

SWAD–Europe Deliverable 8.2: Review of RDF Thesaurus Work

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Abstract:

This document is a review of existing work on RDF-based systems for encoding thesaurus data. Seven schemas are discussed in relation to common themes and design features. Some conclusions are drawn regarding requirements for a thesaurus representation system that will allow thesaurus data to become a part of the semantic web. The schemas themselves are presented for convenient analysis as summary tables.

Status:

Completed report

Comments on this document are welcome and should be sent to [Alistair Miles](#) or to the public-esw-thes@w3.org list. An archive of this list is available at <http://lists.w3.org/Archives/Public/public-esw-thes/>

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1. Introduction [\[back to contents\]](#)

Thesauri are widely used as an aid to information retrieval. A thesaurus can be used in several ways: as a search aid, providing entry to and navigation of a domain vocabulary; as an indexing scheme; as a tool for multilingual translation; as a tool for automated document classification. A number of thesauri exist in the public domain, many of which have been developed over many years by communities of dedicated people. These are highly valuable knowledge resources. There is an opportunity to design systems that allow these resources to enrich the framework of the semantic web. RDF-based representations for thesaurus data are the enabling step towards this goal.

This document is a discussion of work to date on RDF-based representations for thesaurus data. Six RDF schemas and one DAML+OIL ontology are reviewed. [Section 2](#) contains a description and discussion of major

design features, common themes and implementation issues. [Section 3](#) draws conclusions from the discussion, outlining requirements for a semantic web thesaurus system. [Section 4](#) presents the schemas for convenient analysis, in the form of tables. The schemas themselves are included in the [appendices](#).

There is a lot of variability in the schemas reviewed here. This variability includes some fundamental differences in the underlying data model that is implied. It also includes significant differences in how RDF has been used to represent the same information. If thesaurus data is to become a useful part of the semantic web, the above schemas will need to converge, and a common approach agreed upon and deployed. At the very least, it must be understood how they relate to each other. However, many issues remain to be considered. For example, although there is standardisation in this area (see [\[8\]](#), [\[9\]](#)), in practise thesauri come in many different flavours. A useful schema must be able to accommodate these subtle variations of meaning. Also, when it becomes a part of the semantic web, thesaurus data will be used alongside ontologies expressed in languages such as OWL and many other types of knowledge organisation scheme. A well designed schema would enable thesaurus data to be fitted seamlessly in to this semantic web.

By highlighting and discussing these and other issues, this document hopes to be a firm foundation for further work in this area.

2. Discussion of themes [\[back to contents\]](#)

This section contains a discussion of the major themes in the design of the schemas here reviewed. Each sub-section is divided into three parts. Firstly, the theme is described, and the alternative implementation solutions are presented. Secondly, it is stated which of the schemas has implemented which alternative solution. Finally, the pros and cons of the alternatives are discussed.

2.1. Concept-based or term-based [\[back to contents\]](#) - 'Concept-based' and 'term-based' refer to alternative models for understanding the structure of a thesaurus. Which view is taken impacts the design of the schema at a fundamental level.

In the term-based view, a thesaurus is a collection of terms. Terms are the only type of entity considered. Terms may be related to other terms, traditionally using relationships such as 'broader' (BT), 'narrower' (NT), 'related' (RT), 'use for' (UF) and 'use' (US/USE) .



Figure 1. Term-based model.

A term-based thesaurus will consist of data that resembles the following in structure:

AIDS	
UF	Acquired immunodeficiency syndrome
BT	Immune disorders
RT	HIV-positive people
Air	
BT	Environment
RT	Air pollution Ventilation
Air pollution	
BT	Pollution
RT	Air Ozone
Albinism	
US	Pigmentation disorders

Figure 2. Term-based example data.

In the concept-based view, a thesaurus consists of two types of entity, *concepts* and *terms*. A concept is defined as a unit of thought, something which exists in the mind of a person. Relationships such as 'broader' 'narrower' and 'related' are considered to be concept-to-concept relationships, because they convey information about the structure of the concept-space being described. That is, they convey information about *meaning*.

Terms are labels for concepts. Term-to-term relationships are used to convey purely lexical information, for example a term can be an 'abbreviation-for' another term. Concept-to-Term relationships convey information about how a concept may be *indicated* (labelled) by various terms. Term-to-concept relationships convey information about how a term may *imply* a concept (meaning).

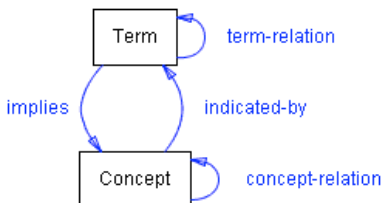
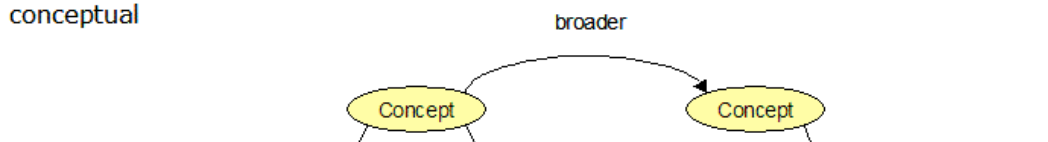


Figure 3. Concept-based model.

Some example data in the concept-based view is shown below in figure 4.

Information

conceptual



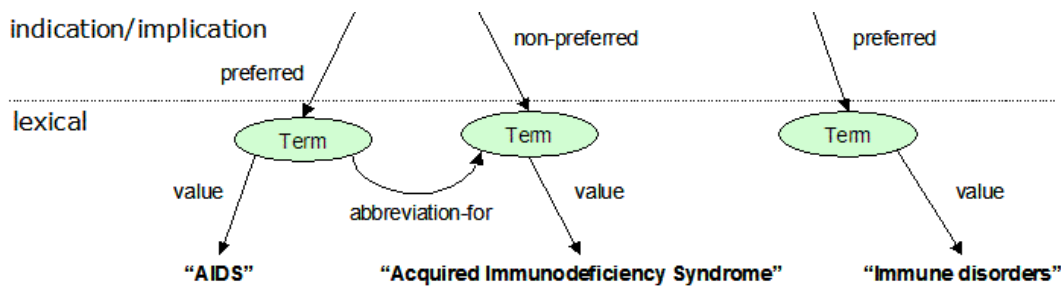


Figure 4. Concept-based example data.

The ILRT and LIMBER schemas implement a concept-based model. The ETB and FAO schemas are harder to classify, and are discussed further below.

The concept-based model is possibly a more precise description of the information contained in a thesaurus. It is explicit about the fact that a thesaurus consists of two distinct types of information, conceptual and lexical, and it separates these clearly. It has been argued that distinguishing between these types of information improves clarity, and failing to do so creates confusion (see for example [10]).

The term-based model translates to a more compact schema and data format. It is also the traditional approach, and more familiar to existing users of thesauri.

The FAO schema is an example of how not being explicit about what is a term and what is a concept can create confusion. The FAO Agrovoc data consists of resources typed as `rdfs:Classes` and resources typed as `kaon:Labels`. This would seem to suggest a concept-based model. However, the property 'uf' is allowed between the resources modelled as classes. The property 'uf' is usually used to link a preferred term to its non-preferred alternative, where both terms imply the same meaning. This suggests that although the resources of the agrovoc thesaurus have been typed as `rdfs:Classes`, they are in fact terms.

2.2. Facets, categories and others grouping structures [[back to contents](#)] - In some thesauri terms or concepts are organised into fundamental categories, or facets. For example:

```
(objects)
A001 . equipment
A002 . . . fixed equipment
A003 . . . portable equipment
A004 . . . electrically-powered equipment
A005 . . . human-powered equipment

(people)
A100 . people
A101 . . . infants
A102 . . . children
A103 . . . adults

(properties)
A200 . properties
A201 . . chemical properties
A202 . . physical properties
A203 . . . optical properties
A204 . . . . colour
A205 . . . . contrast
A206 . . . . luminance
A207 . . . . luminosity
A208 . . . pressure
A209 . . . temperature
```

Figure 5. Terms organised by facets.

Other criteria may also be used to group concepts and terms. For example:

```
(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) (H024)
. . . photographers (H025)
. . . physicists (P005)
```

Figure 6. Term grouping.

The CERES and ETB schemas support categories for terms, the others do not. None of the schemas allow other grouping structures to be represented.

Applying faceted classification and other grouping methods in a thesaurus introduces more useful information about the structure of the conceptual space being defined. A schema which supports these structures allows this information to be captured. In a schema which does not, this information is lost.

2.3. Extensible and customisable relationship sets [[back to contents](#)] - The ISO 2788:1986 [8] thesaurus standard defines a fixed set of term-to-term relationships. However, in practise these recommendations are

implemented in a great variety of ways. In some thesauri, for example, the 'broader-term' relationship strictly implies class subsumption (is-a relationship). In others it is fuzzy, and can imply is-a, instance-of, part-of, geographical part-of etc. For example, in the thesaurus data given in section 2.1, 'AIDS' is an instance of 'immune disorders', 'air' is a part of 'environment', and 'air pollution' is a sub-type of 'pollution', yet all these relationships are modelled as 'BT'. Other thesauri use a more precisely defined set of relationships, BTG (broader-term generic), BTI (broader-term instantive) and BTP (broader-term partitive). In some thesauri the part-of relationship is modelled as BT/NT, in others as RT. Other relationships are also found, for example RBT (related broader-term) and RNT (related narrower-term).

There are two points here. First, none of the schemas explicitly defines the precise meaning of the relationships they use. Most include a property which they label 'broader' or 'BT', but in practise 'BT' means different things in different thesauri. Hence there is possibility for errors of meaning to be introduced when every relationship from every thesaurus labelled as 'BT' is encoded using the same RDF property. The extent to which the exact meaning and intended use of a relationship is defined within a schema therefore reflects the extent to which errors of ambiguity and meaning can be eliminated, and richer semantic constructs can be preserved.

Secondly, a schema that supports customization and/or extension of its relationship set can accommodate more thesauri than one which offers only a fixed set of relationships. Given the variability found, it has been argued that such flexibility is an essential feature of a representation format, although this discussion was in relation to XML formats (see [12]).

The Limber schema supports an extensible relationship set by defining high level properties 'ConceptRelation', 'ConceptEquivalence' and 'indicatedBy'. All other relationships are subproperties of these three. Thus there is room for extending or customising the given relationship set.



Figure 7. LIMBER extensible property set.

The ETB schema, by modelling every relationship as a node in the RDF graph, suggests another mechanism which supports customisation and extension. If a generic term-to-term or concept-to-concept relationship is represented by a node, the node can have a property whose value defines the type of that relationship. Anybody can then define their own types, and it is clear how to integrate them into the schema. The relationships-as-nodes approach is discussed further in section 2.6.

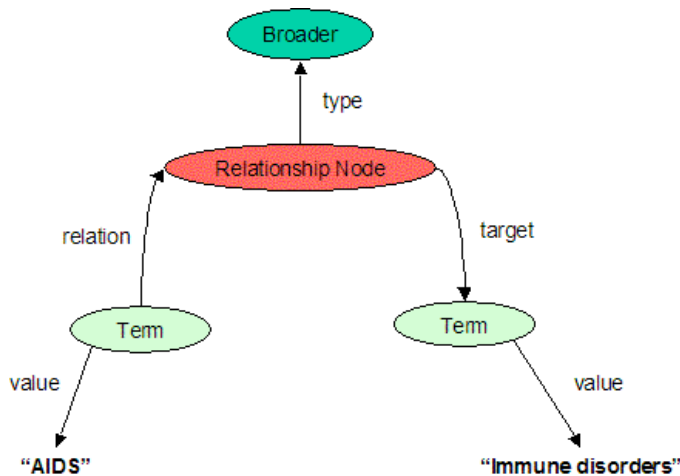


Figure 8. Node model with relationship typing.

However the ETB schema does not in fact allow flexibility in this way, as the properties linking a Term (MTNode) to a Relationship Node (RNode) (which correspond to the property labelled 'relation' in the above diagram) are not generic, and all imply fixed relationship types. For example, in notation 3 format:

```

thes:aTerm
  rdf:type      etb:MTNode;
  etb:BT       thes:aRelationNode.

thes:aRelationNode
  rdf:type      etb:RNode;
  etb:relation  'broader';
  etb:RN       thes:anotherTerm.
    
```

Figure 9. Illustration of ETB schema use.

All other schemas implement a fixed set of relationships, with no mechanism for extension or customisation.

2.4. Multilingual data [[back to contents](#)] - The LIMBER, ILRT, FAO, ETB schemas support multilingual data. Each of these schemas models multilingual data in a different way.

Comparing the two concept-based schemas (LIMBER, ILRT) raises a very interesting philosophical question. The ILRT schema allows *terms* to have a language property. The LIMBER schema allows *concepts* to have a language property. In doing so, the LIMBER schema models all concepts as being embedded in a particular

language; there can be no language independent concepts. Conversely, the ILRT models all concepts as being language independent; there is no mechanism for stating that a concept is language-specific. The extent to which 'concepts' (human thought constructs) are independent of language is an open question.

A more practical consideration is whether the schema supports non-exact equivalence relationships between concepts or terms. ISO 5964:1985 [9] defines four types of multilingual equivalence: exact, inexact, partial and one-to-many. The LIMBER schema supports non-exact equivalence, with properties defined for each of the ISO 5964 equivalence types. All other schemas assume that multilingual equivalents are exact, and have no mechanism for expressing other types of equivalence.

By supporting non-exact equivalence types, a schema allows the representation of more information. Subtle differences of meaning between languages can be captured. By not doing so, these language differences are lost. However, many thesauri (for example [13]) only contain exact equivalences, or the equivalences are assumed to be close enough to exact for practical purposes. By implicitly assuming all equivalence to be exact, a schema results in a more compact data encoding.

2.5. Inter-thesaurus mapping [back to contents] - This theme refers to whether or not a schema allows terms or concepts from different thesauri to be mapped to each other.

Only the LIMBER schema has an explicit mechanism for this. Here the equivalence properties used for multilingual mappings may also be used for inter-thesaurus mappings. This also allows non-exact mappings. No other schema has explicit mechanism for this, if mappings are made they would have to be using RT, BT, NT.

Allowing inter-thesaurus mapping is highly desirable, especially in the situation where the thesaurus is being used to organise information on the web. Different communities may use different but overlapping thesauri, and allowing these to be related permits search across collections. There has been criticism, however, in relation to using the ISO 5964:1985 equivalence types for inter-thesaurus mapping [11]. In particular, the partial equivalence relationship does not specify which is the broader and which is the narrower of the pair of terms/concepts being compared. Doerr [11] uses set based operations and boolean combinators to equate concepts between thesauri. He also produces a system for mapping that ensures recall across collections, where the thesaurus is being applied for information retrieval applications.

2.6. Relationships as nodes or arcs [back to contents] - This theme refers to whether the schema models the relationships between thesaurus entities as an arc in the RDF graph, or as a node. The node and arc approaches are illustrated below.

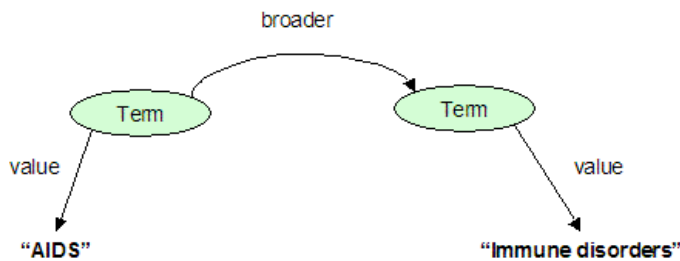


Figure 10. Arc model.

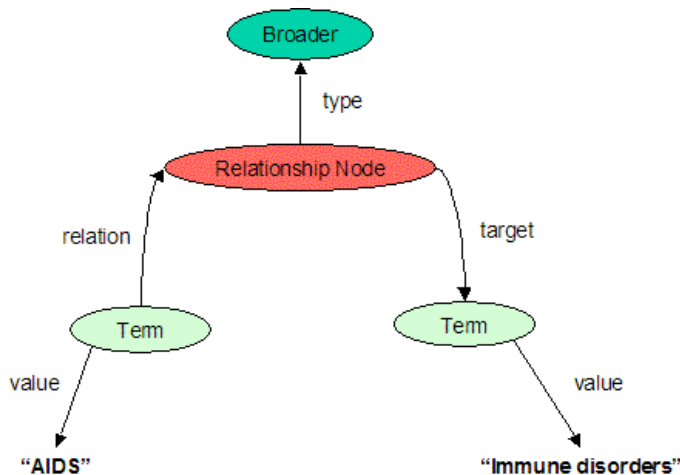


Figure 11. Node model.

The ETB schema uses the node approach. All others model relationships as arcs.

The arc approach is most intuitive, and also most compact, with each relationship using a single statement (path length 1). The node approach is less compact, with each relationship requiring at least two statements (path length of 2). However, the node approach means that every relationship gets its own URI. Statements can then be made about each individual relationship. A similar thing could be done via reification if the arc approach is taken. However reified statements make visual interpretation of the data much more difficult.

2.7. The sub-class approach [back to contents] - The FAO agrovoc schema models all terms as rdfs:classes. In so doing, the rdfs:subClassOf property is re-used to declare hierarchical relationships in the thesaurus.

To re-use properties from other schemas promotes interoperability. Also, using rdfs:Class and rdfs:subClassOf gives us a clue as to how a thesaurus may be mapped or migrated to an ontology, or other conceptual systems. However there is a danger of semantic inaccuracy and ambiguity. In many thesauri the terms/concepts are not in fact classes, for example, 'AIDS' is not a class, but is an instance of the class of 'immune disorders'. So to declare all terms in a thesaurus to be an rdfs:Class would be semantically inaccurate. Secondly the rdfs:subClassOf property implies a specific meaning, that of class subsumption. However, as stated above, the hierarchical relations of many thesauri have a different meaning. Therefore, compressing all hierarchical relationships into the rdfs:subClassOf property would create lots of false information.

2.8. RDFS, DAML or OWL [[↩ back to contents](#)] - This theme refers to whether the schema use RDFS, DAML+OIL or OWL to define the data model.

The DRC schema is defined as a DAML+OIL ontology. All the other schemas are defined using RDFS.

Using DAML+OIL or OWL allows the definition of specific constraints on the data model. For example, one could state that every Concept must have one and only one property defining the preferred term. Thus there is possibility for stricter validation checks of data.

In DAML+OIL or OWL properties can be defined as being symmetric, inverse and transitive. The 'broader' and 'narrower' relationships of a traditional thesaurus are indeed transitive, and each other's inverse, and the 'related' relationships are usually symmetric. When these have been expressed as so in an ontology, there is the possibility of using generic tools to obtain for example the transitive closure of all broader or narrower terms from a given term. There is also the possibility to automatically infer additional facts from partial data.

RDFS allows greater flexibility, and this may be an advantage. For example, OWL lite and OWL DL do not allow a class to be also an instance, but this kind of meta-modelling may be very useful for thesaurus data. Also tool support for RDFS is perhaps at this stage more mature.

2.9. RDF implementation issues - Several of the schemas introduce their own typing mechanism. For example, the ILRT schema has the 'termUsageValue' property, to specify whether a term is preferred or not. The LIMBER schema has a scopeNoteType property to define the type of a ScopeNote. The ETB schema has three independent typing properties, one for each of the MTNode, UNode and RNode classes.

RDF has an inherent typing mechanism. To re-use this mechanism promotes interoperability and allows processing by generic tools. Introducing new typing mechanisms does the opposite.

Another implementation issue involves constraining property values to typed resources wherever possible. For example, the value of the 'relation' property in the ETB schema is expected to be a literal, with value 'broader' 'narrower' or 'related'. Where literals are used, typing errors will create errors in the data. In contrast, the ILRT schema has the 'termUsage' property, which has a range constrained to resources of type 'termUsageValue'.

2.10. Versioning, deprecation and change management - A thesaurus is expected to change and evolve over time. Therefore, some mechanism for representing the deprecation and replacement of entities within a thesaurus is a desirable property of a schema. However, none of the approaches to date offer such a feature.

2.11. Definitions, explanations and scope notes - In a traditional thesaurus, the meaning of a descriptor is primarily inferred from its position in the term hierarchy. Where this is not obvious, a scope note may be added, which is a piece of text that in some way clarifies the meaning and intended use of the descriptor. The DRC and FAO schema do not provide support for scope notes, all the other schemas do.

In terminology standards closely related to thesauri [exact ref], the exact meaning of a concept may be described in a number of ways. For every concept there may be a precise formal definition, an example of its use, a clarifying statement (equivalent to scope note), in addition to several other features. In scientific thesauri, a concept may be associated with an equation, or some units.

Supporting these features may be highly desirable. For example, if a thesaurus is concept-based, and every concept has a definition, then the thesaurus is also a dictionary. Or if a thesaurus is concept based, and many concepts have descriptions, examples, images and/or other multimedia associated, then the thesaurus is also a teaching concept map.

3. Conclusions

This document has discussed themes relating to the design of RDF-based systems for encoding thesaurus data. From this discussion it is possible to extract the following requirements for a thesaurus representation system that will allow thesaurus data to become a part of the semantic web. Such a system will:

- Accurately capture the rich semantic information contained by a thesaurus.
- Accomodate variations in thesaurus structure, semantics and usage.
- Interoperate with existing RDF-based systems for knowledge organisation and representation.
- Support definition of mapping relations between thesauri.
- Provide clear and systematic approach to multilingual data.
- Provide clear and systematic approach to the representation of change and evolution in a thesaurus.
- Employ extensible design patterns to promote adaptability and re-use.

Further deliverables in this workpackage will approach the design and development of a system for thesaurus data representation using RDF.

4. Overview of the schemas [↩ back to contents](#)

In this section each of the schemas is presented as a schema summary table. These tables may be interpreted as follows.

- The classes of the schema are in the first column. If a class is indented relative to the one above, it is a subclass of the above class.
- The properties of the schema are in the second column. The properties are grouped according to their domain (i.e. all properties of a class appear next to it). If a property is indented relative to the one above, it is a subproperty of the above property.
- The range of each property is given in the third column.
- Instances (typed resources) when present appear in the fourth column.

Schema title:	Thesaurus Interchange Format for the Semantic Web
Authors:	B.M.Mathews
Project:	LIMBER
Organisation:	CCLRC
Date:	2001

Class	Property	Range	Instance
ThesaurusObject			
Concept			
	ClassificationCode	rdfs:Literal	
	inLanguageOfC	LanguageCode	
	isIndicatedBy	Term	
	PreferredTerm	Term	
	UsedFor	Term	
	ConceptRelation	Concept	
	BroaderConcept	Concept	
	NarrowerConcept	Concept	
	TopOfHierarchy	Concept	
	isRelatedTo	Concept	
	ConceptEquivalence	Concept	
	ExactEquivalent	Concept	
	InexactEquivalent	Concept	
	PartialEquivalent	Concept	
	OneToManyEquivalent	Concept	
TopConcept			
Term			
ScopeNote			
	inLanguageOfSN	LanguageCode	
	hasTypeOf	ScopeNoteType	
ScopeNoteType			
			General
			Hierarchy
			Translation
			Editor
			History
LanguageCode			

Table 1. Limber schema summary.

Schema title:	RDF Thesaurus Specification (draft)
Authors:	Phil Cross, Dan Brickley, Traugott Koch
Project:	Desire, Desire II
Organisation:	ILRT, Netlab
Date:	2001

Class	Property	Range	Instance
Concept			
	broaderConcept	Concept	
	relatedConcept	Concept	
	indicator	Term	
	conceptCode	rdfs:Literal	
	scope	ScopeNote	
Term			
	lang	rdfs:Literal	
	termUsage	termUsageValue	
ScopeNote			
TermUsageValue			
			preferred
			nonPreferred

Table 2. ILRT schema summary.

Schema title:	Thesaurus:RDF - The RDF Thesaurus Descriptor Standard
Authors:	CERES
Project:	CERES/NBII Thesaurus Partnership Project
Organisation:	CERES, NBII
Date:	2000

Class	Property	Range
Term		
	HN	rdfs:Literal
	Source	rdfs:Literal
	Status	rdfs:Literal
Category		
	descriptor	Descriptor
Descriptor		

	SN	rdfs:Literal
	CN	rdfs:Literal
	CAT	Category
	TT	Descriptor
	BT	Descriptor
	RT	Descriptor
	NT	Descriptor
	LT	Descriptor
	UF	EntryTerm
EntryTerm		
	USE	Descriptor

Table 3. CERES schema summary.

Schema title:	Monolingual Thesauri Vocabulary
Authors:	The GEM Consortium
Project:	GEM
Date:	11-04-2001

Class	Property
	BT
	RT
	NT
	USE
	UF
	TT
	HN
	SCOPE
NISO-Z3919	

Table 4. GEM schema summary.

The properties of this schema have been defined without a domain or range.

Schema title:	CALL Thesaurus Ontology
Authors:	TeamXML at DRC
Project:	CALL Thesaurus Project
Organisation:	DRC
Date:	2002-02-26

Class	Property	Range (restriction)
Term		
	name	xsd:String
	descriptorFor	Term
	preferredTermFor	Term
	USE	Term
	ACK	Term
	entryTermFor	Term
	UF	Term
	AF	Term
	BT	Term
	NT	Term
	RT	Term
CALL-Term		

Table 5. DRC ontology summary.

The properties of this schema have not been defined with a domain or range. DAML restrictions have been defined which restrict the allowed values for the range of each property at the term class.

Authors:	FAO
Organisation:	FAO, KAON

Class	Property	Range
rdfs:Class		
	rt	rdfs:Class
	uf	rdfs:Class
	use	rdfs:Class
Label		
	value	rdfs:Literal
	inLanguage	rdfs:Resource

	references	rdfs:Class
--	------------	------------

Table 6. *FAO Agrovoc schema summary.*

In this schema every term is modelled as an rdfs:Class. The rdfs:subClassOf property is used to indicate hierarchical relationships between terms. 'Labels' are then declared, each of which 'references' one of the previously declared 'rdfs:Class'es (i.e. the terms).

Schema title:	RDF Schema declaration for European Treasury Browser Multilingual Educational Thesaurus (ETBT) version 0.4
Authors:	Tim Read
Project:	ETB Thesaurus Project
Organisation:	ETB, INDIRE
Date:	2001-11-15

Class	Property	Range
ETBT		
Node		
	ID	rdfs:Literal
Thes		
	TmonoNodes	Tmono
TMono		
	Lang	rdfs:Literal
	MTNodes	MT
MT		
	Name	rdfs:Literal
	No	rdfs:Literal
	MTNodeNodes	MTNode
	TopTerms	MTNode
MTNode		
	Title	rdfs:Literal
	SN	rdfs:Literal
	Type	rdfs:Literal
	Date	rdfs:Literal
	PN	rdfs:Literal
	HN	rdfs:Literal
	MTn	MT
	TT	MTNode
	RT	MTNode
	UF	MTNode
	USE	UNode
	BT	RNode
	NT	RNode
	RBT	RNode
	RNT	RNode
	EN	ENode
ENode		
	da	MTNode
	de	MTNode
	en	MTNode
	he	MTNode
	el	MTNode
	es	MTNode
	fi	MTNode
	fr	MTNode
	it	MTNode
	nl	MTNode
	pt	MTNode
	sv	MTNode
UNode		
	UType	rdfs:Literal
	UN	MTNode
RNode		
	Relation	rdfs:Literal
	RN	MTNode

Table 7. *ETB schema summary.*

References [\[↩ back to contents\]](#)

[1] Cross, P., Brickley, D., Koch, T. (2001) **RDF Thesaurus Specification (draft)**, ILRT Technical Report Number: 1011.

http://www.illrt.bristol.ac.uk/publications/researchreport/tr1011/report_html?ilrtyear=00

- [2] Matthews, B.M., Miller, K., Wilson, M.D. (2001) **A Thesaurus interchange Format in RDF**.
http://www.limber.rl.ac.uk/External/SW_conf_thes_paper.htm
- [3] The GEM Consortium (2001) **Monolingual Thesauri Vocabulary**.
<http://gemstar.ischool.washington.edu/schema/2002/08/15/NISO-Z3919#>
- [4] CERES/NBII (2000) **Thesaurus::RDF -- The RDF Thesaurus descriptor standard**.
<http://ceres.ca.gov/thesaurus/RDF.html>
- [5] DRC (2002) **CALL Thesaurus Ontology**.
<http://orlando.drc.com/dam/ontology/Thesaurus/CALL/3.2/CALL-Thesaurus-ont.dam>
- [6] FAO (2001) **Agrovoc Thesaurus**.
<http://kaon.semanticweb.org/Members/rvo/ontologies/AGROVOC.zip>
- [7] Read, T. (2001) **RDF Schema declaration for European Treasury Bowser Multilingual Educational Thesaurus (ETBT) version 0.4**.
<http://braveheart.eun.org/thesaurus/thes.rdf>
- [8] ISO (1986) ISO 2788:1986 Documentation - **Guidelines for the establishment and development of monolingual thesauri**. 2nd ed. (32 p.)
- [9] ISO (1985) ISO 5964:1985 Documentation - **Guidelines for the establishment and development of multilingual thesauri**. (61 p.)
- [10] Soergel, D. (2001) **The representation of Knowledge Organisation Structure (KOS) data. A multiplicity of standards**. Presented at JCDL NKOS Workshop Roanoke, VA 2001-6-28.
<http://www.glam.ac.uk/soc/research/hypermedia/publications/SoergelNKOS2001KOSStandards.PDF>
- [11] Doerr, M. (2001) **Semantic Problems of Thesaurus Mapping**, *Journal of Digital Information*, volume 1 issue 8.
<http://jodi.ecs.soton.ac.uk/Articles/v01/i08/Doerr/>
- [12] Soergel, D. (2001) **Ideas toward an XML specification for KOS**.
<http://nkos.slis.kent.edu/2001/SoergelXMLThesSpec.doc>
- [13] The European multilingual thesaurus on health promotino in 12 languages.
<http://www.hpmulti.net/>

Appendices: schemas and sample data [back to contents](#)

```

A1. LIMBER back to contents - <!-- edited with XML Spy v3.0.7 NT (http://www.xmlspy.com) by Brian
Matthews (Rutherford Appleton Laboratory) -->
<rdf:RDF xml:lang="en"
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:lc="http://www.limber.rl.ac.uk/External/ISO639.rdf#"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
  <rdfs:Class rdf:ID="ThesaurusObject">
    <rdfs:comment>All classes will be an element of the top-level
class Thesaurus concept.
This will allow us to put any common properties or constraints on all
classes (if any).</rdfs:comment>
    <rdfs:subClassOf rdf:resource="http://www.w3.org/2000/01/rdf-schema#Resource"/>
  </rdfs:Class>
  <rdfs:Class rdf:ID="Concept">
    <rdfs:comment>
      A unique concept defined within a vocabulary scheme, such as a
thesaurus or classification scheme. Instances can use the
rdfs:isDefinedBy property with a vocabulary namespace as its
value, to indicate the vocabulary to which the concept
belongs.
    </rdfs:comment>
    <rdfs:subClassOf rdf:resource="#ThesaurusObject"/>
  </rdfs:Class>
  <rdfs:Class rdf:ID="TopConcept">
    <rdfs:comment>
      A top concept of a thesaurus hierarchy; carries the hierarchy note.
    </rdfs:comment>
    <rdfs:subClassOf rdf:resource="#Concept"/>
  </rdfs:Class>
  <rdfs:Class rdf:ID="Term">
    <rdfs:comment>Instances of this class represent the written
forms of
      Concepts, capturing a word or phrase that expresses the concept.
      The string is given by the rdf:value of Term.
    </rdfs:comment>
    <rdfs:subClassOf rdf:resource="#ThesaurusObject"/>
  </rdfs:Class>
  <rdfs:Class rdf:ID="ScopeNote">
    <rdfs:comment>Provides a comment on the concept, for
disambiguation, explanation etc.
      The string is given by the rdf:value of ScopeNote.
    </rdfs:comment>
    <rdfs:subClassOf rdf:resource="#ThesaurusObject"/>
  </rdfs:Class>
  <rdfs:Class rdf:ID="ScopeNoteType">
    <rdfs:subClassOf rdf:resource="#ThesaurusObject"/>
  </rdfs:Class>
  <rdfs:Property rdf:ID="ClassificationCode">
    <rdfs:comment>The unique identifier of a
concept.</rdfs:comment>
    <rdfs:domain rdf:resource="#Concept"/>
    <rdfs:range
rdf:resource="http://www.w3.org/2000/01/rdf-schema#Literal"/>
  </rdf:Property>
  <rdfs:Property rdf:ID="inLanguageOfC">
    <rdfs:comment>The language of a term.</rdfs:comment>
    <rdfs:domain rdf:resource="#Concept"/>
    <rdfs:range
rdf:resource="http://www.limber.rl.ac.uk/External/ISO639.rdf#LanguageCode"/>
  </rdf:Property>

```

```

<rdf:Property rdf:ID="inLanguageOfSN">
  <rdfs:comment>The language of a scope note.</rdfs:comment>
  <rdfs:domain rdf:resource="#ScopeNote"/>
  <rdfs:range rdf:resource="http://www.limber.rl.ac.uk/External/ISO639.rdf#LanguageCode"/>
</rdf:Property>

<rdf:Property rdf:ID="hasTypeOf">
  <rdfs:comment>The type of a scope note.</rdfs:comment>
  <rdfs:domain rdf:resource="#ScopeNote"/>
  <rdfs:range rdf:resource="#ScopeNoteType"/>
</rdf:Property>
<rdf:Property rdf:ID="hasScopeNote">
  <rdfs:comment>A scope note of a concept.</rdfs:comment>
  <rdfs:domain rdf:resource="#Concept"/>
  <rdfs:range rdf:resource="#ScopeNote"/>
</rdf:Property>
<rdf:Property rdf:ID="isIndicatedBy">
  <rdfs:comment>A defining term for a concept.</rdfs:comment>
  <rdfs:domain rdf:resource="#Concept"/>
  <rdfs:range rdf:resource="#Term"/>
</rdf:Property>

<rdf:Property rdf:ID="PreferredTerm">
  <rdfs:comment>The preferred term for a concept w.r.t. a specific language.</rdfs:comment>
  <rdfs:subPropertyOf rdf:resource="#isIndicatedBy"/>
</rdf:Property>
<rdf:Property rdf:ID="UsedFor">
  <rdfs:comment>A non-preferred term for a
concept.</rdfs:comment>
  <rdfs:subPropertyOf rdf:resource="#isIndicatedBy"/>
</rdf:Property>
<rdf:Property rdf:ID="ConceptRelation">
  <rdfs:comment>A generalisation of all relationships between
concepts.</rdfs:comment>
  <rdfs:domain rdf:resource="#Concept"/>
  <rdfs:range rdf:resource="#Concept"/>
</rdf:Property>
  <rdf:Property rdf:ID="BroaderConcept">
    <rdfs:comment>The broader concept relation.</rdfs:comment>
    <rdfs:subPropertyOf rdf:resource="#ConceptRelation"/>
  </rdf:Property>
  <rdf:Property rdf:ID="NarrowerConcept">
    <rdfs:comment>The narrower concept relation.</rdfs:comment>
    <rdfs:subPropertyOf rdf:resource="#ConceptRelation"/>
  </rdf:Property>
  <rdf:Property rdf:ID="TopOfHierarchy">
    <rdfs:comment>The top concept relation.</rdfs:comment>
    <rdfs:subPropertyOf rdf:resource="#ConceptRelation"/>
    <rdfs:range rdf:resource="#TopConcept"/>
  </rdf:Property>
  <rdf:Property rdf:ID="isRelatedTo">
    <rdfs:comment>The related concept relation.</rdfs:comment>
    <rdfs:subPropertyOf rdf:resource="#ConceptRelation"/>
  </rdf:Property>
  <rdf:Property rdf:ID="ConceptEquivalence">
    <rdfs:comment>A generalisation of all relationships between
concepts.</rdfs:comment>
    <rdfs:domain rdf:resource="#Concept"/>
    <rdfs:range rdf:resource="#Concept"/>
  </rdf:Property>
  <rdf:Property rdf:ID="ExactEquivalent">
    <rdfs:comment>The broader concept relation.</rdfs:comment>
    <rdfs:subPropertyOf rdf:resource="#ConceptEquivalence"/>
  </rdf:Property>
  <rdf:Property rdf:ID="InexactEquivalent">
    <rdfs:comment>The broader concept relation.</rdfs:comment>
    <rdfs:subPropertyOf rdf:resource="#ConceptEquivalence"/>
  </rdf:Property>
  <rdf:Property rdf:ID="PartialEquivalent">
    <rdfs:comment>The broader concept relation.</rdfs:comment>
    <rdfs:subPropertyOf rdf:resource="#ConceptEquivalence"/>
  </rdf:Property>
  <rdf:Property rdf:ID="OneToManyEquivalent">
    <rdfs:comment>The broader concept relation.</rdfs:comment>
    <rdfs:subPropertyOf rdf:resource="#ConceptEquivalence"/>
  </rdf:Property>
  <ScopeNoteType rdf:ID="General"/>
  <ScopeNoteType rdf:ID="Hierarchy"/>
  <ScopeNoteType rdf:ID="Translation"/>
  <ScopeNoteType rdf:ID="Editor"/>
  <ScopeNoteType rdf:ID="History"/>
</rdf:RDF>

```

A2. ILRT [\[back to contents\]](#) - <rdf:RDF xml:lang="en"

xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"

xmlns:rdfs="http://www.w3.org/TR/1999/PR-rdf-schema-19990303#"

```

<rdfs:Class rdf:ID="Concept">
  <rdfs:comment>
    A unique concept defined within a thesaurus. Instances
    use the rdfs:isDefinedBy property with a vocabulary
    namespace as its value, to indicate the vocabulary to
    which the concept belongs.
  </rdfs:comment>
  <rdfs:subClassOf
    rdf:resource="http://www.w3.org/TR/1999/PR-rdf-schema-
    19990303#Resource"/>
</rdfs:Class>
<rdfs:Class rdf:ID="Term">
  <rdfs:comment>
    Instances of this class represent the written forms of
    Concepts. The string is given by the rdf:value of Term.
  </rdfs:comment>
  <rdfs:subClassOf
    rdf:resource="http://www.w3.org/TR/1999/PR-rdf-schema-
    19990303#Resource"/>
</rdfs:Class>
<rdfs:Class rdf:ID="ScopeNote">
  <rdfs:comment>
    The value of this optional resource is a scope note:
    a note attached to a term to indicate its meaning within
    an indexing language
  </rdfs:comment>
  <rdfs:subClassOf
    rdf:resource="http://www.w3.org/TR/1999/PR-rdf-schema-
    19990303#Resource"/>
</rdfs:Class>
<rdfs:Class rdf:ID="TermUsageValue">
  <rdfs:comment>
    The value of the property: termUsage. It can take one of two
    values: 'preferred' or 'nonPreferred'.
  </rdfs:comment>
  <rdfs:subClassOf
    rdf:resource="http://www.w3.org/TR/1999/PR-rdf-schema-
    19990303#Resource"/>
</rdfs:Class>
<rdf:Property ID="broaderConcept">
  <rdfs:comment>
    This schema does not define a property 'narrowerConcept',
    but applications can assume the existence of a property
    narrowerConcept such that if:
    {broaderConcept,ConceptA,ConceptB}, then
    {narrowerConcept,ConceptB,ConceptA} is true.
  </rdfs:comment>
  <rdfs:domain rdf:resource="#Concept"/>
  <rdfs:range rdf:resource="#Concept"/>
</rdf:Property>
<rdf:Property ID="relatedConcept">
  <rdfs:comment>
    The relatedConcept is commutative, such that if:
    {relatedConcept,ConceptA,ConceptB}, then
    {relatedConcept,ConceptB,ConceptA} is true.

```

```

</rdfs:comment>
<rdfs:domain rdf:resource="#Concept"/>
<rdfs:range rdf:resource="#Concept"/>
</rdf:Property>
<rdf:Property ID="indicator">
  <rdfs:comment>
    A mandatory property of a Concept whose value is
    the Term instance representing a written form of the
    Concept. A Concept may have as an indicator more than
    one Term. A Term may only be an indicator of one
    Concept.
  </rdfs:comment>
  <rdfs:domain rdf:resource="#Concept"/>
  <rdfs:range rdf:resource="#Term"/>
</rdf:Property>
<rdf:Property ID="conceptCode">
  <rdfs:comment>
    An optional property for any code assigned to the
    thesaurus concepts.
  </rdfs:comment>
  <rdfs:domain rdf:resource="#Concept"/>
  <rdfs:range
    rdf:resource="http://www.w3.org/TR/1999/PR-rdf-schema-
    19990303#Literal"/>
</rdf:Property>
<rdf:Property ID="scope">
  <rdfs:comment>
    This optional property has as its value an instance of
    the resource ScopeNote.
  </rdfs:comment>
  <rdfs:domain rdf:resource="#Concept"/>
  <rdfs:range
    rdf:resource="#ScopeNote"/>
</rdf:Property>
<rdf:Property ID="lang">
  <rdfs:comment>
    Optional property that can be used to give the language
    of a Term instance. The codes from "ISO 639:1988,
    Code for the representation of names of languages" should
    be used as the values for this property.
  </rdfs:comment>
  <rdfs:domain rdf:resource="#Term"/>
  <rdfs:range
    rdf:resource="http://www.w3.org/TR/1999/PR-rdf-schema-
    19990303#Literal"/>
</rdf:Property>
<rdf:Property ID="termUsage">
  <rdfs:comment>
    This optional property indicates whether the Term
    instance is the 'preferred or 'nonPreferred' textual
    expression of the Concept instance that is 'indicated'
    by the Term, for a given language.
  </rdfs:comment>
  <rdfs:domain rdf:resource="#Term"/>
  <rdfs:range rdf:resource="#TermUsageValue"/>

```

```

</rdf:Property>

<rdf:Description rdf:ID="preferred">
  <rdf:type rdf:resource="#TermUsageValue"/>
</rdf:Description>

<rdf:Description rdf:ID="nonPreferred">
  <rdf:type rdf:resource="#TermUsageValue"/>
</rdf:Description>

</rdf:RDF>

```

A3. CERES [\[back to contents\]](#) - <?xml version="1.0"?>

```

<rdf:RDF
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
  <!--thesaurus relations -->
  <rdfs:Class rdf:ID="Term">
    <rdfs:subClassOf rdf:resource="http://www.w3.org/2000/01/rdf-schema#Resource"/>
  </rdfs:Class>

  <rdf:Property rdf:ID="HN">
    <rdfs:domain rdf:resource="#Term"/>
    <rdfs:range rdf:resource="http://www.w3.org/2000/01/rdf-schema#Literal"/>
  </rdf:Property>

  <rdf:Property rdf:ID="Source">
    <rdfs:domain rdf:resource="#Term"/>
    <rdfs:range rdf:resource="http://www.w3.org/2000/01/rdf-schema#Literal"/>
  </rdf:Property>

  <rdf:Property rdf:ID="Status">
    <rdfs:domain rdf:resource="#Term"/>
    <rdfs:range rdf:resource="http://www.w3.org/2000/01/rdf-schema#Literal"/>
  </rdf:Property>

  <rdfs:Class rdf:ID="Category">
    <rdfs:subClassOf rdf:resource="#Term"/>
  </rdfs:Class>

  <rdf:Property rdf:ID="descriptor">
    <rdfs:domain rdf:resource="#Category"/>
    <rdfs:range rdf:resource="#Descriptor"/>
  </rdf:Property>

  <rdfs:Class rdf:ID="Descriptor">
    <rdfs:subClassOf rdf:resource="#Term"/>
  </rdfs:Class>

  <rdf:Property rdf:ID="SN">
    <rdfs:domain rdf:resource="#Descriptor"/>
    <rdfs:range rdf:resource="http://www.w3.org/2000/01/rdf-schema#Literal"/>
  </rdf:Property>

  <rdf:Property rdf:ID="CN">
    <rdfs:domain rdf:resource="#Descriptor"/>
    <rdfs:range rdf:resource="http://www.w3.org/2000/01/rdf-schema#Literal"/>
  </rdf:Property>

  <rdf:Property rdf:ID="CAT">
    <rdfs:domain rdf:resource="#Descriptor"/>
    <rdfs:range rdf:resource="#Category"/>
  </rdf:Property>

  <rdf:Property rdf:ID="TT">
    <rdfs:domain rdf:resource="#Descriptor"/>
    <rdfs:range rdf:resource="#Descriptor"/>
  </rdf:Property>

  <rdf:Property rdf:ID="BT">
    <rdfs:domain rdf:resource="#Descriptor"/>
    <rdfs:range rdf:resource="#Descriptor"/>
  </rdf:Property>

  <rdf:Property rdf:ID="RT">
    <rdfs:domain rdf:resource="#Descriptor"/>
    <rdfs:range rdf:resource="#Descriptor"/>
  </rdf:Property>

  <rdf:Property rdf:ID="NT">
    <rdfs:domain rdf:resource="#Descriptor"/>
    <rdfs:range rdf:resource="#Descriptor"/>
  </rdf:Property>

  <rdf:Property rdf:ID="LT">
    <rdfs:domain rdf:resource="#Descriptor"/>
    <rdfs:range rdf:resource="#Descriptor"/>
  </rdf:Property>

  <rdf:Property rdf:ID="UF">
    <rdfs:domain rdf:resource="#Descriptor"/>
    <rdfs:range rdf:resource="#EntryTerm"/>
  </rdf:Property>

  <rdfs:Class rdf:ID="EntryTerm">
    <rdfs:subClassOf rdf:resource="#Term"/>
  </rdfs:Class>

  <rdf:Property rdf:ID="USE">
    <rdfs:domain rdf:resource="#EntryTerm"/>

```

```
</rdf:Property>
```

```
</rdf:RDF>
```

A4. GEM [\[back to contents\]](#) - <?xml version='1.0' encoding='ISO-8859-1'?>

```
<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
  xmlns:dc="http://purl.org/dc/elements/1.1/">

<!-- Description of this Schema -->

<rdf:Description rdf:about="">
  <dc:title>Monolingual Thesauri</dc:title>
  <dc:publisher>The GEM Consortium</dc:publisher>
  <dc:description>Describes the relationships among thesauri
  terms. Uses a structure based on the NISO Z39.19 standard.
  </dc:description>
  <dc:language>English</dc:language>
  <dc:date>2001-04-11</dc:date>
</rdf:Description>

<rdfs:Class rdf:ID="NISO-Z3919">
  <rdfs:label>Monolingual Theasuri</rdfs:label>
  <rdfs:comment>Provides a schema for Monolingual Thesauri, based
  on NISO Z39.19-1993. Instances are required to contain a rdfs:label and
  a rdfs:value
  </rdfs:comment>
  <rdfs:isDefinedBy
  rdf:resource="http://gemstar.ischool.washington.edu/schema/2001/04/11/NISO-Z3919#" />
</rdfs:Class>

<!-- Begin: Broader Term -->
<rdf:Property rdf:ID="BT">
  <rdfs:label>Broader Term</rdfs:label>
  <rdfs:comment>A descriptor to which another descriptor or
  multiple descriptors are subordinate in a hierarchy. The relationship
  indicator for this type of term in BT.
  </rdfs:comment>
  <rdfs:isDefinedBy
  rdf:resource="http://gemstar.ischool.washington.edu/schema/2001/04/11/NISO-Z3919#" />
</rdf:Property>

<rdf:Property rdf:ID="RT">
  <rdfs:label>Related Term</rdfs:label>
  <rdfs:comment>A descriptor that is associatively but not
  hierarchically linked to another description in a thesaurus. The
  relationship indicator for this type of descriptor is RT.
  </rdfs:comment>
  <rdfs:subPropertyOf
  rdf:resource="http://gemstar.ischool.washington.edu/2.0/gem#cataloging"
  />
  <rdfs:isDefinedBy
  rdf:resource="http://gemstar.ischool.washington.edu/schema/2001/04/11/NISO-Z3919#" />
</rdf:Property>

<rdf:Property rdf:ID="NT">
  <rdfs:label>Narrower Term</rdfs:label>
  <rdfs:comment>A descriptor that is subordinate to another
  descriptor or to multiple descriptors in a hierarchy. The relationship
  indicator for this type or term is NT.
  </rdfs:comment>
  <rdfs:isDefinedBy
  rdf:resource="http://gemstar.ischool.washington.edu/schema/2001/04/11/NISO-Z3919#" />
</rdf:Property>

<rdf:Property rdf:ID="USE">
  <rdfs:label>Use</rdfs:label>
  <rdfs:comment>Leads from a nonpreferred term to the descriptor.
  </rdfs:comment>
  <rdfs:isDefinedBy
  rdf:resource="http://gemstar.ischool.washington.edu/schema/2001/04/11/NISO-Z3919#" />
</rdf:Property>

<rdf:Property rdf:ID="UF">
  <rdfs:label>Use For</rdfs:label>
  <rdfs:comment>Records entry terms leading to the descriptor.
  </rdfs:comment>
  <rdfs:isDefinedBy
  rdf:resource="http://gemstar.ischool.washington.edu/schema/2001/04/11/NISO-Z3919#" />
</rdf:Property>

<rdf:Property rdf:ID="TT">
  <rdfs:label>Top Term</rdfs:label>
  <rdfs:comment>The broadest descriptor in a thesaurus hierachy,
  sometimes indicated by the abbreviation TT.
  </rdfs:comment>
  <rdfs:isDefinedBy
  rdf:resource="http://gemstar.ischool.washington.edu/schema/2001/04/11/NISO-Z3919#" />
</rdf:Property>

<rdf:Property rdf:ID="HN">
  <rdfs:label>History Note</rdfs:label>
  <rdfs:comment> A note in a term record in a thesaurus that
  provides the date of entry of a descriptor as well as the history of
  modification to its scope, relationships, etc.
  </rdfs:comment>
  <rdfs:isDefinedBy
  rdf:resource="http://gemstar.ischool.washington.edu/schema/2001/04/11/NISO-Z3919#" />
</rdf:Property>

<rdf:Property rdf:ID="SCOPE">
  <rdfs:label>Scope Note</rdfs:label>
  <rdfs:comment>A note following a descriptor explaining its
  coverage, specialized usage, or rules for assigning it.
  </rdfs:comment>
  <rdfs:isDefinedBy
  rdf:resource="http://gemstar.ischool.washington.edu/schema/2001/04/11/NISO-Z3919#" />
</rdf:Property>
```

</rdf:RDF>

A5. DRC [[back to contents](#)] - <?xml version="1.0"?>

```

<rdf:RDF
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
  xmlns:daml="http://www.daml.org/2001/03/daml+oil#"
  xmlns:xsd="http://www.w3.org/2000/10/XMLSchema#"
  xmlns:dc="http://orlando.drc.com/daml/ontology/DC/3.2/dces-ont#"
  xmlns:ves="http://orlando.drc.com/daml/ontology/VES/3.2/drc-ves-ont#"
  xmlns:cto="http://orlando.drc.com/daml/ontology/Thesaurus/CALL/3.2/CALL-Thesaurus-ont#"
  xmlns="http://orlando.drc.com/daml/ontology/Thesaurus/CALL/3.2/CALL-Thesaurus-ont#"
>
  <!-- CALL Thesaurus Ontology -->
  <daml:Ontology rdf:about="">
    <ves:versioning>
      <ves:VersionData>
        <dc:title>Call Thesaurus Ontology</dc:title>
      </ves:VersionData>
    </ves:versioning>
    <ves:previous>http://orlando.drc.com/daml/ontology/Thesaurus/CALL/3.1/CALL-Thesaurus-ont.daml</ves:previous>
    <ves:location>http://orlando.drc.com/daml/ontology/Thesaurus/CALL/3.2/CALL-Thesaurus-ont.daml</ves:location>
    <ves:version>3.2</ves:version>
    <ves:email>TeamXML@drc.com</ves:email>
    <dc:creator>DRC</dc:creator>
    <ves:statusDate>2002-02-26</ves:statusDate>
    <ves:status>published</ves:status>
    </ves:VersionData>
  </ves:versioning>
  <daml:comment>Center for Army Lessons Learned Thesaurus Ontology</daml:comment>
  <daml:imports rdf:resource="http://www.daml.org/2001/03/daml+oil"/>
  <daml:imports rdf:resource="http://orlando.drc.com/daml/ontology/daml-extension/3.2/daml-ext-ont"/>
  <daml:comment>This is an ontology of information about CALL Thesaurus Entries.</daml:comment>
</daml:Ontology>
<!-- Term Class -->
<daml:Class rdf:ID="Term">
  <daml:label>Thesaurus Term</daml:label>
  <daml:comment>One or more words designating a concept.</daml:comment>
  <daml:subClassOf>
    <daml:Restriction daml:cardinality="1">
      <daml:onProperty rdf:resource="#name"/>
      <daml:toClass rdf:resource="http://www.w3.org/2000/10/XMLSchema#string"/>
    </daml:Restriction>
  </daml:subClassOf>
  <daml:subClassOf>
    <daml:Restriction>
      <daml:onProperty rdf:resource="#descriptorFor"/>
      <daml:toClass rdf:resource="#Term"/>
    </daml:Restriction>
  </daml:subClassOf>
  <daml:subClassOf>
    <daml:Restriction>
      <daml:onProperty rdf:resource="#preferredTermFor"/>
      <daml:toClass rdf:resource="#Term"/>
    </daml:Restriction>
  </daml:subClassOf>
  <daml:subClassOf>
    <daml:Restriction>
      <daml:onProperty rdf:resource="#entryTermFor"/>
      <daml:toClass rdf:resource="#Term"/>
    </daml:Restriction>
  </daml:subClassOf>
  <daml:subClassOf>
    <daml:Restriction>
      <daml:onProperty rdf:resource="#BT"/>
      <daml:toClass rdf:resource="#Term"/>
    </daml:Restriction>
  </daml:subClassOf>
  <daml:subClassOf>
    <daml:Restriction>
      <daml:onProperty rdf:resource="#NT"/>
      <daml:toClass rdf:resource="#Term"/>
    </daml:Restriction>
  </daml:subClassOf>
  <daml:subClassOf>
    <daml:Restriction>
      <daml:onProperty rdf:resource="#RT"/>
      <daml:toClass rdf:resource="#Term"/>
    </daml:Restriction>
  </daml:subClassOf>
  <daml:subClassOf>
    <daml:Restriction>
      <daml:onProperty rdf:resource="#USE"/>
      <daml:toClass rdf:resource="#Term"/>
    </daml:Restriction>
  </daml:subClassOf>
  <daml:subClassOf>
    <daml:Restriction>
      <daml:onProperty rdf:resource="#UF"/>
      <daml:toClass rdf:resource="#Term"/>
    </daml:Restriction>
  </daml:subClassOf>
  <daml:subClassOf>
    <daml:Restriction>
      <daml:onProperty rdf:resource="#ACK"/>
      <daml:toClass rdf:resource="#Term"/>
    </daml:Restriction>
  </daml:subClassOf>
  <daml:subClassOf>
    <daml:Restriction>
      <daml:onProperty rdf:resource="#AF"/>
      <daml:toClass rdf:resource="#Term"/>
    </daml:Restriction>
  </daml:subClassOf>
</daml:Class>
<!-- CALL Term Class -->
<daml:Class rdf:ID="CALL-Term">
  <daml:label>CALL Thesaurus Term</daml:label>

```



```

        <daml:subClassOf rdf:resource="#Term"/>
    </daml:Class>
    <!-- Term Properties -->
    <daml:ObjectProperty rdf:ID="descriptorFor">
        <daml:label>Descriptor For</daml:label>
        <daml:comment>A type of heading that is a term chosen as the
preferred expression of a concept in a thesaurus.</daml:comment>
    </daml:ObjectProperty>
    <daml:ObjectProperty rdf:ID="preferredTermFor">
        <daml:label>Preferred Term For</daml:label>
        <daml:comment>One of two or more synonyms or lexical variants
selectd as a descriptor.</daml:comment>
        <daml:subPropertyOf rdf:resource="#descriptorFor"/>
        <daml:inverseOf rdf:resource="#entryTermFor"/>
    </daml:ObjectProperty>
    <daml:ObjectProperty rdf:ID="entryTermFor">
        <daml:label>Entry Term For</daml:label>
        <daml:comment>The nonprefered term in a cross-reference that
leads to a descriptor in a thesaurus.</daml:comment>
        <daml:inverseOf rdf:resource="#preferredTermFor"/>
    </daml:ObjectProperty>
    <daml:DatatypeProperty rdf:ID="name">
        <daml:label>Term Name</daml:label>
        <daml:comment>The name of the Term</daml:comment>
    </daml:DatatypeProperty>
    <daml:TransitiveProperty rdf:ID="BT">
        <daml:label>Broader Term</daml:label>
        <daml:inverseOf rdf:resource="#NT"/>
    </daml:TransitiveProperty>
    <daml:TransitiveProperty rdf:ID="NT">
        <daml:label>Narrower Term</daml:label>
        <daml:inverseOf rdf:resource="#BT"/>
    </daml:TransitiveProperty>
    <daml:TransitiveProperty rdf:ID="RT">
        <daml:label>Related Term</daml:label>
    </daml:TransitiveProperty>
    <daml:ObjectProperty rdf:ID="USE">
        <daml:label>Preferred Entry Name</daml:label>
        <daml:inverseOf rdf:resource="#UF"/>
        <daml:subPropertyOf rdf:resource="#preferredTermFor"/>
    </daml:ObjectProperty>
    <daml:ObjectProperty rdf:ID="UF">
        <daml:label>Used For</daml:label>
        <daml:inverseOf rdf:resource="#USE"/>
        <daml:subPropertyOf rdf:resource="#entryTermFor"/>
    </daml:ObjectProperty>
    <daml:ObjectProperty rdf:ID="ACK">
        <daml:label>Acronym</daml:label>
        <daml:inverseOf rdf:resource="#AF"/>
        <daml:subPropertyOf rdf:resource="#preferredTermFor"/>
    </daml:ObjectProperty>
    <daml:ObjectProperty rdf:ID="AF">
        <daml:label>Acronym For</daml:label>
        <daml:inverseOf rdf:resource="#ACK"/>
        <daml:subPropertyOf rdf:resource="#entryTermFor"/>
    </daml:ObjectProperty>
</rdf:RDF>

```

A6. FAO [[back to contents](#)] - The FAO schema has been inferred from the agrovoc thesaurus data available from <http://kaon.semanticweb.org/Members/rvo/ontologies/AGROVOC.zip>. An extract from this data is presented below.

```

<?xml version='1.0' encoding='UTF-8'?>
<!DOCTYPE rdf:RDF [
  <!ENTITY kaon 'http://kaon.semanticweb.org/2001/11/kaon-lexical#'>
  <!ENTITY rdf 'http://www.w3.org/1999/02/22-rdf-syntax-ns#'>
  <!ENTITY rdfs 'http://www.w3.org/2000/01/rdf-schema#'>
  <!ENTITY a 'http://www.fao.org/agris/aos/agrovoc.kaon#'>
]>

<?include-rdf
logicalURI="http://kaon.semanticweb.org/2001/11/kaon-root"
physicalURI="jar:file:C:/java/projects/Agrovoc_Konverter/lib/apionrdf.jar
!/edu/unika/aifb/kaon/apionrdf/res/kaon-root.xml"?>
<?include-rdf
logicalURI="http://kaon.semanticweb.org/2001/11/kaon-lexical"
physicalURI="jar:file:C:/java/projects/Agrovoc_Konverter/lib/apionrdf.jar!
/edu/unika/aifb/kaon/apionrdf/res/kaon-lexical.xml"?>

<rdf:RDF xml:base="http://www.fao.org/agris/aos/agrovoc.kaon#"
  xmlns:kaon="#kaon;"
  xmlns:rdf="#rdf;"
  xmlns:rdfs="#rdfs;"
  xmlns:a="#a;">

<rdfs:Class rdf:ID="10">
  <a:rt rdf:resource="#1591"/>
  <a:rt rdf:resource="#34067"/>
  <rdfs:subClassOf rdf:resource="#5886"/>
  <a:rt rdf:resource="#7776"/>
</rdfs:Class>
<rdfs:Class rdf:ID="100">
  <rdfs:subClassOf rdf:resource="#1070"/>
</rdfs:Class>
<rdfs:Class rdf:ID="1000">
  <a:rt rdf:resource="#1001"/>
  <a:rt rdf:resource="#2835"/>
  <rdfs:subClassOf rdf:resource="#35866"/>
  <a:rt rdf:resource="#4592"/>
  <a:rt rdf:resource="#5800"/>
</rdfs:Class>
<rdfs:Class rdf:ID="10002">
  <rdfs:subClassOf rdf:resource="#11816"/>
  <a:uf rdf:resource="#16724"/>
</rdfs:Class>
<rdfs:Class rdf:ID="10004">

```

```

    <a:rt rdf:resource="#7566"/>
  </rdfs:Class>
  <rdfs:Class rdf:ID="1001">
    <a:rt rdf:resource="#1000"/>
    <a:rt rdf:resource="#15902"/>
    <a:rt rdf:resource="#4671"/>
    <rdfs:subClassOf rdf:resource="#5005"/>
    <a:rt rdf:resource="#997"/>
    <a:rt rdf:resource="#998"/>
  </rdfs:Class>
  <rdfs:Class rdf:ID="1002">
    <a:rt rdf:resource="#33469"/>
    <rdfs:subClassOf rdf:resource="#6195"/>
  </rdfs:Class>
  <rdfs:Class rdf:ID="1003">
    <rdfs:subClassOf rdf:resource="#6765"/>
    <a:rt rdf:resource="#6809"/>
    <a:rt rdf:resource="#8003"/>
  </rdfs:Class>

  <kaon:Label rdf:ID="1033659377902-1485694027">
    kaon:value="ABANDONED LAND">
    <kaon:inLanguage rdf:resource="&kaon;en"/>
    <kaon:references rdf:resource="#6"/>
  </kaon:Label>
  <kaon:Label rdf:ID="1033659377902-1817775492">
    kaon:value="ABIES CONCOLOR">
    <kaon:inLanguage rdf:resource="&kaon;en"/>
    <kaon:references rdf:resource="#13"/>
  </kaon:Label>
  <kaon:Label rdf:ID="1033659377902-1833206718">
    kaon:value="ABIES BALSAMEA">
    <kaon:inLanguage rdf:resource="&kaon;en"/>
    <kaon:references rdf:resource="#12"/>
  </kaon:Label>
  <kaon:Label rdf:ID="1033659377902-2024153981">
    kaon:value="ABATTOIR BYPRODUCTS">
    <kaon:inLanguage rdf:resource="&kaon;en"/>
    <kaon:references rdf:resource="#7"/>
  </kaon:Label>
  <kaon:Label rdf:ID="1033659377902-238603785">
    kaon:value="ABDOMEN">
    <kaon:inLanguage rdf:resource="&kaon;en"/>
    <kaon:references rdf:resource="#9"/>
  </kaon:Label>
  <kaon:Label rdf:ID="1033659377902-438767850">
    kaon:value="ABIES ALBA">
    <kaon:inLanguage rdf:resource="&kaon;en"/>
    <kaon:references rdf:resource="#11"/>
  </kaon:Label>
  <kaon:Label rdf:ID="1033659377902-878144042">
    kaon:value="ABIES">
    <kaon:inLanguage rdf:resource="&kaon;en"/>
    <kaon:references rdf:resource="#10"/>
  </kaon:Label>
  <kaon:Label rdf:ID="1033659377902-890729402">
    kaon:value="ABALONES">
    <kaon:inLanguage rdf:resource="&kaon;en"/>
    <kaon:references rdf:resource="#5"/>
  </kaon:Label>
  <kaon:Label rdf:ID="1033659377912-1215467615">
    kaon:value="ABIES LASIOCARPA">
    <kaon:inLanguage rdf:resource="&kaon;en"/>
    <kaon:references rdf:resource="#15"/>
  </kaon:Label>
  <kaon:Label rdf:ID="1033659377912-1391285581">
    kaon:value="ABIES SACHALINENSIS">
    <kaon:inLanguage rdf:resource="&kaon;en"/>
    <kaon:references rdf:resource="#18"/>
  </kaon:Label>
  <kaon:Label rdf:ID="1033659377912-1410406613">
    kaon:value="ABIES NORDMANNIANA">
    <kaon:inLanguage rdf:resource="&kaon;en"/>
    <kaon:references rdf:resource="#16"/>
  </kaon:Label>
  <kaon:Label rdf:ID="1033659377912-1526816853">
    kaon:value="ABIES PROCERA">
    <kaon:inLanguage rdf:resource="&kaon;en"/>
    <kaon:references rdf:resource="#17"/>
  </kaon:Label>
  <kaon:Label rdf:ID="1033659377912-1638223015">
    kaon:value="ABNORMAL BEHAVIOUR">
    <kaon:inLanguage rdf:resource="&kaon;en"/>
    <kaon:references rdf:resource="#20"/>
  </kaon:Label>
  <kaon:Label rdf:ID="1033659377912-1743724779">
    kaon:value="ABIES GRANDIS">
    <kaon:inLanguage rdf:resource="&kaon;en"/>
    <kaon:references rdf:resource="#14"/>
  </kaon:Label>
  <kaon:Label rdf:ID="1033659377912-184673113">
    kaon:value="ABIES SIBIRICA">
    <kaon:inLanguage rdf:resource="&kaon;en"/>
    <kaon:references rdf:resource="#19"/>
  </kaon:Label>
  <kaon:Label rdf:ID="1033659377912-687414363">
    kaon:value="ABOMASUM">
    <kaon:inLanguage rdf:resource="&kaon;en"/>
    <kaon:references rdf:resource="#21"/>
  </kaon:Label>
  <kaon:Label rdf:ID="1033659377922-1154190247">
    kaon:value="ABSORPTION">
    <kaon:inLanguage rdf:resource="&kaon;en"/>
    <kaon:references rdf:resource="#27"/>
  </kaon:Label>
</rdf:RDF>

```

```

<!--
  RDF Schema declaration for European Treasury Browser Multilingual
  Educational Thesaurus (ETBT)
  version 0.4 http://www.eun.org/eun.org2/eun/en/etb/sub_area.cfm?sa=440

  The official URL for this document is http://eun.org/etb/thesaurus/elements/

  Author:
    Tim Read <tread@ieec.uned.es>

  Changes:
    version 0.2 - ask UNED...
      - first hacked version
    version 0.3 - 2001-11-15
      - updated namespaces
      - added RBT and RNT as requested by INDIRE (see http://www.indire.it/)
    version 0.4 - 2001-11-15
      - agreed with Antonio Ronca to use ISO639-1 for language encoding
      - added HEBREW support
-->
<!DOCTYPE rdf:RDF [
<!ENTITY rdf "http://www.w3.org/1999/02/22-rdf-syntax-ns#">
<!ENTITY rdfs "http://www.w3.org/2000/01/rdf-schema#">
<!ENTITY dc "http://purl.org/dc/elements/1.1/">
<!ENTITY dcq "http://purl.org/dc/terms/">
<!ENTITY daml-o "http://www.daml.org/2000/10/daml-ont#">
<!ENTITY etbthes "http://eun.org/etb/thesaurus/elements/">
]>
<rdf:RDF
  xmlns:rdf="&rdf;"
  xmlns:rdfs="&rdfs;"
  xmlns:dc="&dc;"
  xmlns:dcq="&dcq;"
  xmlns:daml="&daml-o;">
  <rdf:Description rdf:about="&etbthes;">
    <dc:title>European School's Treasury Browser Thesaurus
    (ETBT)</dc:title>
    <dc:publisher>tread@ieec.uned.es</dc:publisher>
    <dc:language>en</dc:language>
    <dc:description>European School's Treasury Browser Thesaurus
    (ETBT)</dc:description>
    <dc:date>2001-12-06</dc:date>
    <daml:versionInfo>European Treasury Browser (ETB) Educational Multilingual Thesaurus, v0.3</daml:versionInfo>
    <rdfs:seeAlso rdf:resource = "http://www.uned.es" />
    <rdfs:seeAlso rdf:resource = "http://www.indire.it" />
  </rdf:Description>

  <!-- *** Classes *** -->
  <rdfs:Class rdf:ID="ETBT">
  <rdfs:label xml:lang="en">ETBT</rdfs:label>
  <rdfs:comment xml:lang="en">European School's Treasury Browser Thesaurus Encoding Scheme</rdfs:comment>
  <rdfs:isDefinedBy rdf:resource = "&etbthes;" />
  <rdfs:type rdf:resource = "&dcq;SubjectScheme" />
  </rdfs:Class>

  <rdfs:Class rdf:ID="Node">
  <rdfs:label xml:lang="en">Node</rdfs:label>
  <rdfs:comment xml:lang="en">The top class of the ETBT hierarchy</rdfs:comment>
  <rdfs:type rdf:resource="&rdfs;Class" />
  <rdfs:isDefinedBy rdf:resource = "&etbthes;" />
  </rdfs:Class>

  <rdfs:Class rdf:ID="Thes">
  <rdfs:label xml:lang="en">Thesaurus</rdfs:label>
  <rdfs:comment xml:lang="en">The main thesaurus container class of
  monolingual thesauri</rdfs:comment>
  <rdfs:subClassOf rdf:resource="#Node" />
  <rdfs:isDefinedBy rdf:resource = "&etbthes;" />
  <rdfs:seeAlso rdf:resource = "http://etbdemo.jrc.it/thesaurus/docs/Thes.gif" />
  </rdfs:Class>

  <rdfs:Class rdf:ID="Tmono">
  <rdfs:label xml:lang="en">Monolingual Thesaurus</rdfs:label>
  <rdfs:comment xml:lang="en">The monolingual thesaurus class
  containing different semantic-fields(categories) within the same
  language</rdfs:comment>
  <rdfs:subClassOf rdf:resource="#Node" />
  <rdfs:isDefinedBy rdf:resource = "&etbthes;" />
  <rdfs:seeAlso rdf:resource = "http://etbdemo.jrc.it/thesaurus/docs/Tmono-MT.gif" />
  </rdfs:Class>

  <rdfs:Class rdf:ID="MT">
  <rdfs:label xml:lang="en">Category</rdfs:label>
  <rdfs:comment xml:lang="en">A semantic-field or category
  class</rdfs:comment>
  <rdfs:subClassOf rdf:resource="#Node" />
  <rdfs:isDefinedBy rdf:resource = "&etbthes;" />
  <rdfs:seeAlso rdf:resource = "http://etbdemo.jrc.it/thesaurus/docs/MT.gif" />
  </rdfs:Class>

  <rdfs:Class rdf:ID="MTNode">
  <rdfs:label xml:lang="en">Term</rdfs:label>
  <rdfs:comment xml:lang="en">A term class representing either
  descriptor and non-descriptors</rdfs:comment>
  <rdfs:subClassOf rdf:resource="#Node" />
  <rdfs:isDefinedBy rdf:resource = "&etbthes;" />
  <rdfs:seeAlso rdf:resource = "http://etbdemo.jrc.it/thesaurus/docs/MTNode.gif" />
  </rdfs:Class>

  <rdfs:Class rdf:ID="ENode">
  <rdfs:label xml:lang="en">Language Equivalents</rdfs:label>
  <rdfs:comment xml:lang="en">References to the complete set of
  unique multilingual MTNode equivalents</rdfs:comment>
  <rdfs:subClassOf rdf:resource="#Node" />
  <rdfs:isDefinedBy rdf:resource = "&etbthes;" />
  <rdfs:seeAlso rdf:resource = "http://etbdemo.jrc.it/thesaurus/docs/MTNode.gif" />
  </rdfs:Class>

```

```

<rdfs:Class rdf:ID="UNode">
<rdfs:label xml:lang="en">Descriptors</rdfs:label>
  <rdfs:comment xml:lang="en">A class containing a list of
  descriptors</rdfs:comment>
<rdfs:subClassOf rdf:resource="#Node" />
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:seeAlso rdf:resource = "http://etbdemo.jrc.it/thesaurus/docs/MTNode.gif" />
</rdfs:Class>

<rdfs:Class rdf:ID="RNode">
<rdfs:label xml:lang="en">Related</rdfs:label>
  <rdfs:comment xml:lang="en">Class containing BT, NT, RT, RBT and
  RNT</rdfs:comment> <rdfs:subClassOf rdf:resource="#Node" />
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:seeAlso rdf:resource =
  "http://etbdemo.jrc.it/thesaurus/docs/MTNode.gif" />
</rdfs:Class>

<!-- *** Properties of class Node *** -->
<rdf:Property rdf:ID="ID">
<rdfs:label xml:lang="en">ID</rdfs:label>
  <rdfs:comment xml:lang="en">An identification label encoded as
  URI</rdfs:comment> <rdfs:range rdf:resource="&rdfs;Literal"/>
<rdfs:domain rdf:resource="#Node" />
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;identifier" />
</rdf:Property>

<!-- *** Properties of class Thes *** -->
<rdf:Property rdf:ID="TmonoNodes">
<rdfs:label xml:lang="en">TmonoNodes</rdfs:label>
  <rdfs:comment xml:lang="en">References to a collection of
  mono-lingual objects</rdfs:comment>
<rdfs:range rdf:resource="#Tmono"/>
<rdfs:domain rdf:resource="#Thes" />
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;relation" />
</rdf:Property>

<!-- *** Properties of class Tmono *** -->
<rdf:Property rdf:ID="Lang">
<rdfs:label xml:lang="en">Language</rdfs:label>
  <rdfs:comment xml:lang="en">Language code for category or term
  encoded using ISO639-1</rdfs:comment>
<rdfs:range rdf:resource="&rdfs;Literal"/>
<rdfs:domain rdf:resource="#Tmono" />
<rdfs:domain rdf:resource="#MTNode" />
<rdfs:domain rdf:resource="#MT" />
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;language" />
</rdf:Property>

<rdf:Property rdf:ID="MTNodes">
<rdfs:label xml:lang="en">MTNodes</rdfs:label>
  <rdfs:comment xml:lang="en">References to a collection of category
  objects</rdfs:comment> <rdfs:range rdf:resource="#MT" />
<rdfs:domain rdf:resource="#Tmono" />
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;relation" />
</rdf:Property>

<!-- *** Properties of class MT *** -->
<rdf:Property rdf:ID="Name">
<rdfs:label xml:lang="en">Category Name</rdfs:label>
  <rdfs:comment xml:lang="en">The human-readable name of the
  category (which may or may not be the same as the top
  term)</rdfs:comment>
<rdfs:range rdf:resource="&rdfs;Literal"/>
<rdfs:domain rdf:resource="#MT"/>
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;title" />
</rdf:Property>

<rdf:Property rdf:ID="No">
<rdfs:label xml:lang="en">Category Number</rdfs:label>
  <rdfs:comment xml:lang="en">The number of this
  category</rdfs:comment>
<rdfs:range rdf:resource="&rdfs;Literal"/>
<rdfs:domain rdf:resource="#MT"/>
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;identifier" />
</rdf:Property>

<rdf:Property rdf:ID="MTNodeNodes">
<rdfs:label xml:lang="en">MTNodeNodes</rdfs:label>
  <rdfs:comment xml:lang="en">References to the term objects
  (descriptors) which make up this category (note: this relation can only
  be present for descriptors)</rdfs:comment>
<rdfs:range rdf:resource="#MTNode"/>
<rdfs:domain rdf:resource="#MT"/>
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;relation" />
</rdf:Property>

<rdf:Property rdf:ID="TopTerms">
<rdfs:label xml:lang="en">TopTerms</rdfs:label>
  <rdfs:comment xml:lang="en">References to the term objects of the
  top terms of this category</rdfs:comment>
<rdfs:range rdf:resource="#MTNode"/>
<rdfs:domain rdf:resource="#MT"/>
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;relation" />
</rdf:Property>

<!-- *** Properties of class MTNode *** -->
<rdf:Property rdf:ID="Title">
<rdfs:label xml:lang="en">Title</rdfs:label>

```

```

actual word or term being)</rdfs:comment>
<rdfs:label rdf:resource="#&rdfs;Literal"/>
<rdfs:domain rdf:resource="#MTNode"/>
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;title" />
</rdf:Property>

<rdf:Property rdf:ID="SN">
<rdfs:label xml:lang="en">Scope Note</rdfs:label>
<rdfs:comment xml:lang="en">A source note (as much text as is desired)</rdfs:comment>
<rdfs:range rdf:resource="#&rdfs;Literal"/>
<rdfs:domain rdf:resource="#MTNode"/>
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;description" />
</rdf:Property>

<rdf:Property rdf:ID="Type">
<rdfs:label xml:lang="en">Type</rdfs:label>
<rdfs:comment xml:lang="en">The term type, either descriptor or non-descriptor</rdfs:comment>
<rdfs:range rdf:resource="#&rdfs;Literal"/>
<rdfs:domain rdf:resource="#MTNode"/>
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;type" />
</rdf:Property>

<rdf:Property rdf:ID="Date">
<rdfs:label xml:lang="en">Date</rdfs:label>
<rdfs:comment xml:lang="en">The date the term was instantiated</rdfs:comment>
<rdfs:range rdf:resource="#&rdfs;Literal"/>
<rdfs:domain rdf:resource="#MTNode"/>
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dcq;created" />
</rdf:Property>

<rdf:Property rdf:ID="PN">
<rdfs:label xml:lang="en">PN</rdfs:label>
<rdfs:comment xml:lang="en">The date the term was issued</rdfs:comment>
<rdfs:range rdf:resource="#&rdfs;Literal"/>
<rdfs:domain rdf:resource="#MTNode"/>
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dcq;issued" />
</rdf:Property>

<rdf:Property rdf:ID="HN">
<rdfs:label xml:lang="en">HN</rdfs:label>
<rdfs:comment xml:lang="en">history note of a term</rdfs:comment>
<rdfs:range rdf:resource="#&rdfs;Literal"/>
<rdfs:domain rdf:resource="#MTNode"/>
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;description" />
</rdf:Property>

<rdf:Property rdf:ID="MTn">
<rdfs:label xml:lang="en">MTn</rdfs:label>
<rdfs:comment xml:lang="en">A reference to one or more category
objects to which this term (descriptor) belongs (note: this relation can
only be present for descriptors)</rdfs:comment>
<rdfs:range rdf:resource="#MT"/>
<rdfs:domain rdf:resource="#MTNode"/>
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;relation" />
</rdf:Property>

<rdf:Property rdf:ID="TT">
<rdfs:label xml:lang="en">TT</rdfs:label>
<rdfs:comment xml:lang="en">References to the term objects of the
top terms of this category</rdfs:comment>
<rdfs:range rdf:resource="#MTNode"/>
<rdfs:domain rdf:resource="#MTNode"/>
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;relation" />
</rdf:Property>

<rdf:Property rdf:ID="RT">
<rdfs:label xml:lang="en">RT</rdfs:label>
<rdfs:comment xml:lang="en">References to term objects which
correspond to related terms</rdfs:comment>
<rdfs:range rdf:resource="#MTNode"/>
<rdfs:domain rdf:resource="#MTNode"/>
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;relation" />
</rdf:Property>

<rdf:Property rdf:ID="UF">
<rdfs:label xml:lang="en">UF</rdfs:label>
<rdfs:comment xml:lang="en">References to term objects which
correspond to non-descriptors (note: this label can only be present for
descriptors)</rdfs:comment>
<rdfs:range rdf:resource="#MTNode"/>
<rdfs:domain rdf:resource="#MTNode"/>
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;relation" />
</rdf:Property>

<rdf:Property rdf:ID="USE">
<rdfs:label xml:lang="en">USE</rdfs:label>
<rdfs:comment xml:lang="en">A reference to a UNode that contains
one or more references to term objects, together with the way in which
they should be used as descriptors (note: this label can only be present
for non-descriptors)</rdfs:comment>
;
<rdfs:range rdf:resource="#UNode"/>
<rdfs:domain rdf:resource="#MTNode"/>
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;relation" />
</rdf:Property>

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<rdf:Property rdf:ID="BT">
<rdfs:label xml:lang="en">BT</rdfs:label>
<rdfs:comment xml:lang="en">A reference to one or more RNodes
which are containers for term objects which have a broader
meaning</rdfs:comment> <rdfs:range rdf:resource="#RNode"/>
<rdfs:domain rdf:resource="#MTNode"/>
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;relation" />
</rdf:Property>

<rdf:Property rdf:ID="NT">
<rdfs:label xml:lang="en">NT</rdfs:label>
<rdfs:comment xml:lang="en">A reference to one or more RNodes
which are containers for term objects which have a narrower
meaning</rdfs:comment> <rdfs:range rdf:resource="#RNode"/>
<rdfs:domain rdf:resource="#MTNode"/>
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;relation" />
</rdf:Property>

<rdf:Property rdf:ID="RBT">
<rdfs:label xml:lang="en">RBT</rdfs:label>
<rdfs:comment xml:lang="en">A reference to one or more RNodes
which are containers for term objects which are related but are
represented as broader in meaning</rdfs:comment>
<rdfs:range rdf:resource="#RNode"/>
<rdfs:domain rdf:resource="#MTNode"/>
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;relation" />
<rdfs:seeAlso rdf:resource = "http://www.indire.it/" />
</rdf:Property>

<rdf:Property rdf:ID="RNT">
<rdfs:label xml:lang="en">RNT</rdfs:label>
<rdfs:comment xml:lang="en">A reference to one or more RNodes
which are containers for term objects which are related but are
represented as narrower in meaning</rdfs:comment>
<rdfs:range rdf:resource="#RNode"/>
<rdfs:domain rdf:resource="#MTNode"/>
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;relation" />
<rdfs:seeAlso rdf:resource = "http://www.indire.it/" />
</rdf:Property>

<rdf:Property rdf:ID="EN">
<rdfs:label xml:lang="en">EN</rdfs:label>
<rdfs:comment xml:lang="en">A reference to an ENode, a unique
multilingual equivalent node</rdfs:comment>
<rdfs:range rdf:resource="#ENode"/>
<rdfs:domain rdf:resource="#MTNode"/>
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;relation" />
</rdf:Property>

<!-- *** Properties of class UNode *** -->
<rdf:Property rdf:ID="UType">
<rdfs:label xml:lang="en">UType</rdfs:label>
<rdfs:comment xml:lang="en">A reference to a UNode that contains
one or more references to term objects, together with the
way in which they should be used as descriptors (note: this label can
only be present for non-descriptors)Following convention, there are only
three possible combinations: '/', '+' and 'MTNode'</rdfs:comment>
<rdfs:range rdf:resource="&rdfs;Literal"/>
<rdfs:domain rdf:resource="#UNode"/>
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;type" />
</rdf:Property>

<rdf:Property rdf:ID="UN">
<rdfs:label xml:lang="en">UN</rdfs:label>
<rdfs:comment xml:lang="en">A reference to an term object</rdfs:comment>
<rdfs:range rdf:resource="#MTNode"/>
<rdfs:domain rdf:resource="#UNode"/>
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;relation" />
</rdf:Property>

<!-- *** Properties of class RNode *** -->
<rdf:Property rdf:ID="Relation">
<rdfs:label xml:lang="en">Relation</rdfs:label>
<rdfs:comment xml:lang="en">A broader or narrower relation
including a level. I.e. BT, RBT, RNT, BT1, NT2 and so
on</rdfs:comment> <rdfs:range rdf:resource="&rdfs;Literal"/>
<rdfs:domain rdf:resource="#RNode"/>
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;description" />
</rdf:Property>

<rdf:Property rdf:ID="RN">
<rdfs:label xml:lang="en">RN</rdfs:label>
<rdfs:comment xml:lang="en">A reference to an broader or narrower
term object</rdfs:comment>
<rdfs:range rdf:resource="#MTNode"/>
<rdfs:domain rdf:resource="#RNode"/>
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;relation" />
</rdf:Property>

<!-- *** Properties of class ENode *** -->
<rdf:Property rdf:ID="da">
<rdfs:label xml:lang="en">Danish</rdfs:label>
<rdfs:comment xml:lang="en">Danish translation</rdfs:comment>
<rdfs:range rdf:resource="#MTNode" />
<rdfs:domain rdf:resource="#ENode" />
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;relation" />
</rdf:Property>

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<rdfs:label xml:lang="en">German</rdfs:label>
<rdfs:comment xml:lang="en">German translation</rdfs:comment>
<rdfs:range rdf:resource="#MTNode" />
<rdfs:domain rdf:resource="#ENode" />
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;relation" />
</rdf:Property>

<rdf:Property rdf:ID="en">
<rdfs:label xml:lang="en">English</rdfs:label>
<rdfs:comment xml:lang="en">English translation</rdfs:comment>
<rdfs:range rdf:resource="#MTNode" />
<rdfs:domain rdf:resource="#ENode" />
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;relation" />
</rdf:Property>

<rdf:Property rdf:ID="he">
<rdfs:label xml:lang="en">Hebrew</rdfs:label>
<rdfs:comment xml:lang="en">Hebrew translation</rdfs:comment>
<rdfs:range rdf:resource="#MTNode" />
<rdfs:domain rdf:resource="#ENode" />
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;relation" />
</rdf:Property>

<rdf:Property rdf:ID="el">
<rdfs:label xml:lang="en">Greek</rdfs:label>
<rdfs:comment xml:lang="en">Greek translation</rdfs:comment>
<rdfs:range rdf:resource="#MTNode" />
<rdfs:domain rdf:resource="#ENode" />
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;relation" />
</rdf:Property>

<rdf:Property rdf:ID="es">
<rdfs:label xml:lang="en">Spanish</rdfs:label>
<rdfs:comment xml:lang="en">Spanish translation</rdfs:comment>
<rdfs:range rdf:resource="#MTNode" />
<rdfs:domain rdf:resource="#ENode" />
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;relation" />
</rdf:Property>

<rdf:Property rdf:ID="fi">
<rdfs:label xml:lang="en">Finnish</rdfs:label>
<rdfs:comment xml:lang="en">Finnish translation</rdfs:comment>
<rdfs:range rdf:resource="#MTNode" />
<rdfs:domain rdf:resource="#ENode" />
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;relation" />
</rdf:Property>

<rdf:Property rdf:ID="fr">
<rdfs:label xml:lang="en">French</rdfs:label>
<rdfs:comment xml:lang="en">French translation</rdfs:comment>
<rdfs:range rdf:resource="#MTNode" />
<rdfs:domain rdf:resource="#ENode" />
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;relation" />
</rdf:Property>

<rdf:Property rdf:ID="it">
<rdfs:label xml:lang="en">Italian</rdfs:label>
<rdfs:comment xml:lang="en">Italian translation</rdfs:comment>
<rdfs:range rdf:resource="#MTNode" />
<rdfs:domain rdf:resource="#ENode" />
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;relation" />
</rdf:Property>

<rdf:Property rdf:ID="nl">
<rdfs:label xml:lang="en">Dutch</rdfs:label>
<rdfs:comment xml:lang="en">Dutch translation</rdfs:comment>
<rdfs:range rdf:resource="#MTNode" />
<rdfs:domain rdf:resource="#ENode" />
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;relation" />
</rdf:Property>

<rdf:Property rdf:ID="pt">
<rdfs:label xml:lang="en">Portuguese</rdfs:label>
<rdfs:comment xml:lang="en">Portuguese translation</rdfs:comment>
<rdfs:range rdf:resource="#MTNode" />
<rdfs:domain rdf:resource="#ENode" />
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;relation" />
</rdf:Property>

<rdf:Property rdf:ID="sv">
<rdfs:label xml:lang="en">Swedish</rdfs:label>
<rdfs:comment xml:lang="en">Swedish translation</rdfs:comment>
<rdfs:range rdf:resource="#MTNode" />
<rdfs:domain rdf:resource="#ENode" />
<rdfs:isDefinedBy rdf:resource = "&etbthes;" />
<rdfs:subPropertyOf rdf:resource = "&dc;relation" />
</rdf:Property>

</rdf:RDF>

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