

KT 2002, Knowledge Topics for Newcomers:

# Introduction to Topic Maps

**Dr. H. Holger Rath**

Director Research & Development

empolis GmbH

holger.rath@empolis.com – <http://www.empolis.com>

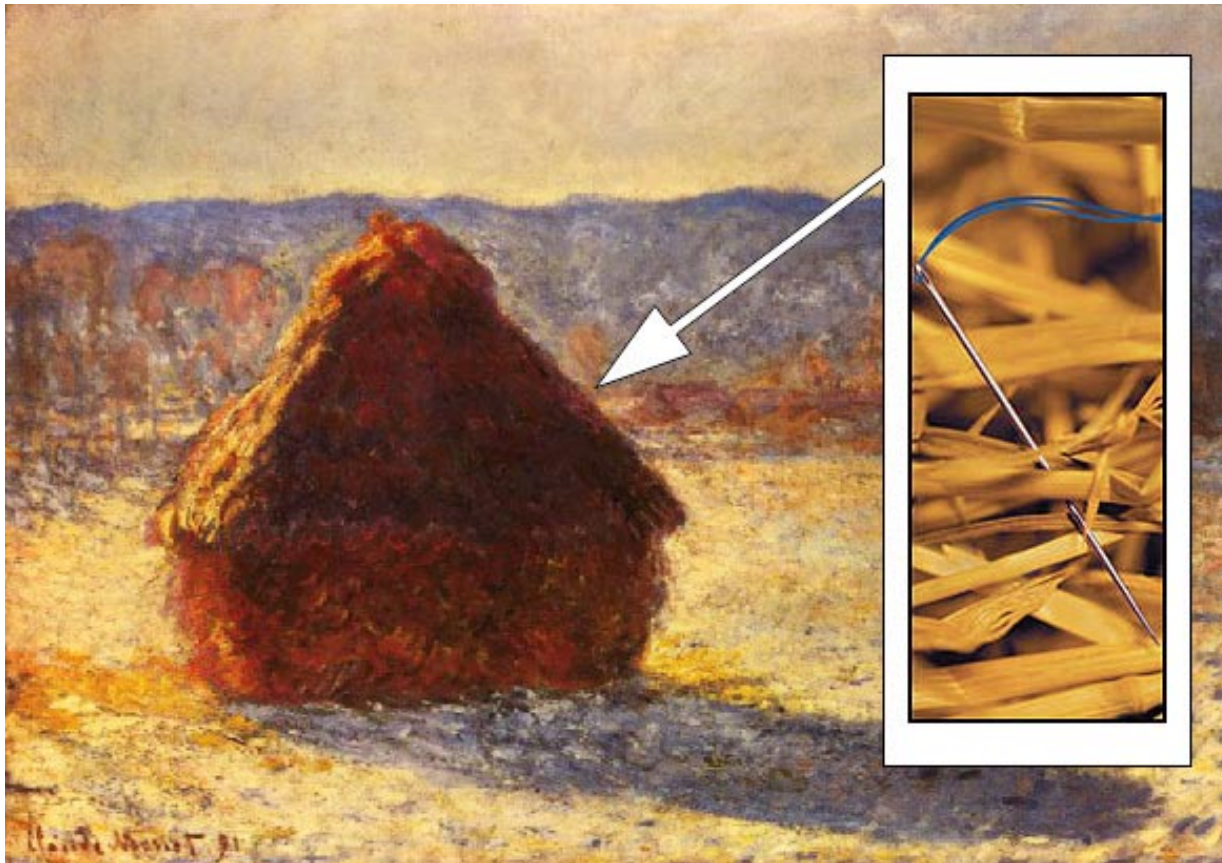


# Why do we need Topic Maps?

Some arguments ...



# Manage the Info Glut



# Sounds challenging ... But what are Topic Maps?

An overview ...



## Topic Maps are ...

- Standardized: ISO/IEC 13250:2000
  - ISO standard published Jan. 2000
  - enabling standard to describe knowledge structures, electronic indices, classification schemes, ...
- Web enabled:
  - XML Topic Maps (XTM) are ready to use
- Designed to:
  - manage the info glut
  - build valuable information networks above any kind of resources / data objects
  - enable the structuring of unstructured information



# OK, Topic Maps seemed to be needed ... But how do they work?

A first example ...



## Back-of-the-Book Index “British Virgin Islands”

Gorda Sound	<i>see</i> North Sound	
Little Dix Bay	.....	89
North Sound	.....	90
Road Harbour	<i>see also</i> Road Town ...	73
Road Town	.....	69, <b>71</b>
Spanish Town	.....	81, <b>82</b>
<i>Tortola</i>	.....	67
<i>Virgin Gorda</i>	.....	77



# Back-of-the-Book Index “British Virgin Islands”

Gorda Sound	<i>see</i> North Sound	
Little Dix Bay	.....	89
North Sound	.....	90
Road Harbour	<i>see also</i> Road Town	... 73
Road Town	.....	69, <b>71</b>
Spanish Town	.....	81, <b>82</b>
<i>Tortola</i>	.....	67
<i>Virgin Gorda</i>	.....	77

**Topics**



## Back-of-the-Book Index “British Virgin Islands”

Gorda Sound	<i>see</i> North Sound	
Little Dix Bay	.....	89
North Sound	.....	90
Road Harbour	<i>see also</i> Road Town	73
Road Town	.....	69, 71
Spanish Town	.....	81, 82
<i>Tortola</i>	.....	67
<i>Virgin Gorda</i>	.....	77

**Occurrences**



# Back-of-the-Book Index “British Virgin Islands”

Gorda Sound	see North Sound	
Little Dix Bay	.....	89
North Sound	.....	90
Road Harbour	see also Road Town	... 73
Road Town	.....	69, 71
Spanish Town	.....	81, 82
Tortola	.....	67
Virgin Gorda	.....	77

Different topic classes



## Back-of-the-Book Index “British Virgin Islands”

Gorda Sound	<i>see</i> North Sound	
Little Dix Bay	.....	89
North Sound	.....	90
Road Harbour	<i>see also</i> Road Town	... 73
Road Town	.....	69, 71
Spanish Town	.....	81, 82
<i>Tortola</i>	.....	67
<i>Virgin Gorda</i>	.....	77

**Different occurrences classes**



## Back-of-the-Book Index “British Virgin Islands”

Gorda Sound <i>see</i> North Sound	
Little Dix Bay .....	89
North Sound .....	90
Road Harbour <i>see also</i> Road Town ...	73
Road Town .....	69, 71
Spanish Town .....	81, 82
<i>Tortola</i> .....	67
<i>Virgin Gorda</i> .....	77

**Multiple topic names**



## Back-of-the-Book Index “British Virgin Islands”

Gorda Sound	<i>see</i> North Sound	
Little Dix Bay	.....	89
North Sound	.....	90
Road Harbour	<i>see also</i> Road Town	73
Road Town	.....	69, 71
Spanish Town	.....	81, 82
<i>Tortola</i>	.....	67
<i>Virgin Gorda</i>	.....	77

**Association**

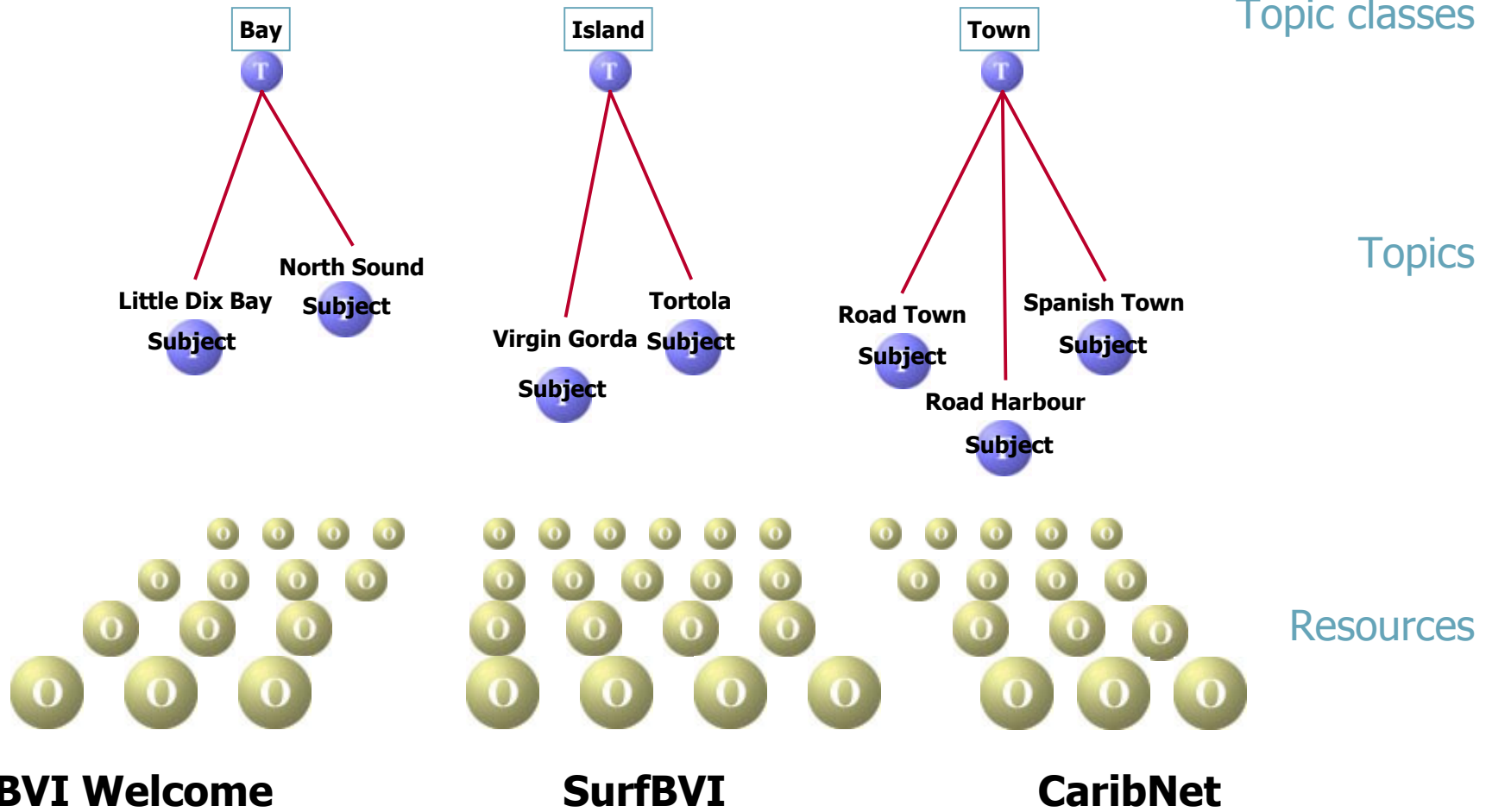


# The Topic Map building blocks

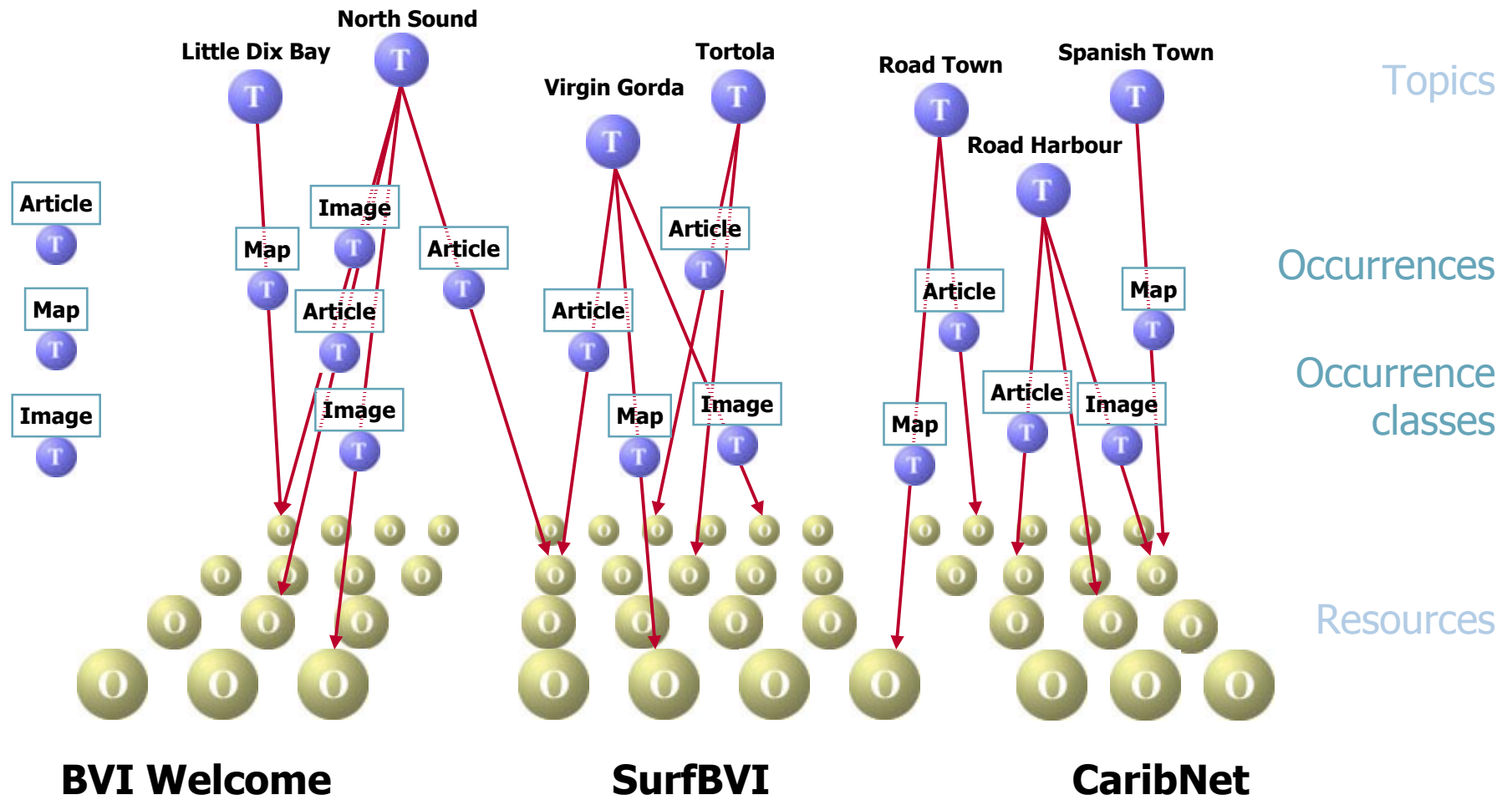
**Topic, occurrences,  
associations, classes**



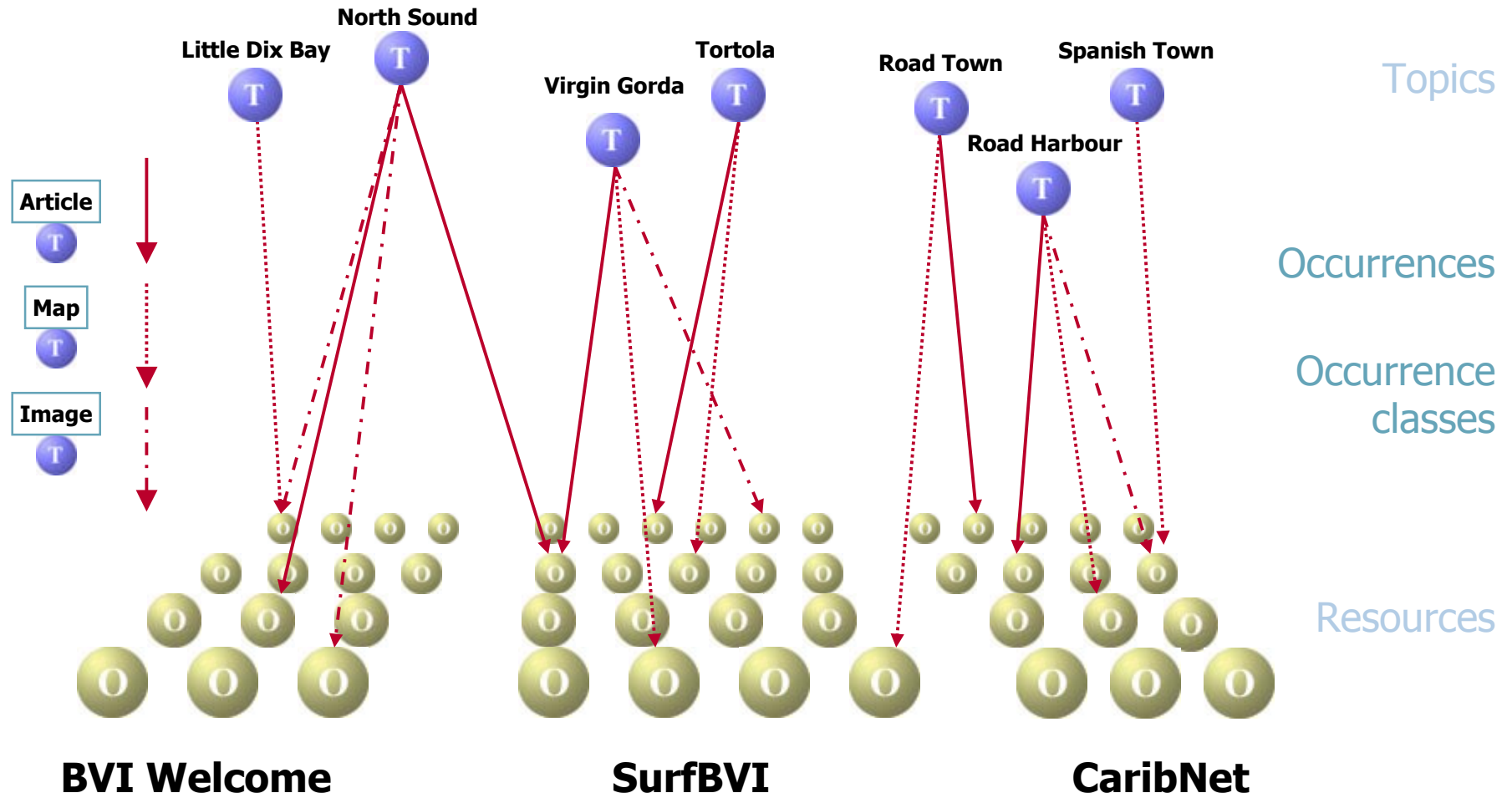
# Topics



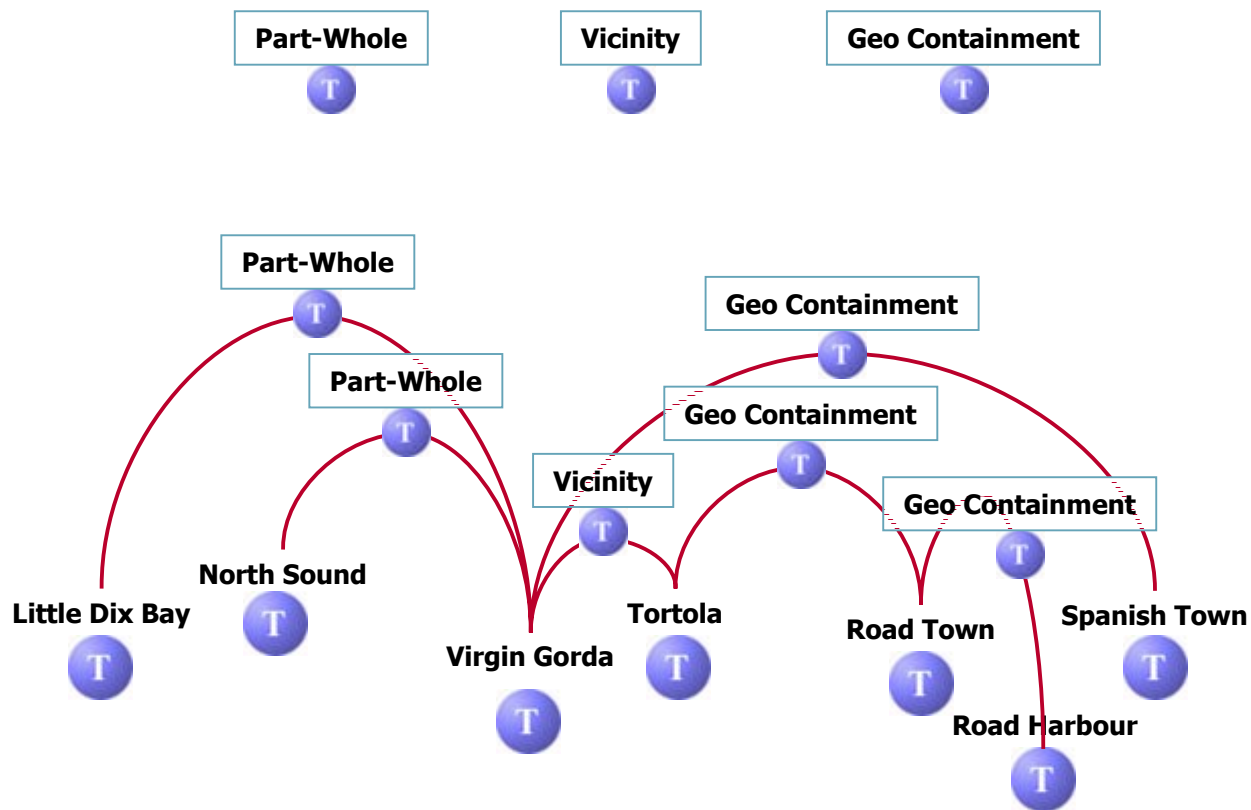
# Occurrences



# Occurrences



# Associations



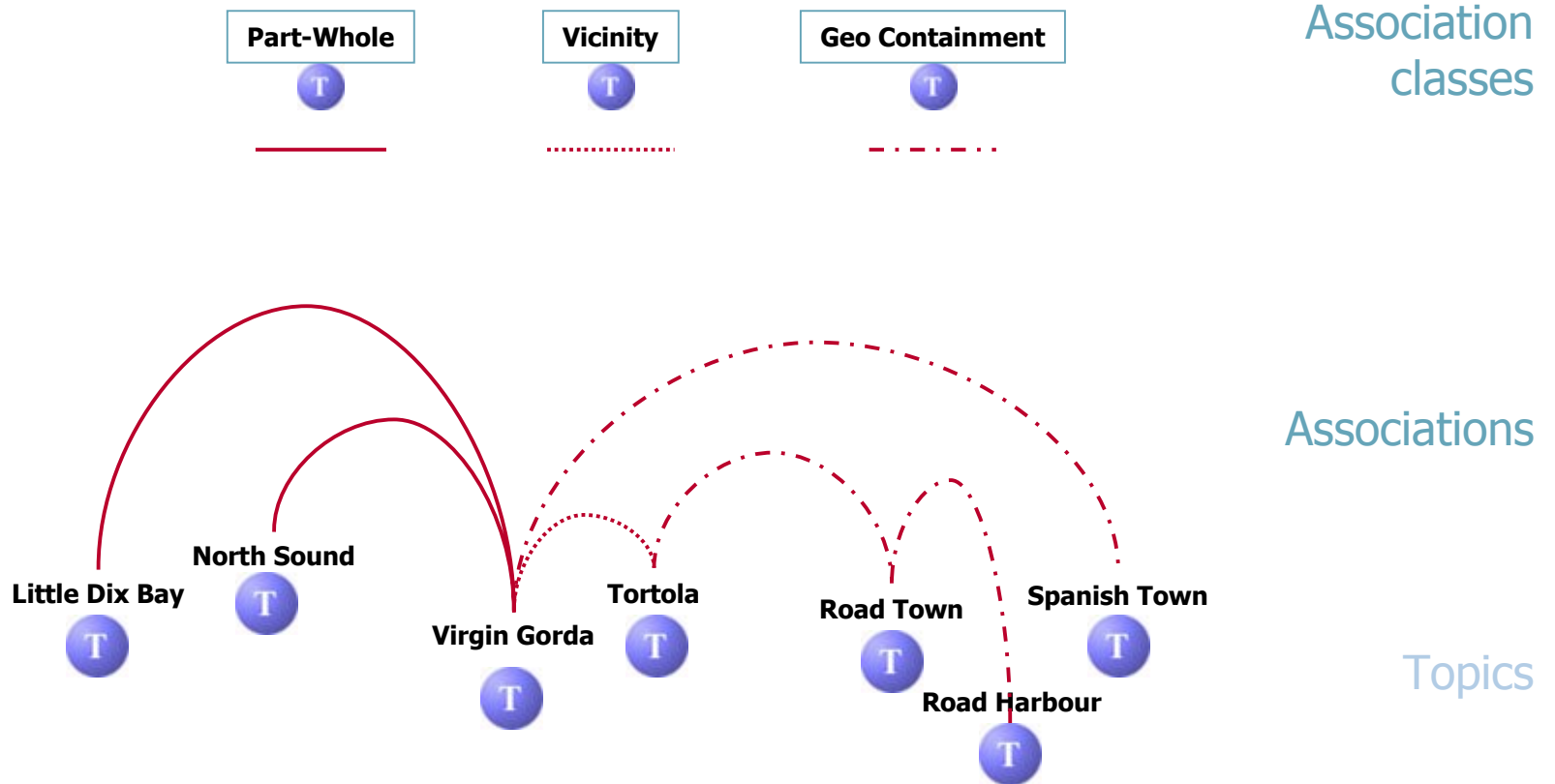
Association  
classes

Associations

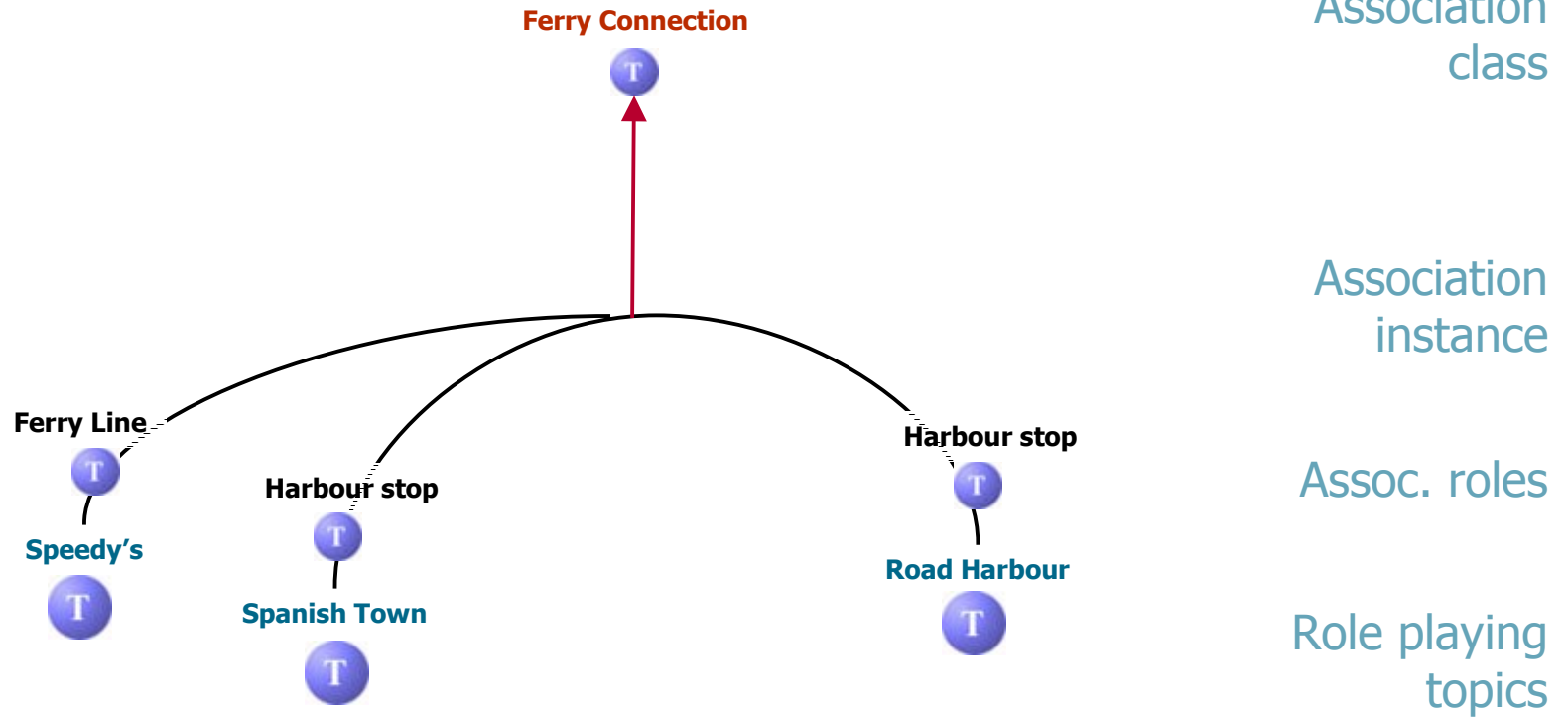
Topics



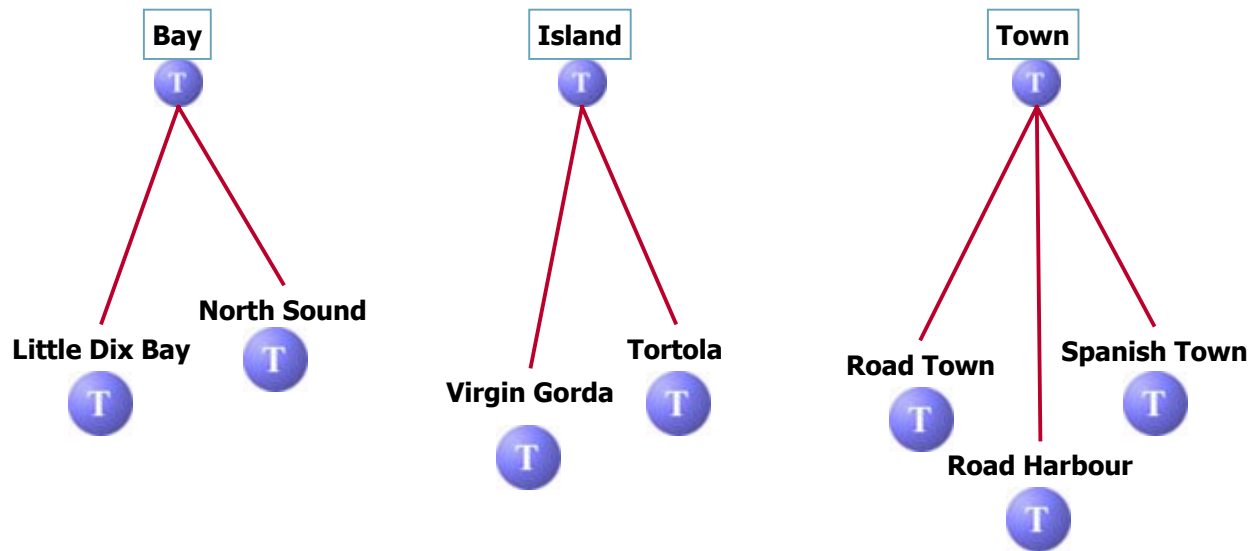
# Associations



# Associations cont'd



# Class Hierarchies (Taxonomy)

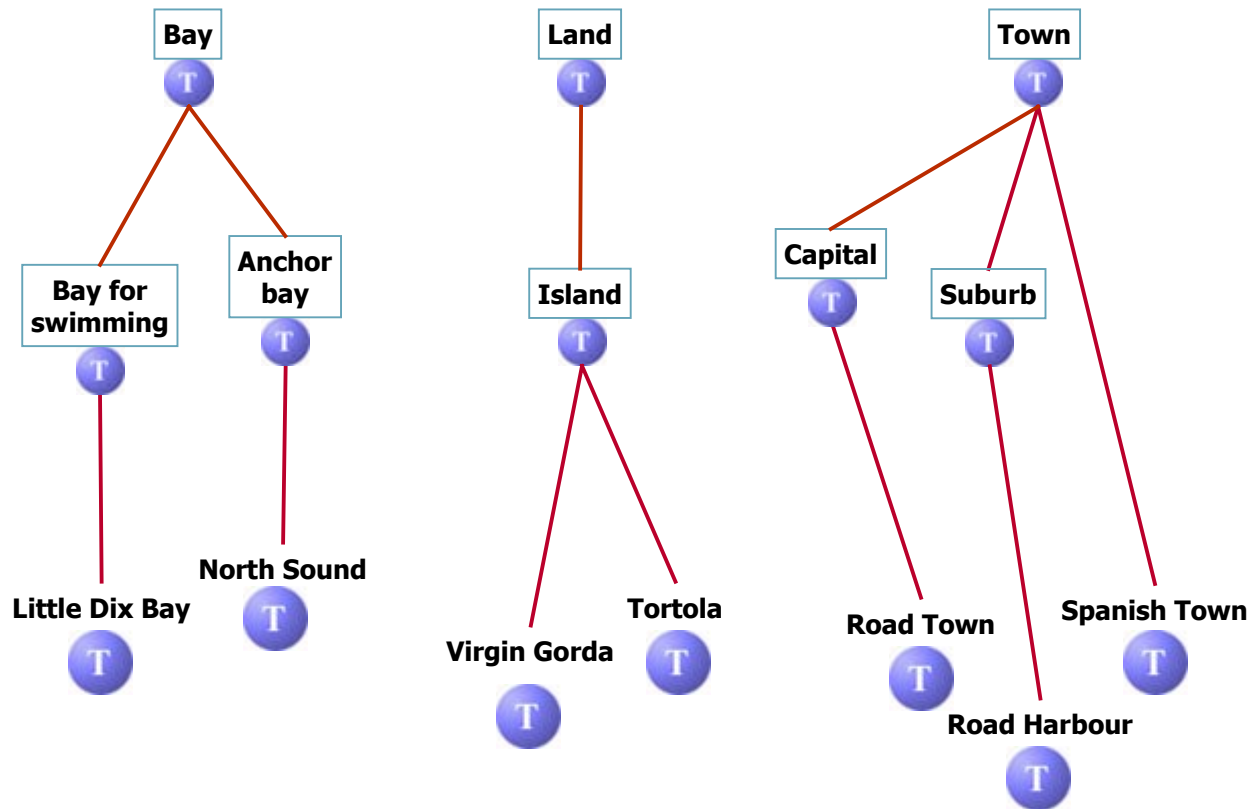


Topic classes

Topics



# Class Hierarchies (Taxonomy)



Super-classes

Sub-classes

Topics



# Information in context

## Scopes

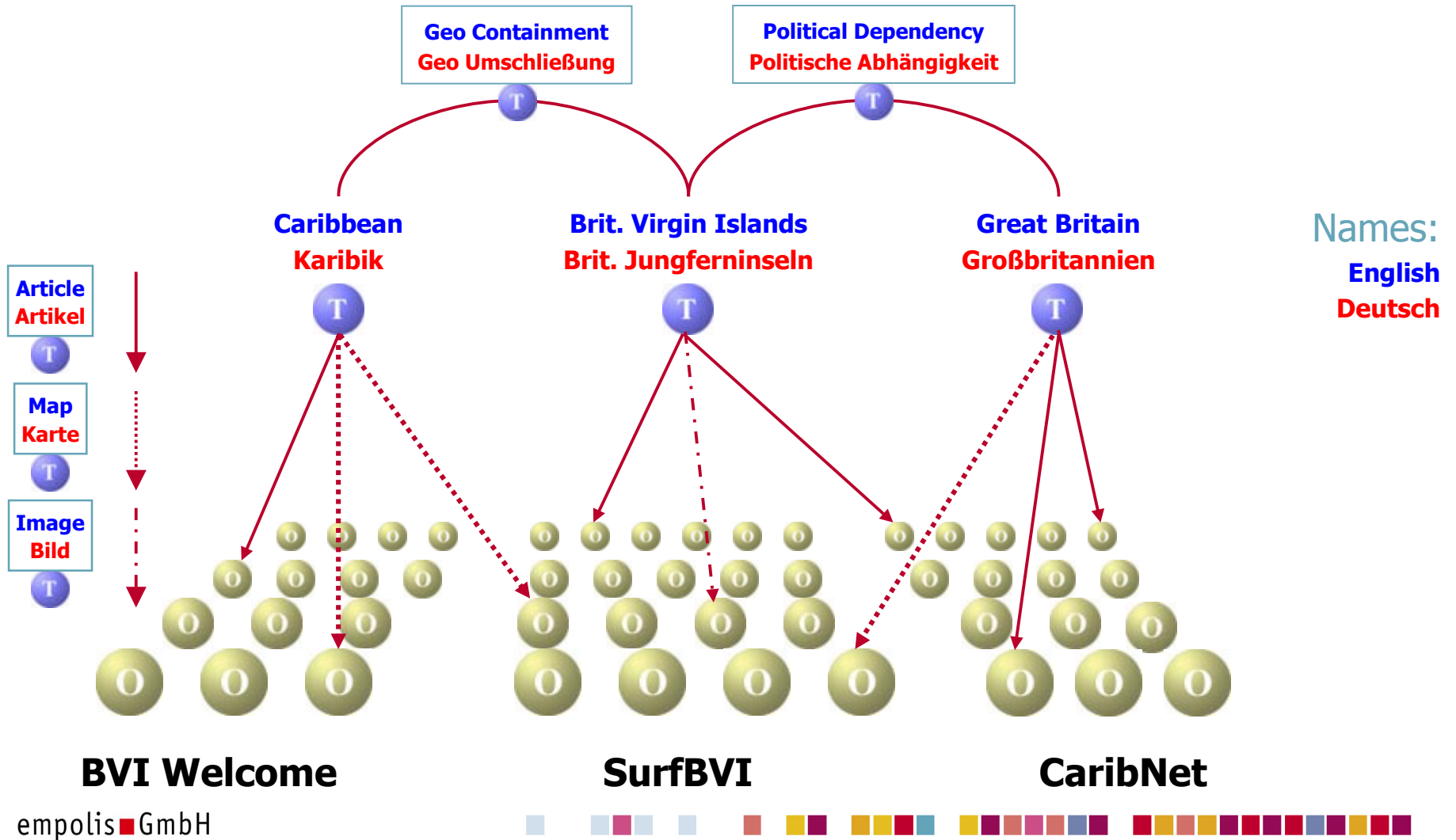






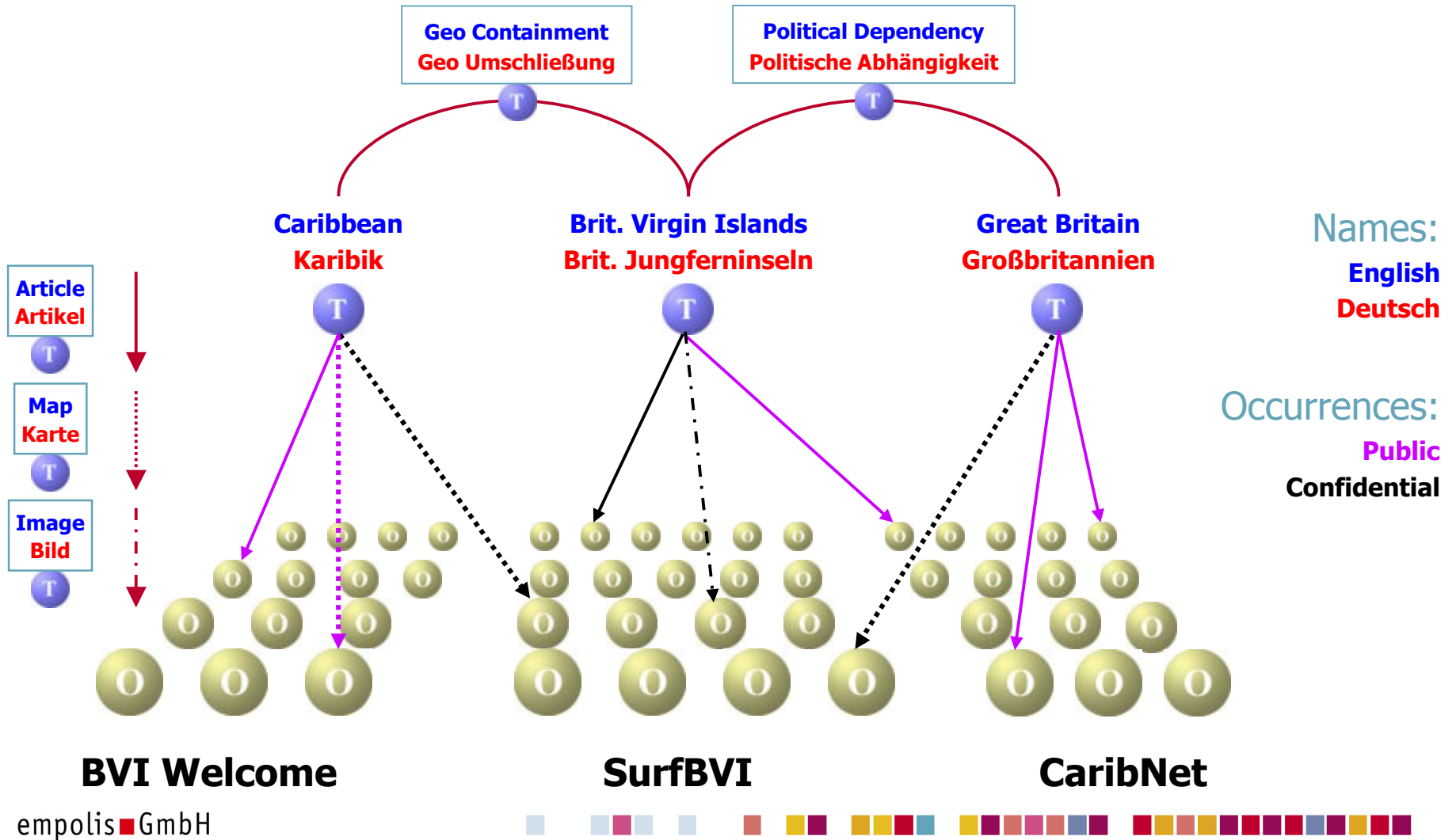
# Scopes

Scopes



# Scopes

Scopes



# Scopes

Scopes

Associations:

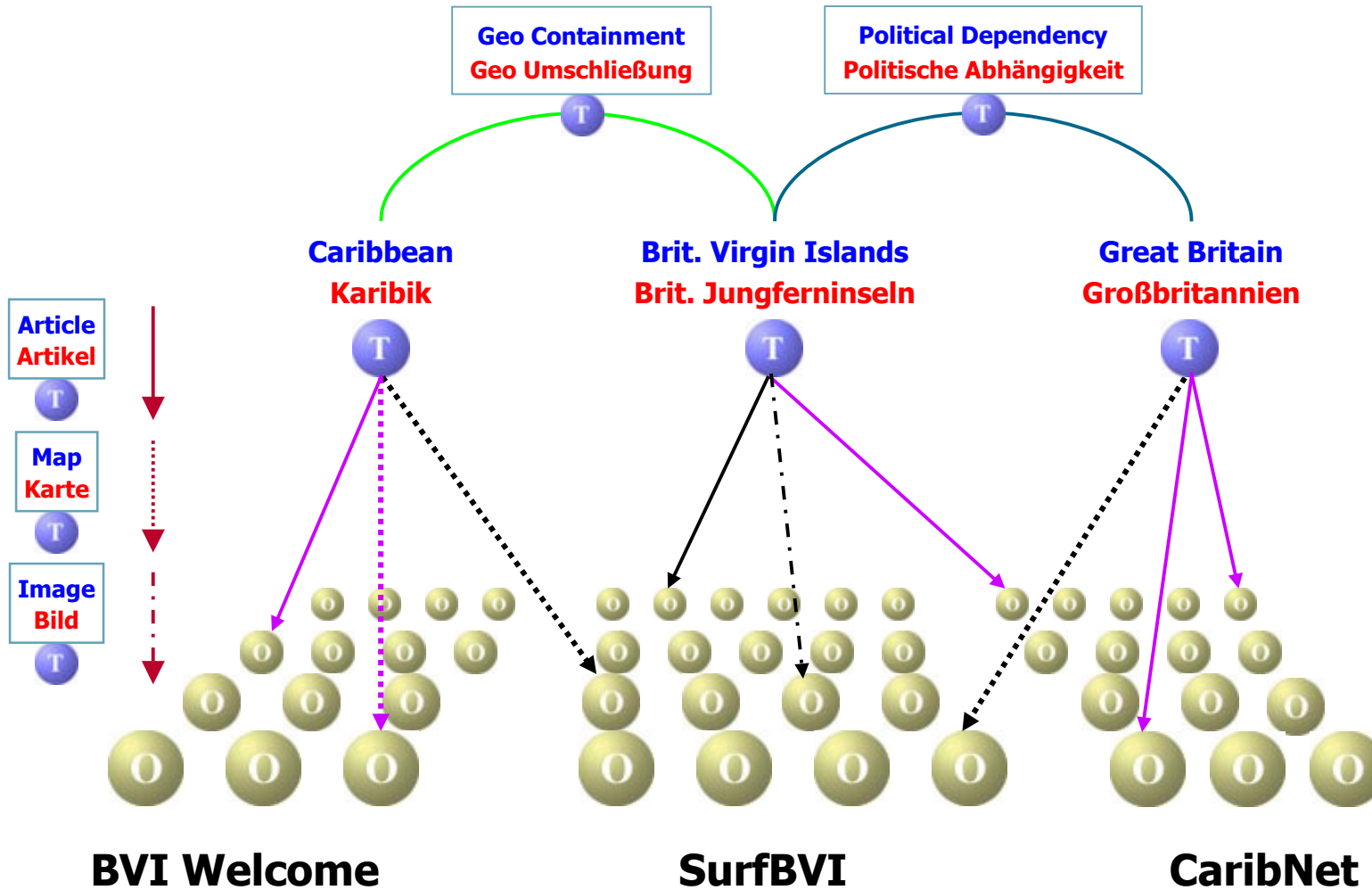
Geography  
Politics

Names:

English  
Deutsch

Occurrences:

Public  
Confidential



# Scope Examples: English, Public, Politics

Scopes

Associations:

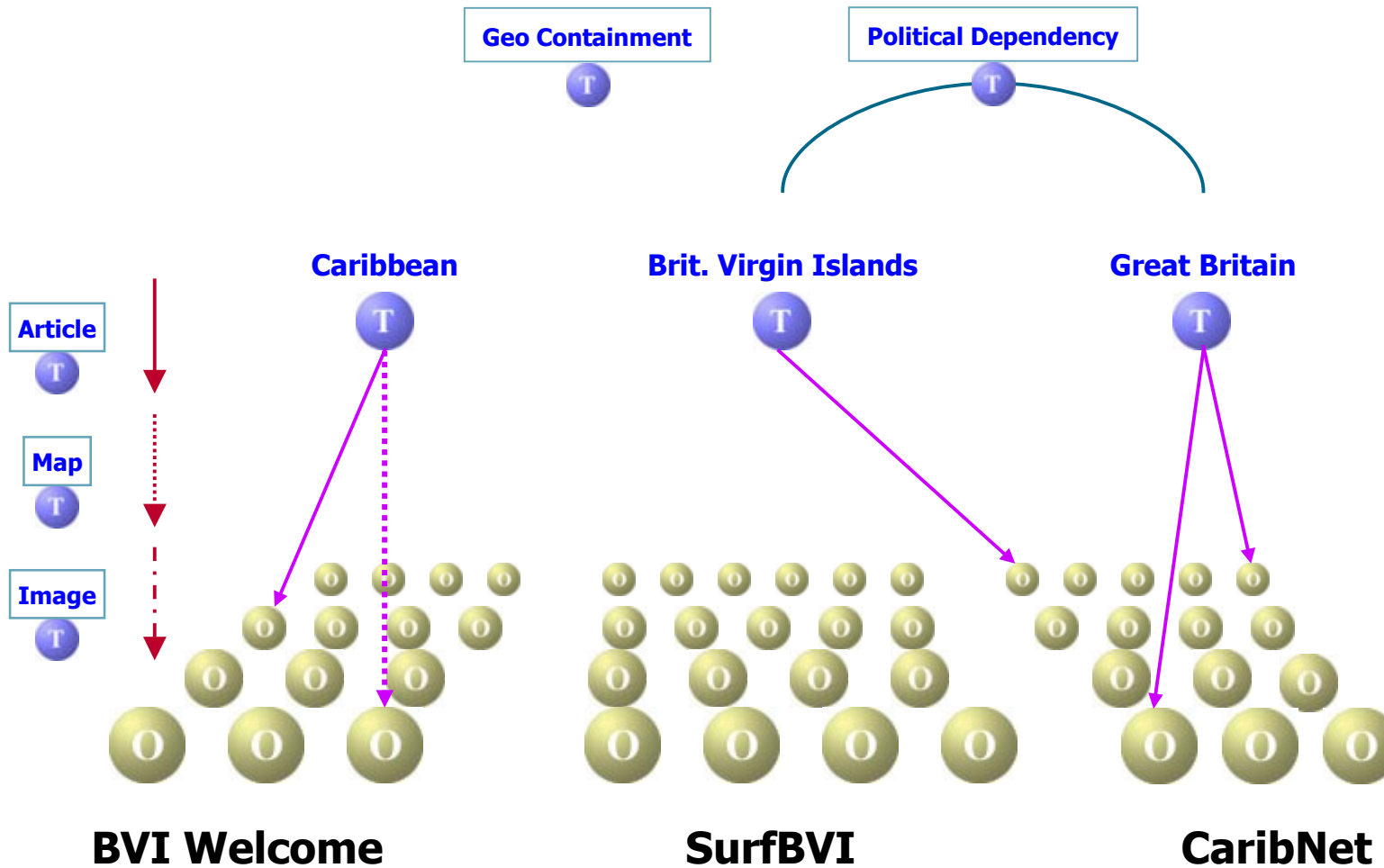
Geography  
Politics

Names:

English  
Deutsch

Occurrences:

Public  
Confidential



# Knowing where we talk about

## Addressable and Non-Addressable Subjects



## Addressable & Non-Addressable Subjects

### ■ Addressable subject

- if subject itself is a resource in the computer – e.g., it has an URI
- example: the web site “<http://bviwelcome.com>”

### ■ Non-addressable subject

- if subject exists outside the bounds of the computer
- example: the British Virgin Islands



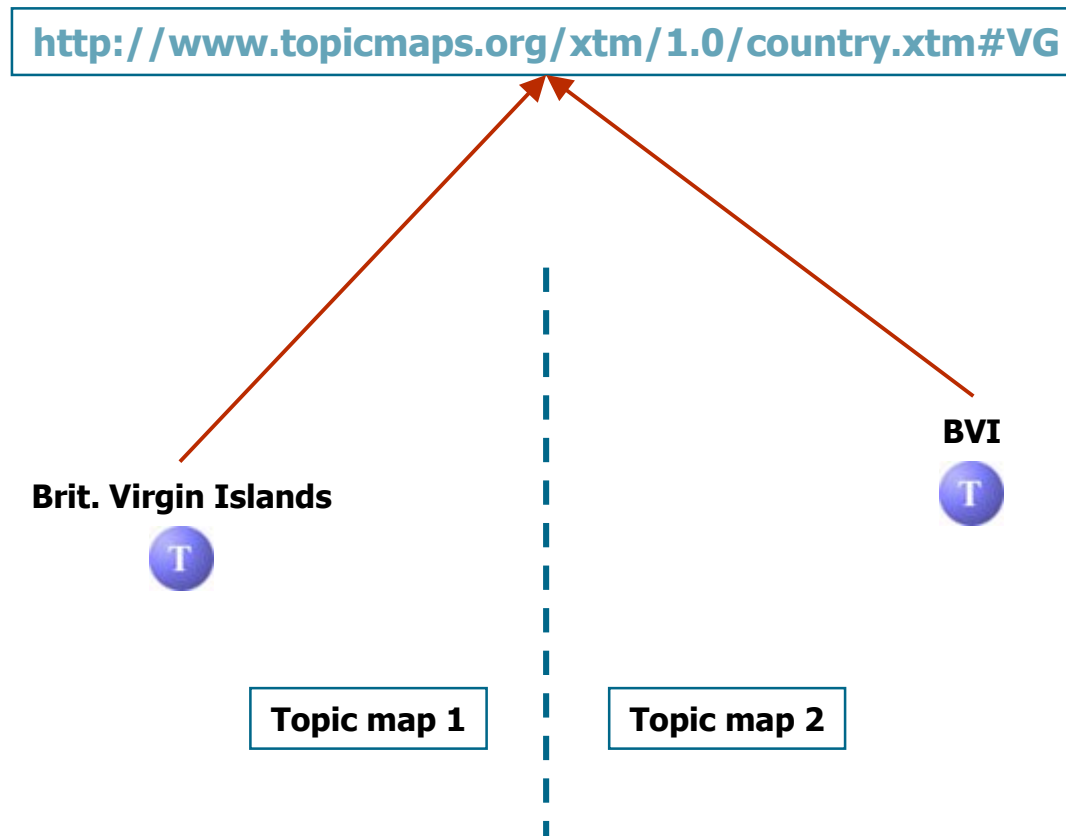


# Bringing things together

**Identity, Topic Naming Constraint,  
Merging, Reification**



# Identity of a Topic



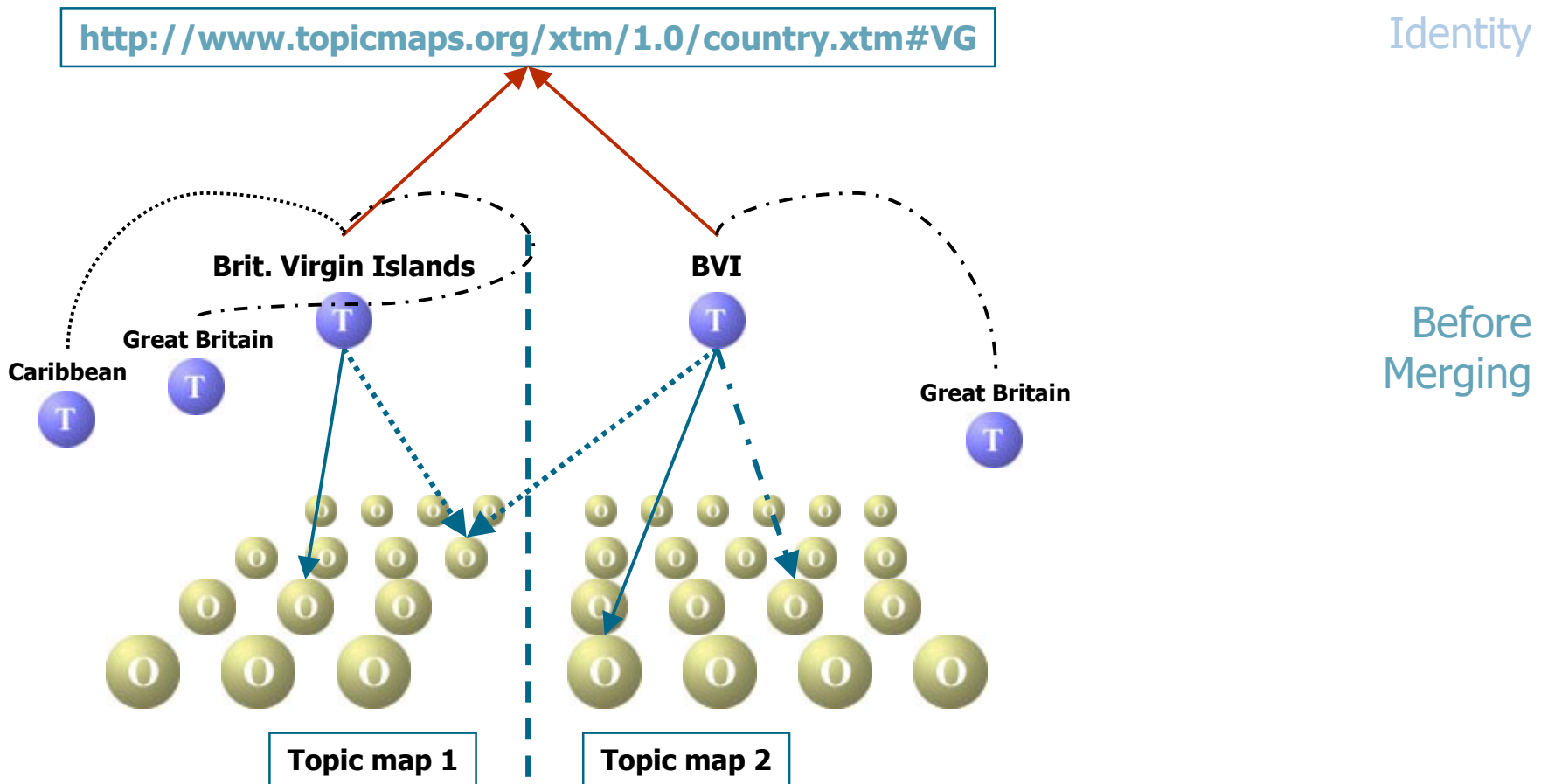
Identity established by Resource Reference or Subject Indicator

## Topic Naming Constraint (TNC)

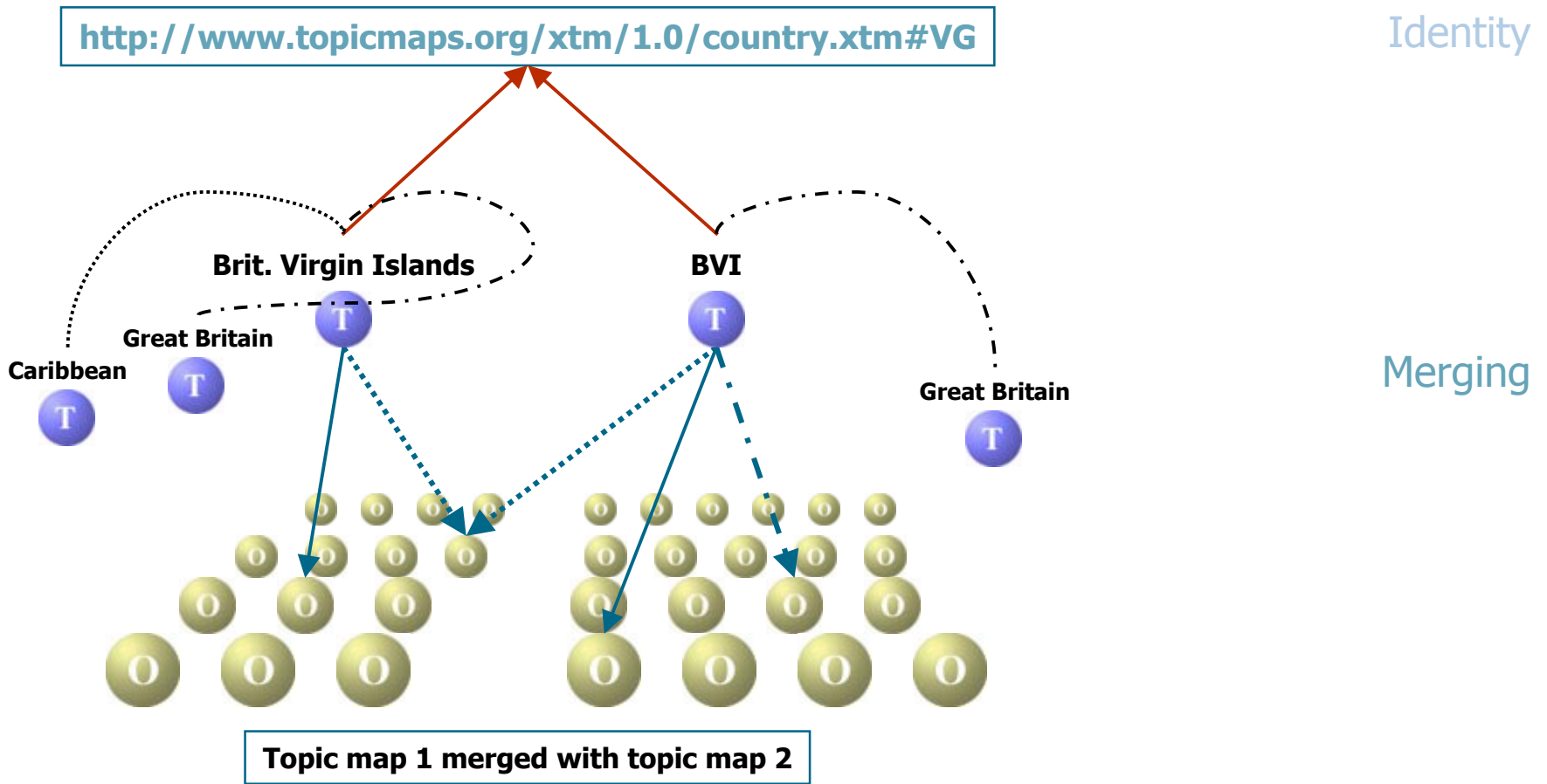
- Topics with the same name **in the same scope** are to be seen as the same topic by the processing software
- Controversial, because of danger of merging even if the topics are not about the same subject
  - they just have accidentally the same name



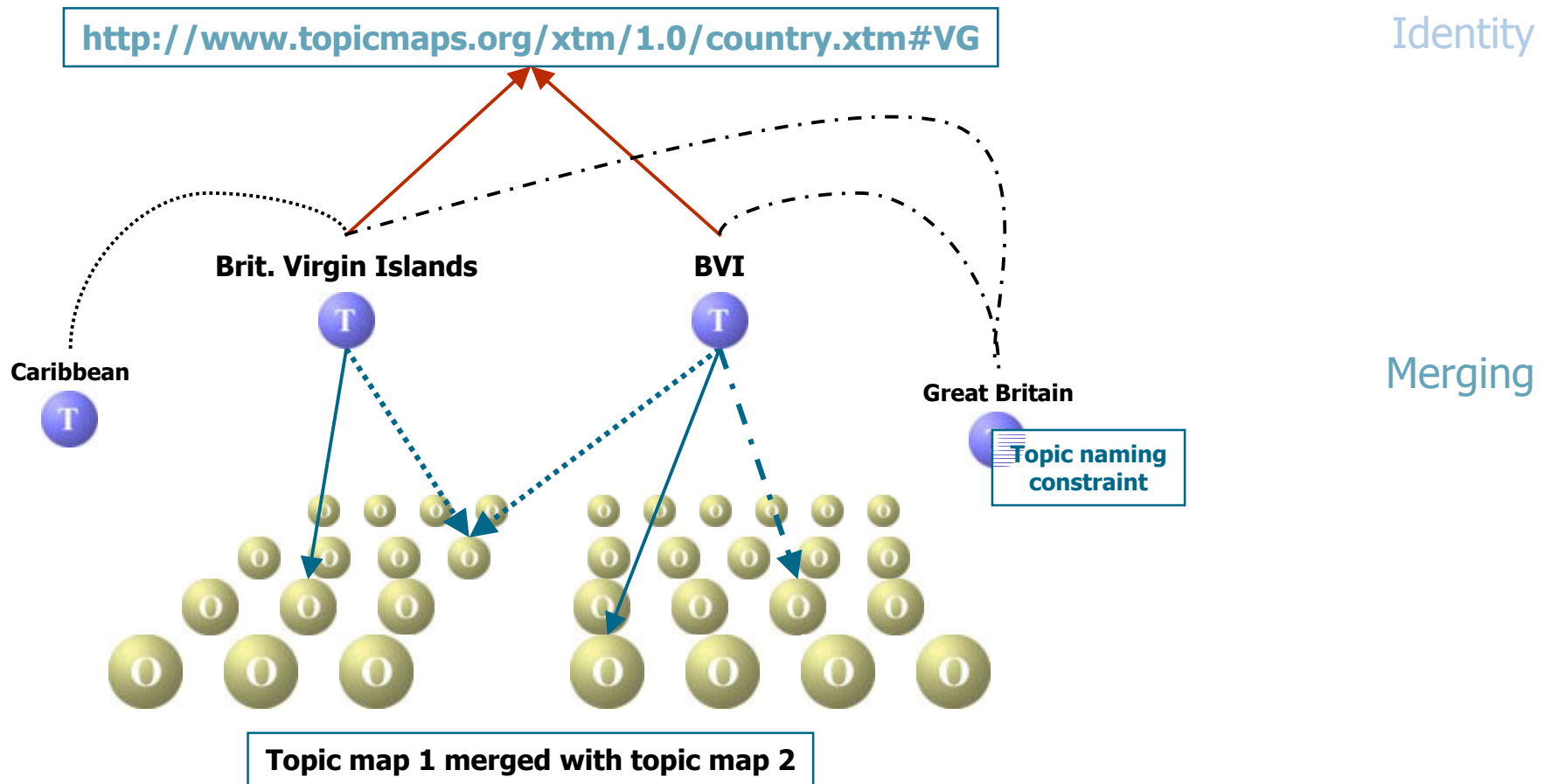
# Merging



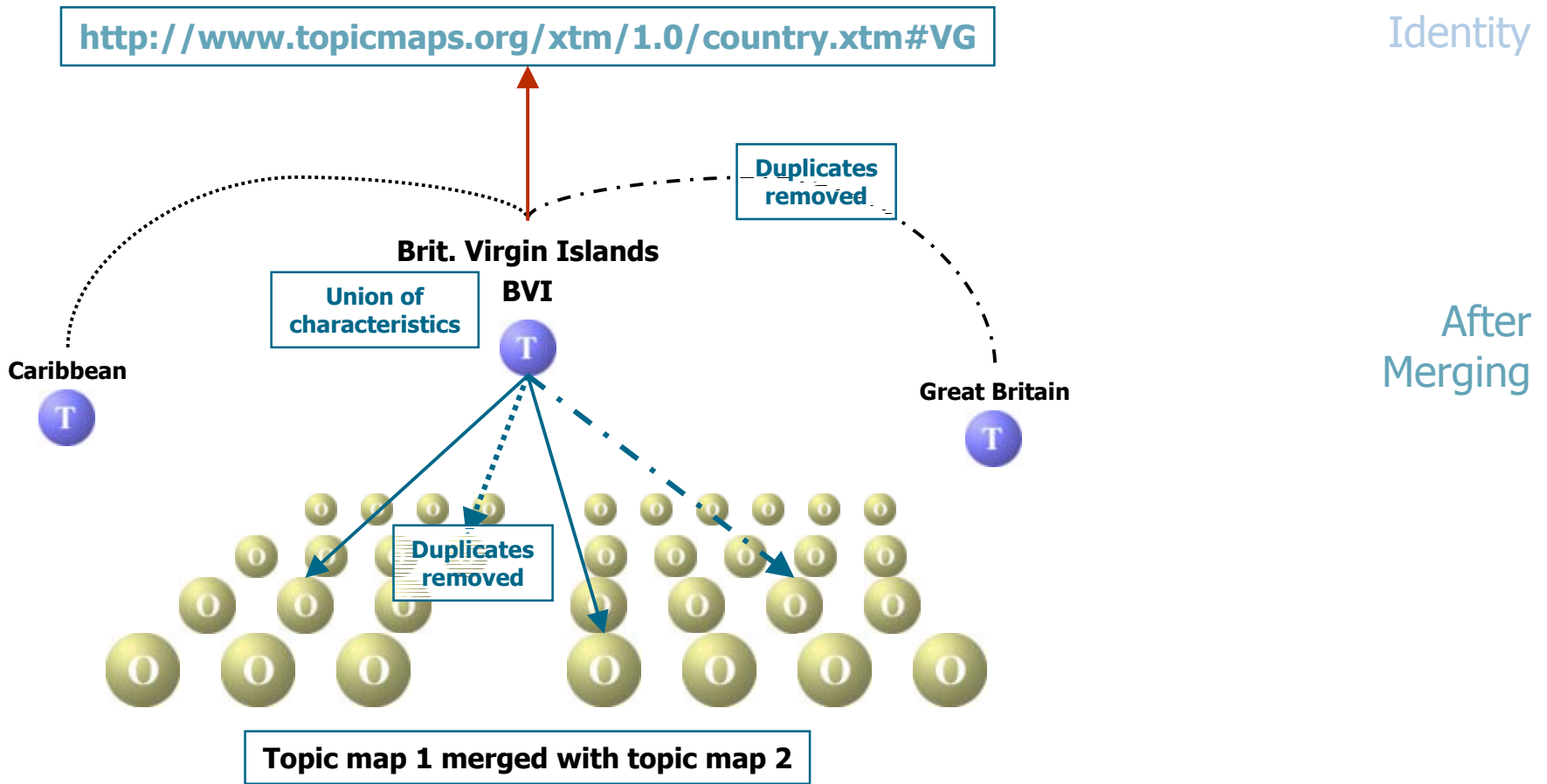
# Merging



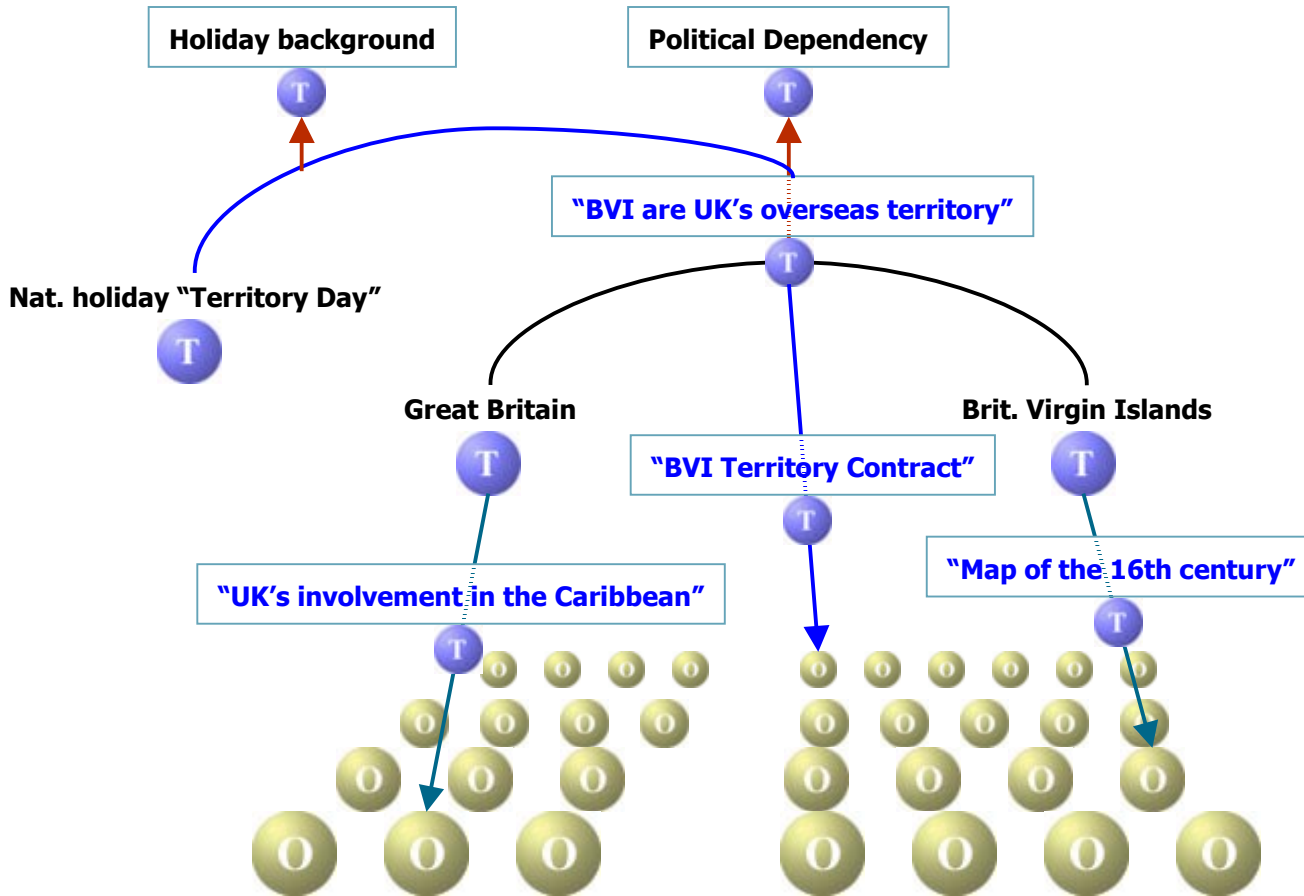
# Merging



# Merging



# Reification



Associated associations

Association names

Association occurrences

Occurrence names



## Summary: Topic Map Concepts

- Topic, occurrence, association
- Classes for topics occurrences, and associations
- Class-instance, super-subclass associations
- Scope and scoping topic
- Addressable and non-addressable subjects
- Identity and subject indicator
- Merging
- Reification

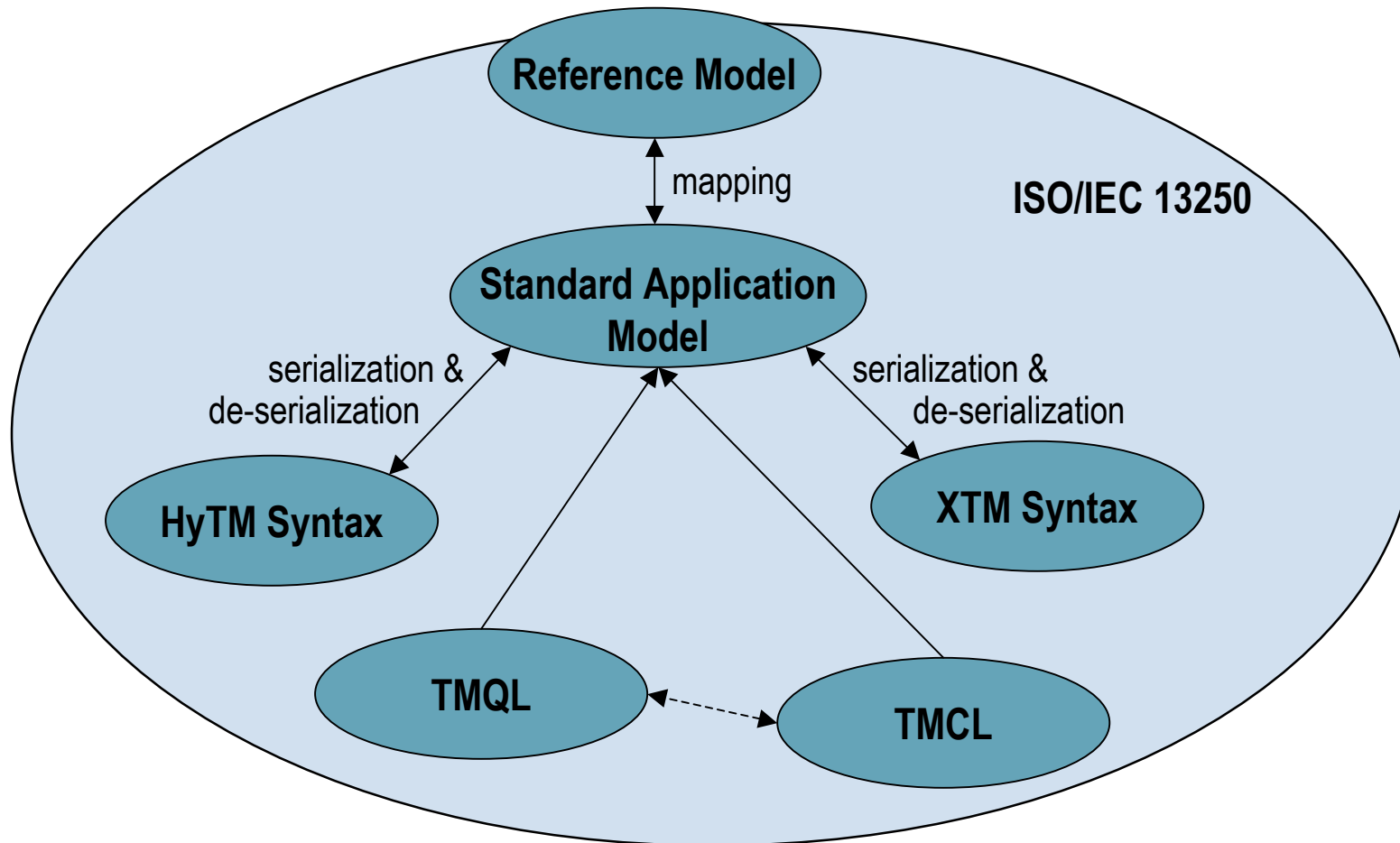


# The Family of Topic Map Standards

**ISO/IEC 13250, Reference Model,  
Standard Application Model,  
TMQL, TMCL**



# Family of TM Standards



## Family of TM Standards cont'd

- ISO/IEC 13250:2000
  - ISO standard defining general concepts and interchange syntax (HyTM = SGML/HyTime, XTM = XML/Xlink)
- Reference Model (RM)
  - ISO project
  - foundation of the TM paradigm
  - independent of any particular (storage/interchange) syntax
- Standard Application Model (SAM)
  - ISO project
  - info-set-based TM model for implementers on top of RM
  - mapping to HyTM and XTM interchange syntax



## Family of TM Standards cont'd

- TMQL – TM Query Language
  - ISO project
  - ‘SQL’ for TMs
  - Standardized creation/modification of TMs stored in TM Management Systems
- TMCL – TM Constraint Language
  - ISO project
  - Framework for the definition of ontologies / schemas for vertical or domain specific applications
  - Support for semantic validation



# Topic Maps and Related W3C Standards

**XML, XLink, RDF**



## Topic Maps and XML

- XML is format to exchange TMs between software tools
- XML **is not** the internal data structure of TM tools but the ASCII serialization of a complex knowledge network
- Resources could be of **any** notation / format; they just have to be addressable
- If resources are XML occurrences can easily point into the resources



## Topic Maps and XLink

- XLink is format to exchange the links in TMs
- TMs can point to resources which are addressable by XLink
- TMs organize link networks like XML structures data





## Topic Maps and RDF cont'd

- TM / RDF – Similarities
  - Structured, complex metadata
  - Based on graphs
  - Knowledge representation, ontologies
  - Help power the Semantic Web idea
  - TMs on top of RDF ↔ RDF on top of TMs



## Topic Maps and RDF cont'd

### ■ TM / RDF – Differences

TM	RDF
topic-centric	resource-centric
pre-defined semantics	simple data structure
<i>n</i> -ary associations with role players (instead of direction)	directed binary relations
distinguishes between addressable and non-addressable subjects	–
merging	–



# Some TM application scenarios, please

Here they are ...



## Typical Topical Applications

- Subject classification
  - Connecting resources with a classification scheme
- Knowledge representation
  - Model domain knowledge in a topic map explicitly
- Publishing knowledge networks
  - Selling added-value (e.g., commentaries, rich metadata)
- Search engines
  - Intelligent 'find' technologies



# Who is using TMs?

## Some real-world projects



## Who is Using TMs?

- Publishers
  - encyclopedia
  - legal
  - eLearning
  - media, news
- Web portal provider
  - site organization principle
- Industry
  - intelligent call center, knowledge gateway
  - corporate memory
  - next generation content management



**</End>**

**Thank You!**

**Any Questions?**



# Transforming Information into Value



BERTELSMANN MOHN MEDIA GROUP

