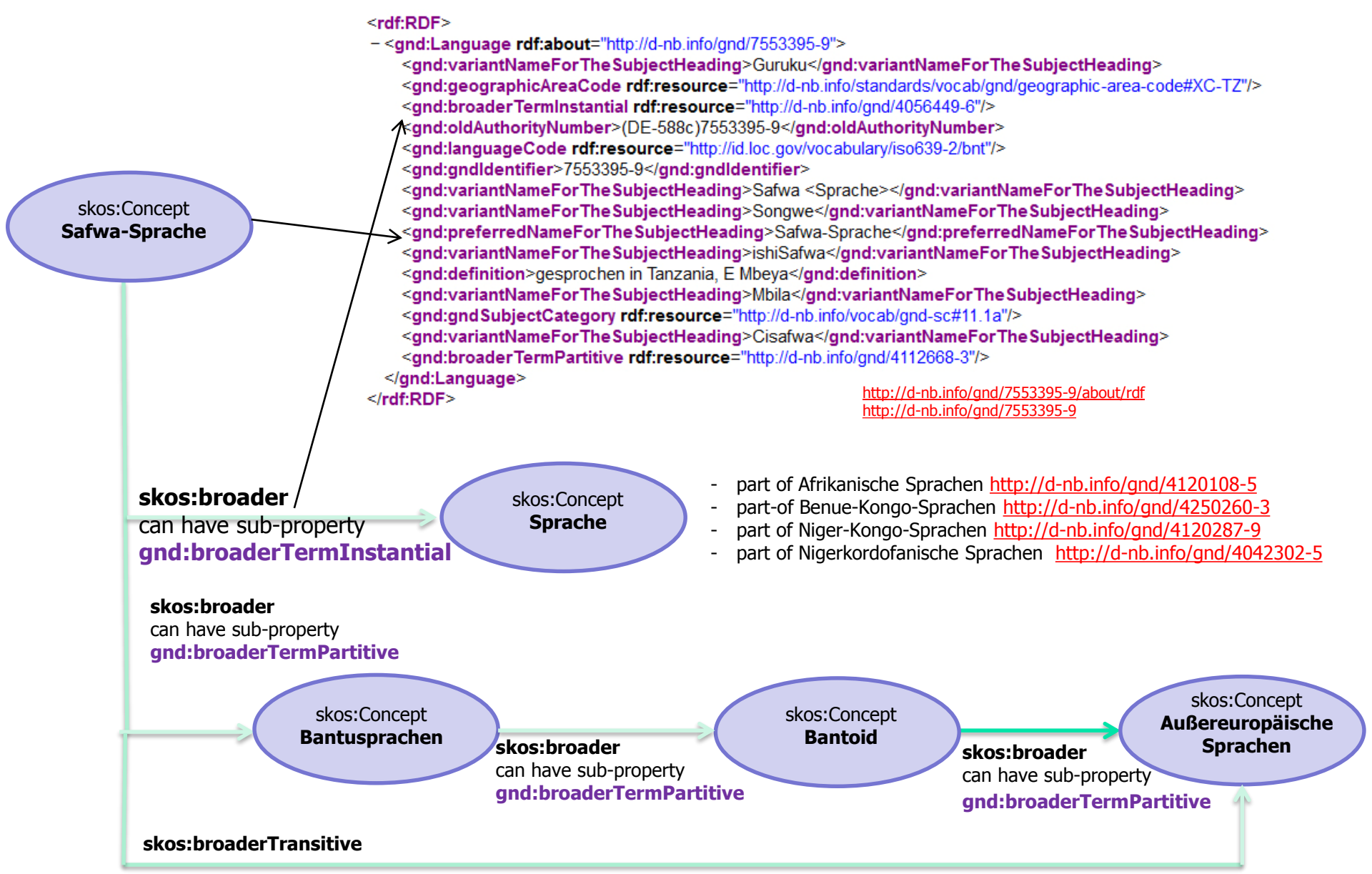
(Deutsche Nationalbibliothek)



GND	
Link zu diesem Datensatz	http://d-nb.info/gnd/4030550-8
Sachbegriff	Kind
Quelle	M
Erläuterungen	Definition: verwendet für das 1.-1 Verhältnis zu den Eltern; mit einz gebildet, z.B. Missionar / Kind
Synonyme	Kindheit Kindesalter Kindschaft Kinder Child (eng) Children (eng) Childhood (eng)

Example: http://d-nb.info/gnd/4030550-8/about/rdf

Thesaurus Concept (2/3) HierarchicalRelationship + Role (Deutsche National Bibliothek)



ISSUE: skos:broaderTransitive does not capture different semantics of (e.g.) BTP and BTI