

Methods and Tools for Management Information Systems

Lecture 6

15. Juni 2009



Topic Maps

- ISO standard for an implementation-independent representation of knowledge about resources, their subjects and interrelationships
- Topic maps consist of *topics* (concepts), *associations* (relationships) and *occurrences* (relevant information resources)
- As opposed to RDF that aims at machine-processable metadata, topic maps are used to structure knowledge for *human readers*, with an emphasis on the *findability* of information



- Provide powerful new ways of navigating large and interconnected information sources (“the GPS of the information universe”)
- Stem from glossaries, classification systems and thesauri, but provide more expressiveness
- Can be used to develop ontologies which may be even mapped to RDF, but are not part of the *Semantic Web* effort of the W3C



■ Fundamental concepts:

<i>Topic</i>	⇒	Fundamental entity in the context of the modeled knowledge domain
<i>Topic Name</i>	⇒	Topic identifier (<i>Base Name</i> , <i>Display Name</i> und <i>Sort Name</i>)
<i>Topic Occurrence</i>	⇒	Instances and roles (<i>Occurrence Role Type</i>)
<i>Public Subject Descriptor</i>	⇒	Unique topic descriptor
<i>Associations</i>	⇒	Relationships between topics and their roles (<i>association role</i>)

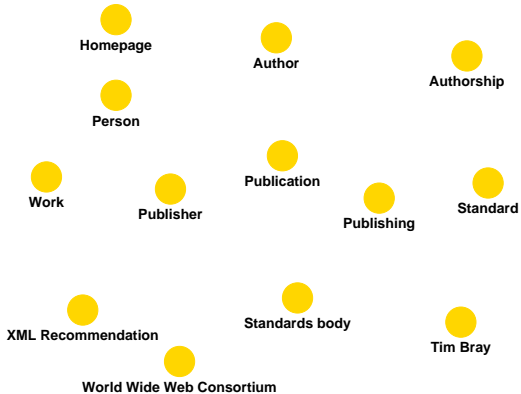


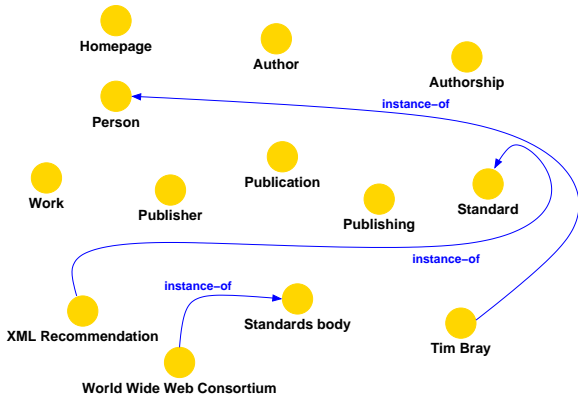
■ Fundamental concepts (cont'd):

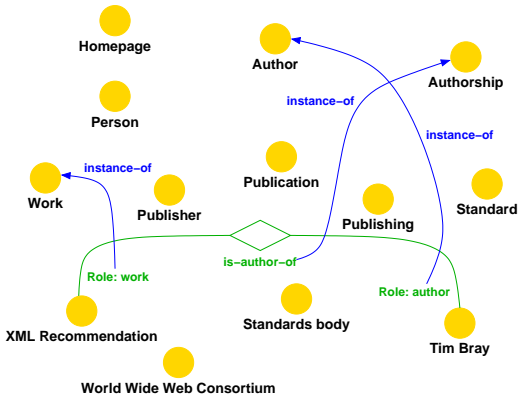
Scope ⇒ Specifies the extent of the validity

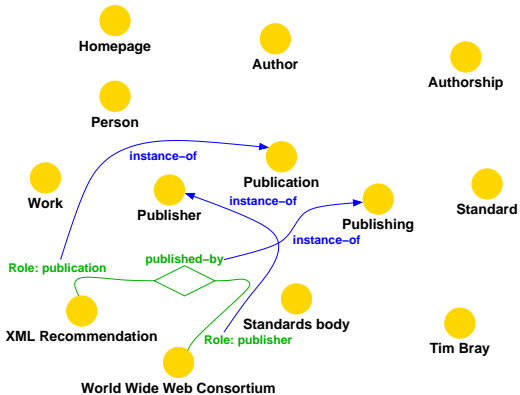
Facet ⇒ Attribute-value-pair that describes a topic in more detail

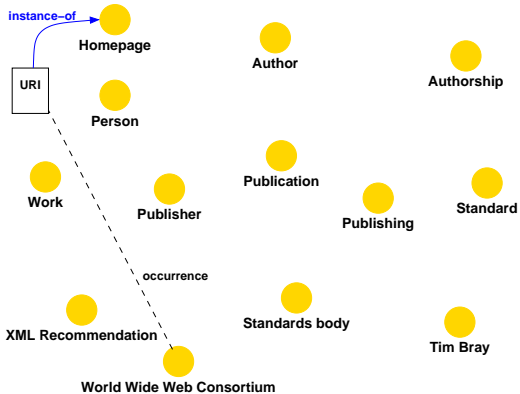


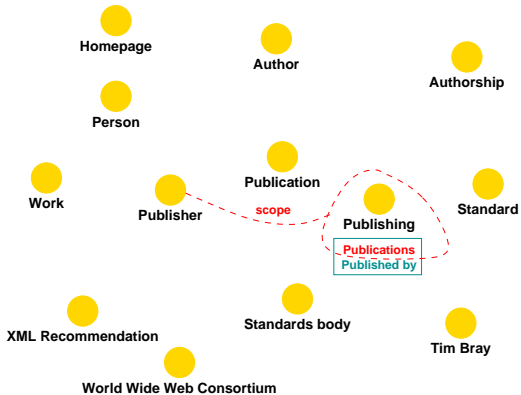


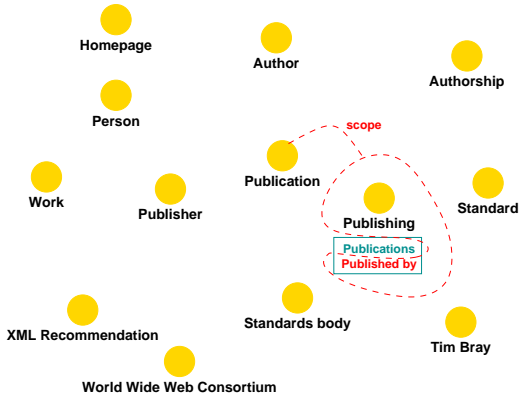


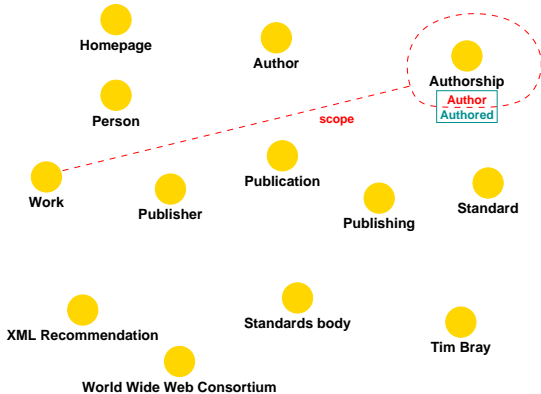


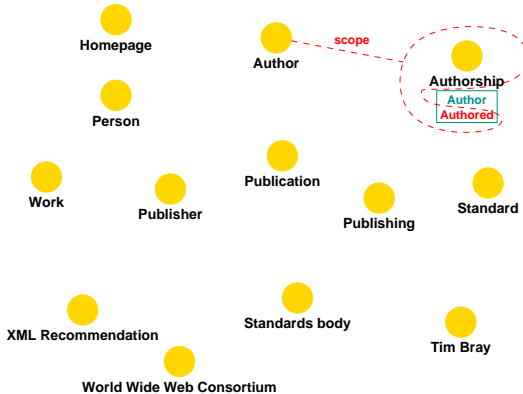












XML Topic Maps (XTM)

- Abstract model and XML grammar for the exchange of Web-based topic maps created by the *TopicMaps.Org Authoring Group* (2001)
- XTM specification is based on the following standards:
 - XML 1.0 (<http://www.w3.org/TR/REC-xml>)
 - XLink 1.0 (<http://www.w3.org/TR/xlink>)
 - XML Base (<http://www.w3.org/TR/xmlbase>)
 - IETF URI specification (RFC 2396, as updated by RFC 2732)



- Design goals:

- Ease of use
- Support for a wide range of applications
- Standards compatible
- Ideally no optional features
- Short and concise specification
- XTM documents shall be easy to create, read and understand



■ XTM Specification Overview: *Concepts*

■ Topics

■ *Subject* \Rightarrow *Reification* \Rightarrow *Topic*

"[...] a subject is anything whatsoever, regardless of whether it exists or has any other specific characteristics, about which anything whatsoever may be asserted by any means whatsoever."

■ *Subject Identity*

■ *Subject Indicator*

■ *Topic Characteristics (Name, Occurrence, Role)*

■ *Scope*



- Name

- *Base Name*

- *Variant Name* ⇒ *Display* or *Sort Name*

- *Parameters* ⇒ Processing context for variant names

- Occurrence

- Association

- *Member*

- *Role*

- *Class-Instance*

- *Superclass-Subclass*



■ Topic Map

- *Topic Map Node*
- *Consistent Topic Map*
 - ⇒ Exactly one topic per subject
 - ⇒ No further opportunities for merging or duplicate suppression
- *Topic Map Document*
- *XTM Document*



- XTM Specification Overview: *Published Subjects*
 - *XTM Mandatory Published Subject Indicators*
 - *topic*
 - *association*
 - *occurrence*
 - *class-instance relationship*
 - *class*
 - *instance*
 - *superclass-subclass relationship*
 - *superclass*
 - *subclass*
 - *suitability for sorting*
 - *suitability for display*



XTM Specification Overview: *Merging*

- Two cases:

- 1 Merging two topics:

- Union of the characteristics of the original topics, i. e., any duplicates are removed

- 2 Merging two topic maps:

- Any topics determined to have the same subject are merged
 - Any duplicate associations are removed

- Two topics have the same subject if:

- they have one or more subject indicators in common,
 - they reify the same addressable subject, or
 - they have the same base name in the same scope



■ *XTM Syntax Overview:*

- `topicRef`: Reference to a Topic element
- `subjectIndicatorRef`: Reference to a Subject Indicator
- `scope`: Reference to Topic(s) that comprise the Scope
- `instanceOf`: Points to a Topic representing a class
- `topicMap`: Topic Map document element
- `topic`: Topic element
- `subjectIdentity`: Subject reified by Topic
- `baseName`: Base Name of a Topic
- `baseNameString`: Base Name String container
- `variant`: Alternate forms of Base Name
- `variantName`: Container for Variant Name
- `parameters`: Processing context for Variant



■ *XTM Syntax Overview (cont'd):*

- `association`: Topic Association
- `member`: Member in Topic Association
- `roleSpec`: Points to a Topic serving as an Association Role
- `occurrence`: Resources regarded as an Occurrence
- `resourceRef`: Reference to a Resource
- `resourceData`: Container for Resource data
- `mergeMap`: Merge with another Topic Map



topicRef

- *Synopsis:*

The <topicRef> element provides a URI reference to a topic. The target of a <topicRef> link must resolve to a <topic> element child of a <topicMap> document that conforms to this XTM specification. The target <topic> need not be in the document entity of origin.

- *Content Model:*

```
<!ELEMENT topicRef EMPTY>
```



■ *Attributes:*

```
<!ATTLIST topicRef
  id          ID          #IMPLIED
  xlink:type  NMTOKEN    #FIXED 'simple'
  xlink:href  CDATA      #REQUIRED>
```

■ Example:

```
<topicRef
  xlink:href="http://www.topicmaps.org/xtm/1.0/language.xtm#en"/>

<topicRef xlink:href="#play"/>
```



subjectIndicatorRef

- *Synopsis:*

The <subjectIndicatorRef> element provides a URI reference to a resource that acts as a subject indicator.

- *Content Model:*

<!ELEMENT subjectIndicatorRef EMPTY>



■ *Attributes:*

```
<!ATTLIST subjectIndicatorRef
  id          ID          #IMPLIED
  xlink:type  NMTOKEN    #FIXED 'simple'
  xlink:href  CDATA      #REQUIRED>
```

■ Example:

```
<subjectIndicatorRef
  xlink:href="http://www.topicmaps.org/xtm/1.0/language.xtm#en"/>
```

```
<subjectIndicatorRef
  xlink:href="http://www.shakespeare.org/plays.html#hamlet"/>
```



scope

- *Synopsis:*

The <scope> element consists of one or more <topicRef>, <resourceRef>, or <subjectIndicatorRef> elements. The union of the subjects corresponding to these elements specifies the context in which the assignment of the topic characteristic is considered to be valid.

- *Content Model:*

```
<!ELEMENT scope (topicRef | resourceRef | subjectIndicatorRef)
```



■ *Attributes:*

```
<!ATTLIST scope
    id ID #IMPLIED>
```

■ Example:

```
<scope>
  <subjectIndicatorRef
    xlink:href="http://www.topicmaps.org/xtm/1.0/language.xtm#en"/>
</scope>
<scope>
  <topicRef xlink:href="#tragedy"/>
  <topicRef xlink:href="#theatre"/>
</scope>
```



instanceOf

- *Synopsis:*

The <instanceOf> element specifies the class to which its parent belongs, via a <topicRef> or <subjectIndicatorRef> child element.

- *Content Model:*

```
<!ELEMENT instanceOf (topicRef | subjectIndicatorRef) >
```



- *Attributes:*

```
<!ATTLIST instanceOf  
    id ID #IMPLIED>
```

- *Example:*

```
<topic id="hamlet">  
    <instanceOf>  
        <subjectIndicatorRef  
            xlink:href="http://www.shakespeare.org/plays.html"/>  
        </instanceOf>  
    </topic>
```



topicMap

- *Synopsis:*

The <topicMap> element is the parent of all <topic>, <association>, and <mergeMap> elements in the topic map document.

- *Content Model:*

```
<!ELEMENT topicMap  
    (topic | association | mergeMap)*>
```



■ *Attributes:*

```
<!ATTLIST topicMap
  id          ID          #IMPLIED
  xmlns      CDATA      #FIXED 'http://www.topicmaps.org/xtm/1.0/'
  xmlns:xlink CDATA      #FIXED 'http://www.w3.org/1999/xlink'
  xml:base   CDATA      #IMPLIED>
```



■ Example:

```
<?xml version="1.0"?>

<!DOCTYPE topicMap
  PUBLIC "-//TopicMaps.Org//DTD XML Topic Map (XTM) 1.0//EN"
  "file:///usr/local/home/gromit/xml/xtm/xtm1.dtd">

<topicMap xmlns='http://www.topicmaps.org/xtm/1.0/'
  xmlns:xlink='http://www.w3.org/1999/xlink'
  xml:base='http://www.shakespeare.org/hamlet/'>

  <!-- topics, associations, and merge map directives go here -->

</topicMap>
```



topic

- *Synopsis:*

The <topic> element specifies the name and occurrence characteristics of a single topic.

- *Content Model:*

```
<!ELEMENT topic  
  (instanceOf*, subjectIdentity?, (baseName | occurrence)*)>
```



■ *Attributes:*

```
<!ATTLIST topic
  id ID #REQUIRED>
```

■ Example:

```
<topic id="hamlet">
  <instanceOf>
    <topicRef xlink:href="#play"/>
  </instanceOf>
  <!-- base names and occurrences go here -->
</topic>
```



subjectIdentity

- *Synopsis:*

The <subjectIdentity> element specifies the subject that is reified by a topic, via <resourceRef>, <subjectIndicatorRef>, and/or <topicRef> child elements.

- *Content Model:*

```
<!ELEMENT subjectIdentity  
    (resourceRef?, (topicRef | subjectIndicatorRef)*)>
```



- *Attributes:*

```
<!ATTLIST subjectIdentity  
  id ID #IMPLIED>
```

- *Example:*

```
<topic id="dk">  
  <subjectIdentity>  
    <subjectIndicatorRef  
      xlink:href="http://www.topicmaps.org/xtm/1.0/country  
    </subjectIdentity>  
</topic>
```



baseName

- *Synopsis:*

The <baseName> element specifies a topic name in form of a <baseNameString> child element.

- *Content Model:*

```
<!ELEMENT baseName (scope?, baseNameString, variant*)>
```



- *Attributes:*

```
<!ATTLIST baseName  
    id ID #IMPLIED>
```

- Example:

```
<topic id="shakespeare">  
    <baseName>  
        <baseNameString>William Shakespeare</baseNameString>  
    </baseName>  
</topic>
```



baseNameString

- *Synopsis:*

The <baseNameString> element is a string that represents the base name of its ancestor <topic> parent.

- *Content Model:*

```
<!ELEMENT baseNameString (#PCDATA)>
```



■ *Attributes:*

```
<!ATTLIST baseNameString  
    id ID #IMPLIED>
```

■ Example:

```
<topic id="written-by">  
  <baseName>  
    <baseNameString>written by</baseNameString>  
  </baseName>  
  <baseName>  
    <scope><topicRef xlink:href="#author"/></scope>  
    <baseNameString>author of</baseNameString>  
  </baseName>  
</topic>
```



variant

- *Synopsis:*

The <variant> element is an alternate form of a topic's base name appropriate for a processing context specified by the variant's <parameters> child element. Among these contexts may be sorting and display.

- *Content Model:*

```
<!ELEMENT variant  
  (parameters, variantName?, variant*)>
```



■ *Attributes:*

```
<!ATTLIST variant
    id ID #IMPLIED>
```

■ *Example:*

```
<topic id="shakespeare">
  <baseName>
    <baseNameString>William Shakespeare</baseNameString>
    <!-- form for sorting (sort name) -->
  <variant>
    <parameters><topicRef xlink:href="#sort"/></parameters>
    <variantName>
      <resourceData>shakespeare,william</resourceData>
    </variantName></variant></baseName></topic>
```



variantName

- *Synopsis:*

The <variantName> element provides the resource to be used as a variant of a base name.

- *Content Model:*

```
<!ELEMENT variantName (resourceRef | resourceData)>
```

- *Attributes:*

```
<!ATTLIST variantName id ID #IMPLIED>
```



parameters

- *Synopsis:*

The <parameters> element consists of one or more <topicRef> or <subjectIndicatorRef> elements. The union of the subjects corresponding to these elements specifies an additional processing context in which variant names in the variant's subtree are considered to be appropriate.

- *Content Model:*

```
<!ELEMENT parameters  
  (topicRef | subjectIndicatorRef)+>
```



■ *Attributes:*

```
<!ATTLIST parameters
    id ID #IMPLIED>
```

■ Example:

```
<topic id="shakespeare">
  <baseName>
    <baseNameString>William Shakespeare</baseNameString>
    <!-- form for sorting (sort name) -->
    <variant>
      <parameters><topicRef xlink:href="#sort"/></parameters>
      <variantName>
        <resourceData>shakespeare,william</resourceData>
      </variantName></variant></baseName></topic>
```



association

- *Synopsis:*

The <association> element asserts a relationship among topics that play roles as members of the association.

- *Content Model:*

```
<!ELEMENT association  
    (instanceOf?, scope?, member+)>
```

- *Attributes:*

```
<!ATTLIST association    id    ID    #IMPLIED>
```



■ Example:

```
<association id="will-wrote-hamlet">
  <instanceOf>
    <topicRef xlink:href="#written-by"/>
  </instanceOf>
  <member>
    <roleSpec>
      <topicRef xlink:href="#author"/></roleSpec>
      <topicRef xlink:href="#shakespeare"/>
    </member>
  <member>
    <roleSpec>
      <topicRef xlink:href="#work"/></roleSpec>
      <topicRef xlink:href="#hamlet"/>
    </member>
</association>
```



member

- *Synopsis:*

The <member> element specifies all topics that play a given role in an association. The <roleSpec> element specifies the role played by these topics.

- *Content Model:*

```
<!ELEMENT member  
    (roleSpec?, (topicRef | resourceRef | subjectIndicatorRef)+)>
```

- *Attributes:*

```
<!ATTLIST member    id    ID    #IMPLIED>
```



roleSpec

- *Synopsis:*

The <roleSpec> element specifies the role played by a member in an association.

- *Content Model:*

```
<!ELEMENT roleSpec (topicRef | subjectIndicatorRef)>
```

- *Attributes:*

```
<!ATTLIST roleSpec  
  id ID #IMPLIED>
```



occurrence

- *Synopsis:*

The <occurrence> element specifies a resource supplying information relevant to a topic.

- *Content Model:*

```
<!ELEMENT occurrence  
  (instanceOf?, scope?, (resourceRef | resourceData))>
```



■ *Attributes:*

```
<!ATTLIST occurrence
    id ID #IMPLIED>
```

■ Example:

```
<topic id="hamlet">
  <occurrence id="hamlet-in-xml">
    <instanceOf>
      <topicRef xlink:href="#xml-version"/>
    </instanceOf>
    <resourceRef
      xlink:href="http://www.uwaterloo.ca/relander/XML/hamlet.xml"/>
    </occurrence>
  </topic>
```



resourceRef

- *Synopsis:*

The <resourceRef> element provides a URI reference to a resource:

- 1 as occurrences of topics (in <occurrence> elements)
- 2 as addressable subjects (in <member>, <mergeMap>, <scope>, and <subjectIdentity> elements)
- 3 as variant names of topics (in <variantName> elements)

- *Content Model:*

<!ELEMENT resourceRef EMPTY>



■ *Attributes:*

```
<!ATTLIST resourceRef
  id          ID          #IMPLIED
  xlink:type  NMTOKEN    #FIXED 'simple'
  xlink:href  CDATA      #REQUIRED>
```

■ Example:

```
<occurrence id="hamlet-in-xml">
  <instanceOf>
    <topicRef xlink:href="#xml-version"/>
  </instanceOf>
  <resourceRef
    xlink:href="http://www.uwaterloo.ca/relander/XML/hamlet.xml"/>
</occurrence>
```



resourceData

- *Synopsis:*

The <resourceData> element contains information in the form of character data that may be

- 1 an occurrence of a topic, or
- 2 a variant form of a base name.

- *Content Model:*

<!ELEMENT resourceData (#PCDATA)>



- *Attributes:*

```
<!ATTLIST resourceData id ID #IMPLIED>
```

- Example:

```
<topic id="hamlet">  
  <occurrence>  
    <instanceOf>  
      <topicRef xlink:href="#date-of-composition"/>  
    </instanceOf>  
    <resourceData>1600-01</resourceData>  
  </occurrence>  
</topic>
```



mergeMap

- *Synopsis:*

A `<mergeMap>` element references an external `<topicMap>` element through an `xlink:href` attribute containing a URI. It is a directive to merge the containing topic map and the referenced topic map.

- *Content Model:*

```
<!ELEMENT mergeMap (topicRef | resourceRef | subjectIndicatorRef)*>
```



■ *Attributes:*

```
<!ATTLIST mergeMap
  id          ID          #IMPLIED
  xlink:type  NMTOKEN    #FIXED 'simple'
  xlink:href  CDATA      #REQUIRED>
```

■ Example:

```
<mergeMap xlink:href="http://www.shakespeare.org/plays.xtm">
  <topicRef xlink:href="#shakespeare"/>
  <topicRef xlink:href="#drama"/>
</mergeMap>
<mergeMap xlink:href="http://www.shakespeare.org/biography.xtm">
  <resourceRef
    xlink:href="http://www.shakespeare.org/biography.xtm"/>
</mergeMap>
```




```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE topicMap PUBLIC
    "-//TopicMaps.Org//DTD XML Topic Map (XTM) 1.0//EN"
    "http://www.topicmaps.org/xtm/1.0/xtm1.dtd">
<topicMap xmlns="http://www.topicmaps.org/xtm/1.0/"
    xmlns:xlink="http://www.w3.org/1999/xlink">
  <topic id="person">
    <baseName>
      <baseNameString>Person</baseNameString>
    </baseName>
  </topic>
  <topic id="standards-body">
    <baseName>
      <baseNameString>Standards body</baseNameString>
    </baseName>
  </topic>
```



```
<topic id="standard">
  <baseName>
    <baseNameString>Standard</baseNameString>
  </baseName>
</topic>
<topic id="xml-rec">
  <instanceOf>
    <topicRef xlink:href="#standard"/>
  </instanceOf>
  <baseName>
    <baseNameString>
      The XML Recommendation
    </baseNameString>
  </baseName>
</topic>
```



```
<topic id="tim-bray">
  <instanceOf>
    <topicRef xlink:href="#person"/>
  </instanceOf>
  <baseName>
    <baseNameString>Tim Bray</baseNameString>
  </baseName>
</topic>
<topic id="homepage">
  <baseName>
    <baseNameString>Homepage</baseNameString>
  </baseName>
</topic>
```



```
<topic id="w3c">
  <instanceOf>
    <topicRef xlink:href="#standards-body"/>
  </instanceOf>
  <baseName>
    <baseNameString>
      World Wide Web Consortium
    </baseNameString>
  </baseName>
  <occurrence>
    <instanceOf>
      <topicRef xlink:href="#homepage"/>
    </instanceOf>
    <resourceRef xlink:href="http://www.w3.org"/>
  </occurrence>
</topic>
```




```
<topic id="authorship">
  <baseName>
    <baseNameString>Authorship</baseNameString>
  </baseName>
  <baseName>
    <scope><topicRef xlink:href="#work"/></scope>
    <baseNameString>Author</baseNameString>
  </baseName>
  <baseName>
    <scope><topicRef xlink:href="#author"/></scope>
    <baseNameString>Authored</baseNameString>
  </baseName>
</topic>
```



```
<topic id="author">
  <baseName>
    <baseNameString>Author</baseNameString>
  </baseName>
</topic>
<topic id="work">
  <baseName>
    <baseNameString>Work</baseNameString>
  </baseName>
</topic>
<association>
  <instanceOf>
    <topicRef xlink:href="#authorship"/>
  </instanceOf>
</association>
```



```
<member>
  <roleSpec>
    <topicRef xlink:href="#author"/>
  </roleSpec>
  <topicRef xlink:href="#tim-bray"/>
</member>
<member>
  <roleSpec>
    <topicRef xlink:href="#work"/>
  </roleSpec>
  <topicRef xlink:href="#xml-rec"/>
</member>
</association>
```



```
<topic id="publishing">
  <baseName>
    <baseNameString>Publishing</baseNameString>
  </baseName>
  <baseName>
    <scope><topicRef xlink:href="#publisher"/></scope>
    <baseNameString>Publications</baseNameString>
  </baseName>
  <baseName>
    <scope><topicRef xlink:href="#publication"/></scope>
    <baseNameString>Published by</baseNameString>
  </baseName>
</topic>
```



```
<topic id="publisher">
  <baseName>
    <baseNameString>Publisher</baseNameString>
  </baseName>
</topic>
<topic id="publication">
  <baseName>
    <baseNameString>Publication</baseNameString>
  </baseName>
</topic>
<association>
  <instanceOf>
    <topicRef xlink:href="#publishing"/>
  </instanceOf>
</association>
```



```
<member>
  <roleSpec>
    <topicRef xlink:href="#publication"/>
  </roleSpec>
  <topicRef xlink:href="#xml-rec"/>
</member>
<member>
  <roleSpec>
    <topicRef xlink:href="#publisher"/>
  </roleSpec>
  <topicRef xlink:href="#w3c"/>
</member>
</association>
```



```
<topic id="publishing">
  <baseName>
    <baseNameString>Publishing</baseNameString>
  </baseName>
</topic>
</topicMap>
```



Classification

- Process of assigning objects to categories or classes based on common properties, where the objects to be classified can be of any nature, e. g.:
 - Library classification
 - Scientific classification of organisms
 - Medical classification like ICD
- Application of a classification system on a set of objects
- Assignment may be done manually (categorizing, sorting, indexing) or automatically (machine learning \Rightarrow *supervised learning*)



- Representation in form of a decision tree, decision table, decision list, or as a set of decision rules
- Advantage is the assignment of an object to exactly one class (depending on the level chosen in the hierarchy and the method used)
- Drawbacks are the potential information loss and the strictly hierarchical structure of classifications



Systematics

- Ordered representation of classes, categories or other concepts according to a specific taxonomic scheme
- Synonym for *classification system* and *taxonomy*
- Classes are usually derived by the process of classification
- Frequently hierarchical in structure based on common properties but may also refer to relationship schemes other than hierarchies, such as network structures



- Slightly less broad than ontologies
- Distinction of classification systems with respect to the resulting structure:
 - 1 Mono hierarchy:
 - *strong* hierarchy or hierarchy with single inheritance
 - each class has exactly one super class
 - tree structure
 - 2 Poly hierarchy:
 - *weak* hierarchy or hierarchy with multiple inheritance
 - a class may have more than one super class
 - acyclic graph structure



- Distinction of classification systems with respect to coordination

- 1 Analytical classification

- based on pre-coordination
 - from the general case to the specific case

- 2 Synthetical classification

- based on post-coordination
 - from the specific case to the general case



Thesaurus

- Systematically ordered, networked collection of terms (controlled vocabulary \Rightarrow list of terms with an unambiguous, non-redundant definition that have been enumerated explicitly), connected via associative and parent-child relationships
- Organized in a poly hierarchy (in general), i. e., multiple broader terms may be assigned to a single *narrower* term
- Used to describe/represent topics, for subject indexing and/or document retrieval



- Authoritative definition (for information and documentation purposes, freely translated from DIN 1463, part 1):

A thesaurus is an ordered collection of terms and their notations (in natural language), which are used in documentation projects to index, store and retrieve documents.

- International standards:
 - ISO2788 ⇒ for monolingual thesauri
 - ISO5964 ⇒ for multilingual thesauri



- A thesaurus is characterized as follows:
 - (a) mutual relation of terms and their notations is non-ambiguously (terminological control):
 - synonyms are captured as completely as possible
 - homonyms und polysems are indicated particularly
 - for each term a preferred notation is determined that acts as a non-ambiguous proxy
 - (b) named representation of associative relationships between terms



■ Fundamental concepts:

Antonyms: terms with opposite meaning

Synonyms: different terms with the same meaning

Homonyms: equal terms with different meaning

Polysems: equally spelled terms with different meaning and pronunciation

Documentation language: Set of phrases to describe documents applied according to specific rules for the purpose of storage and retrieval

Descriptor: preferred notation permitted to be used for indexing

Non-descriptor: notation not permitted to be used for indexing (and marked accordingly) to support the search for descriptors

Vocabulary: set of descriptors in a documentation language



Pre-coordination: descriptors that represent combinations of notations permitted

Post-coordination: representation of combinations of notations by multiple descriptors which are combined for retrieval



■ Types of relationships:

1 Hierarchy relation \Rightarrow generalization/specialization between two terms

1 Abstraction (generic relation): inferior term has the same set of attributes as the superior term, plus at least one *specifying* attribute

\Rightarrow the concept represented by the superior term has less attributes (content definition)

\Rightarrow the coverage of the concept represented by the superior term is greater, i. e., it comprises more objects (scale definition)

2 Partitive relation: superior (broader) term represents the whole subject, inferior (narrower) term refers to a part of the subject



2 Equivalence relation: terms refer to the same concept, i. e., they have equal meaning:

- different spelling
- (quasi) synonyms
- abbreviations
- translations



- 3** Associative relation: important relation that is neither hierarchical nor equivalent, and facilitates indexing and/or retrieval
- Relation between determination term and specifying term, e. g. pet – pet food
 - Logical equivalence, i. e., terms have the same superior concept or common properties, e. g. diesel engine – petrol engine
 - spatial or ontological co-subordination, i. e., concepts are part of the same superior concept, e. g. Hessen – Rheinland-Pfalz
 - Antonyms, terms represent the opposite with respect to the concept expressed, e. g. heat – cold
 - Succession relation, one term succeeds the other chronologically, e. g. father – son



- Affinity, i. e., terms that belong to different categories are connected via a functional or causal relation, e. g. book – reading
- ...



- Support the search for adequate notations for the purpose of indexing
- Support the retrieval of documents by enriching the original query using synonyms, inferior terms, etc.
- Special types of thesauri:
 - Dictionaries
 - ⇒ consist of the vocabulary of an entire (natural) language
 - Linguistical thesauri or or dictionary of synonyms
 - ⇒ lexically/semantically organized reference book in which terms with similar or equal meaning are connected



Catalogue

- Directory of objects built according to a specific principle of order (alphabetical, indexed terms, etc.)
- Provide an overview of collections of objects (books, paintings, etc.)
- Web portals
- *Data Dictionary*
- ...

