

Creating a Topic Map-driven Learning Portal

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Contents

1. Trans-field Structure
↑ Inter-linked Topic hierarchies
2. Making “association” to interlink various fields.
3. Topic map exploration and page design.
4. Mashup and linked topic maps.

An online learning system: “Everyday Physics on Web” supported by Knowledge Synergy Inc. Naito-san.

- The aim of portal is to interlink a variety of knowledge domains.

Physics, Chemistry, Biology, Earth Science, Astronomy, Environment, Sustainability, Industry, Aritifact, Daily Life, Policy, History of Science,,,

- The target is informal learning and self-learning in the future web learning environment.

- Topic Maps application server: **Ontopia Navigator Framework** at <http://tm.u-gakugei.ac.jp:8080/epw/>
Thanks to open-source Ontopia.

The screenshot shows the 'Everyday Physics on Web' (EPW) website. The header includes the site name and a search bar. Below the header, there is a 'Single Type Menu' on the left with a list of subjects: History of Sci. & Tech., Sustainability, Occupations, Place, Topic Types, and a 'Show Hierarchy' link. The main content area is titled 'Everyday Physics on Web (EPW)' and contains introductory text in English and Japanese. The English text explains the site's purpose and the use of Topic Maps. The Japanese text provides a similar explanation. At the bottom right, there is a diagram titled 'Taxonomy of Physics Subjects' showing a hierarchical structure of topic types and instances. The diagram includes a legend for 'Supertype-Subtype', 'Type-Instance', 'Association', and 'Occurrence'.

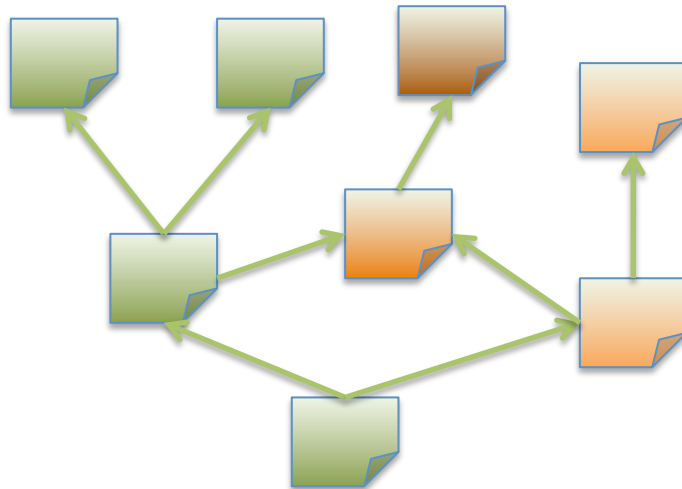
Change of our online learning application.

- up to 2006 (from 1999): "course-centric approach"



Lecture courses were constructed by linking **original materials** linearly. Facilities for preparation and review of lectures. Courses were classified by domains. Purpose of service is to increase effectiveness of lectures.

- from 2006 to 2008: "subject (relation) centric approach"



Original materials were interlinked with each other semantically. Facilities for preparation and repetitive review based on a spaced-learning method, facilities for storing personal learning records. Purpose of service is to support and evaluated diversified personal learning.

Change from Course-centric to Subject-centric

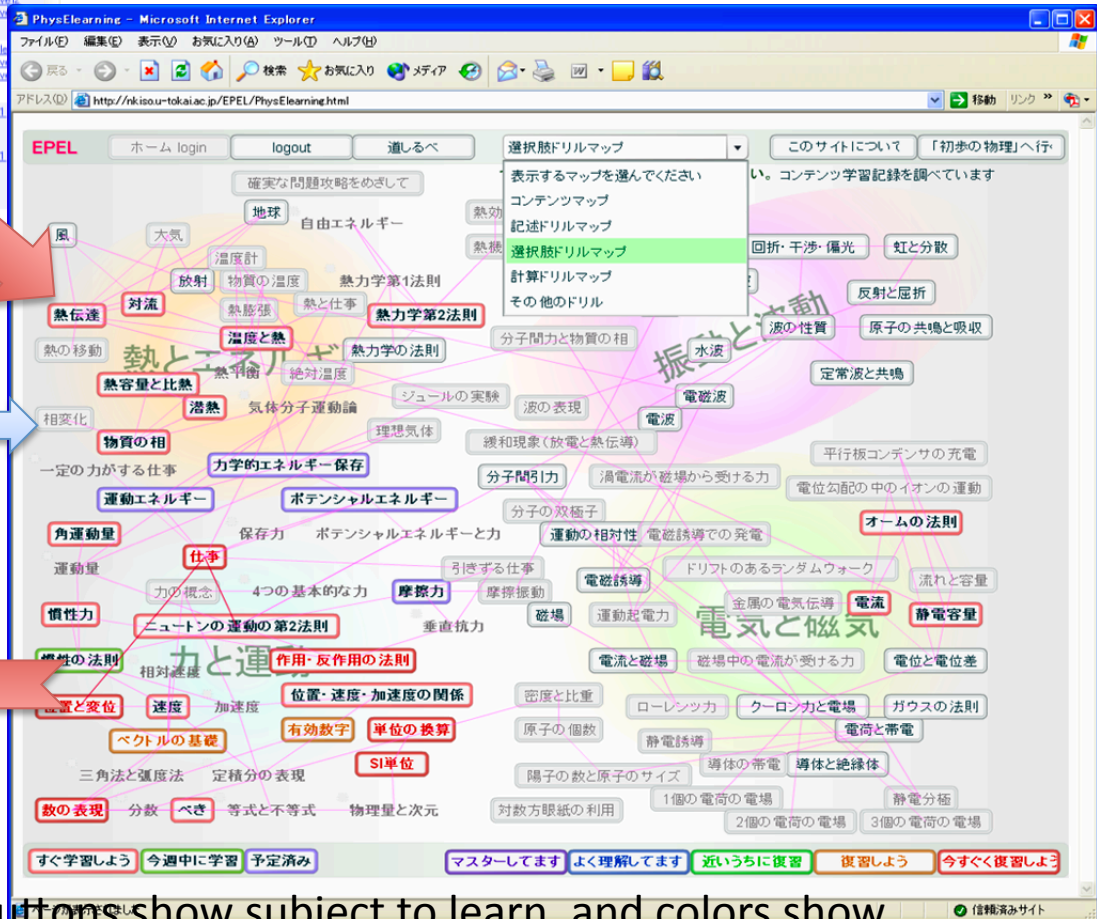
Course-centric portal for online learning (<2007)

- easy to start course learning
- fragmented knowledge
- restrict the range of learning



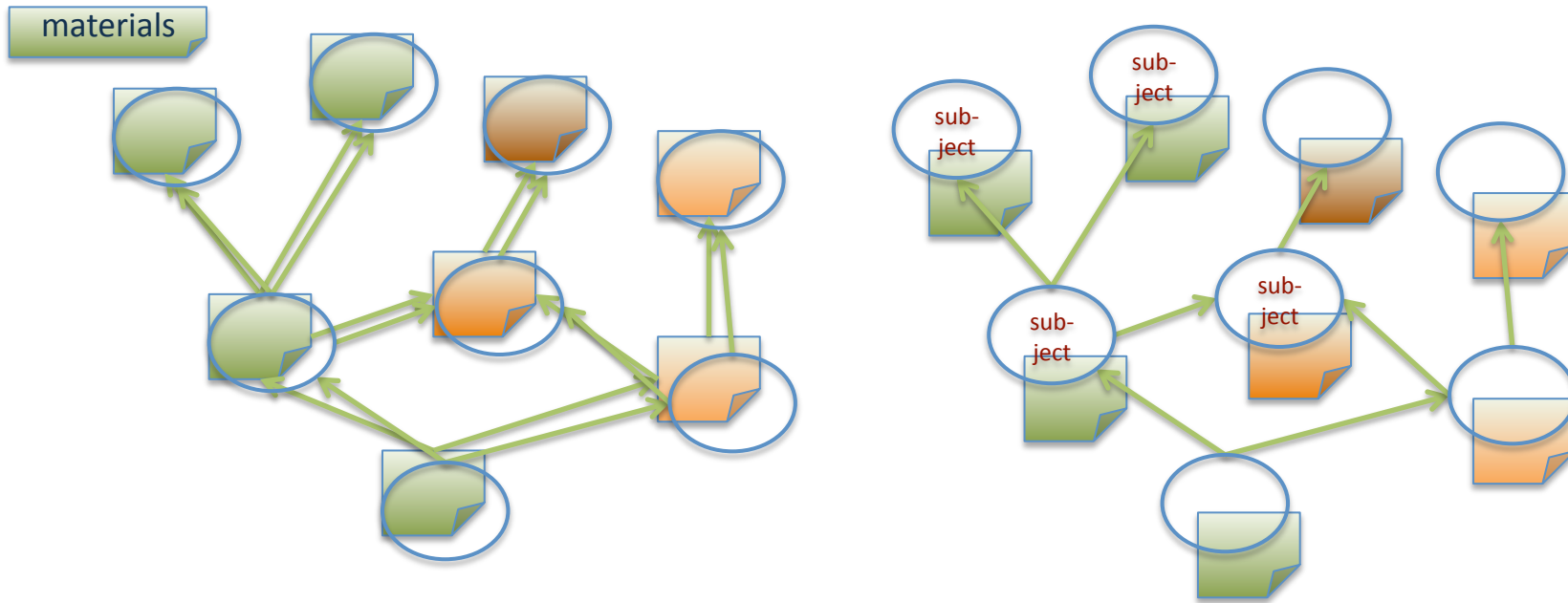
Subject-centric, association-centric portal
One can start with any topic, and recorded and evaluated

Topic map based trans-field learning portal for informal learning.

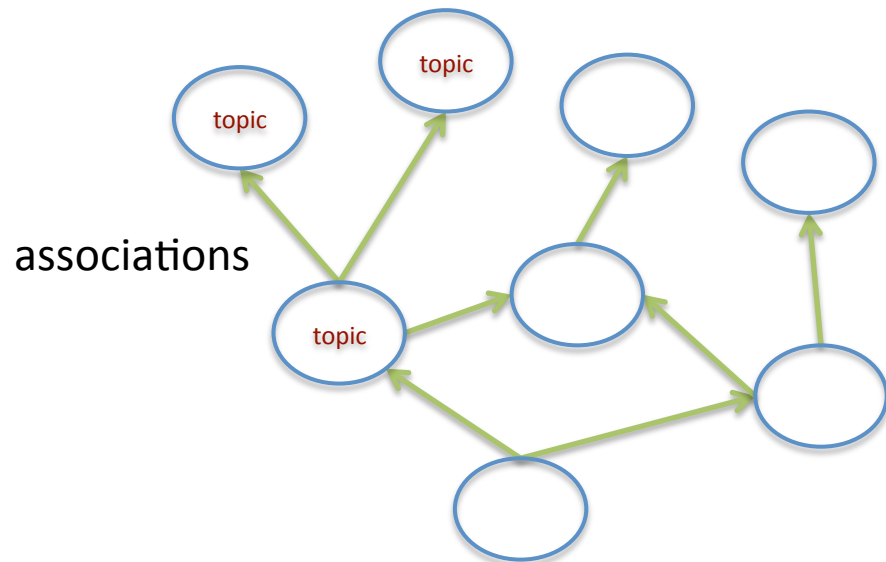


Buttons show subject to learn, and colors show recommendation of review.

Actually, it was “subject”, not the text resource, that was linked semantically. Contents were linked with topics through the occurrences.



Associations between subjects directly affect on the way to learn and understand.

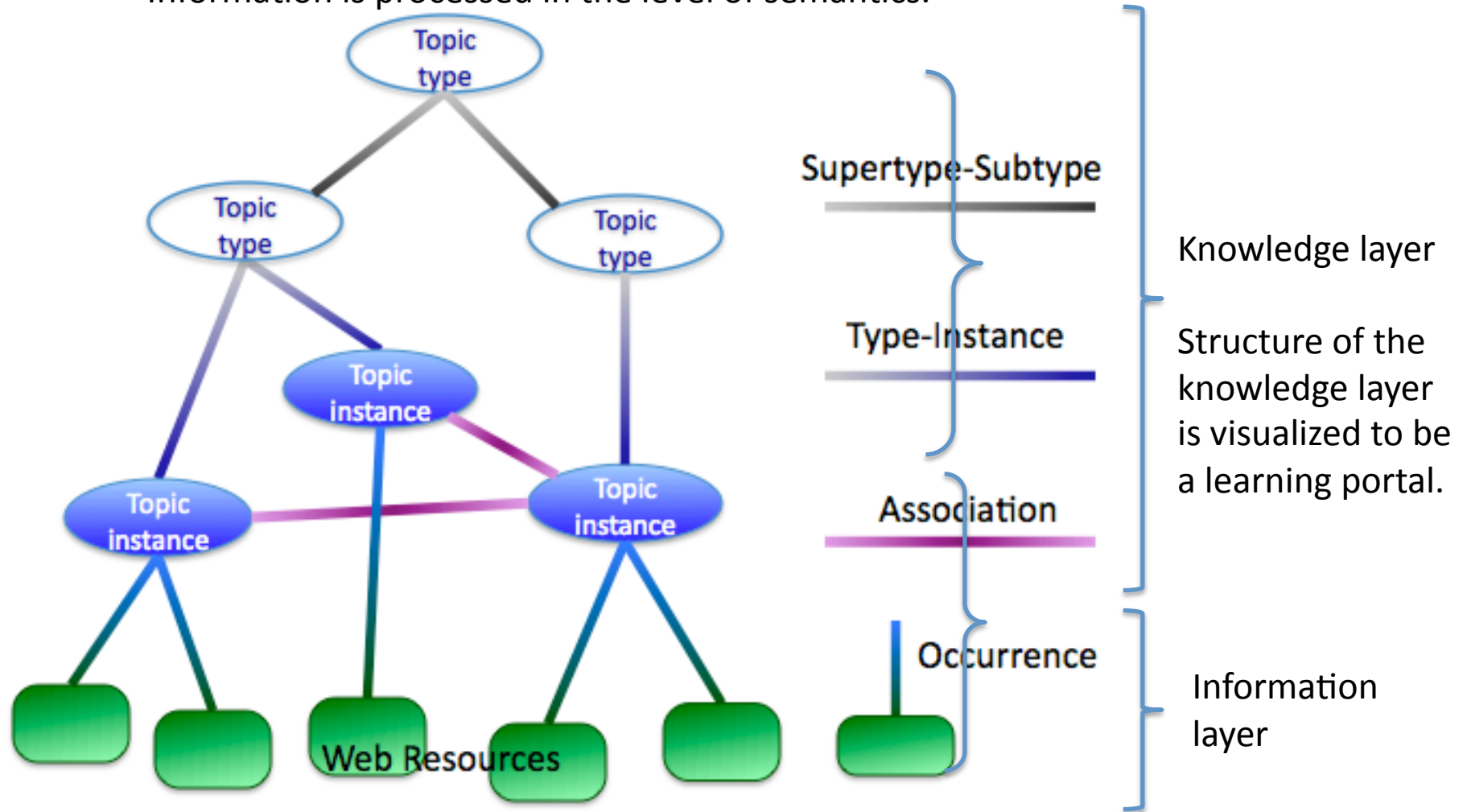


Elements of Topic Maps

(ISO/IEC 13250-3 XML construction (XTM 2.0))

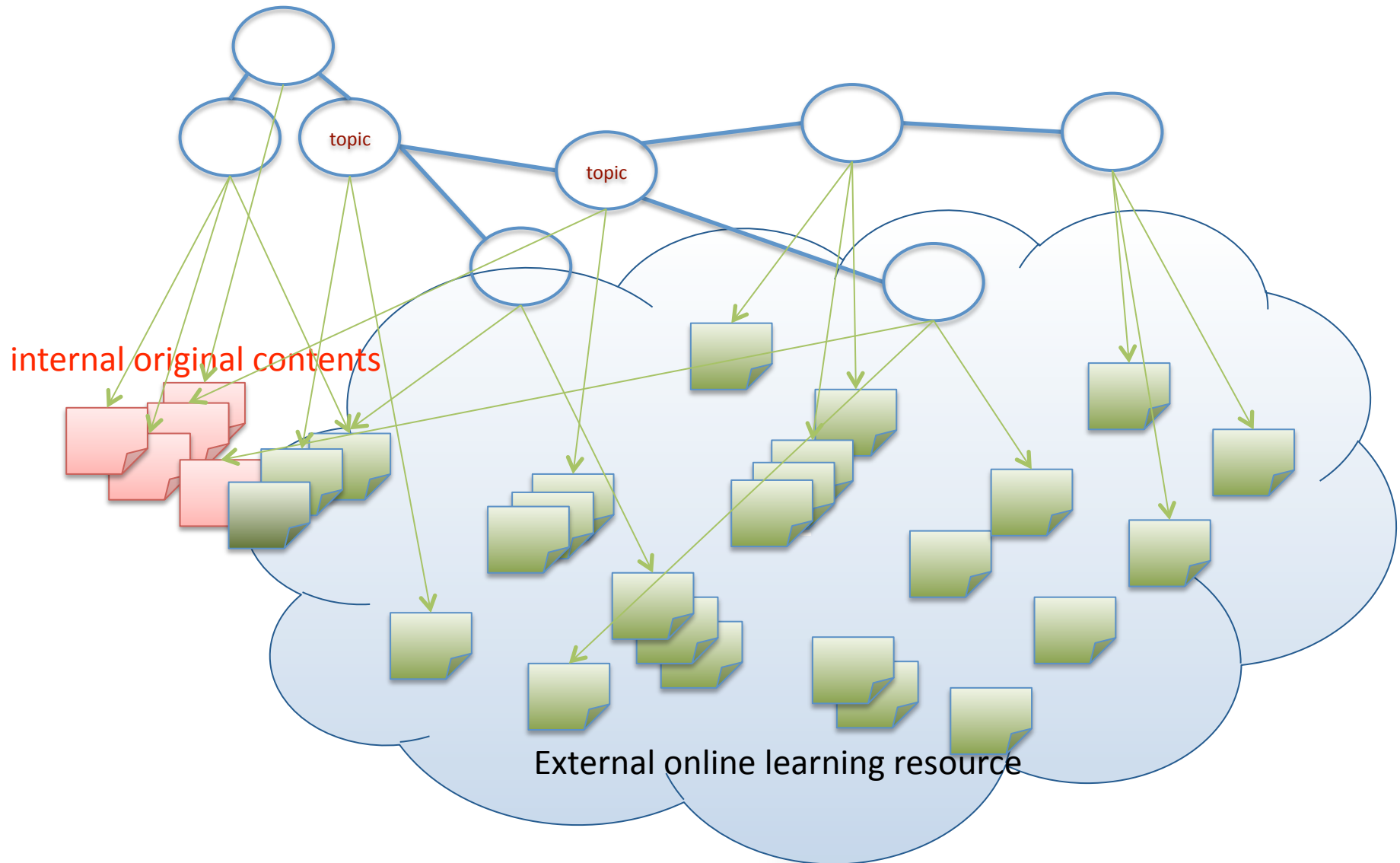
Actual resources of information is separated from their metadata.

Information is processed in the level of semantics.



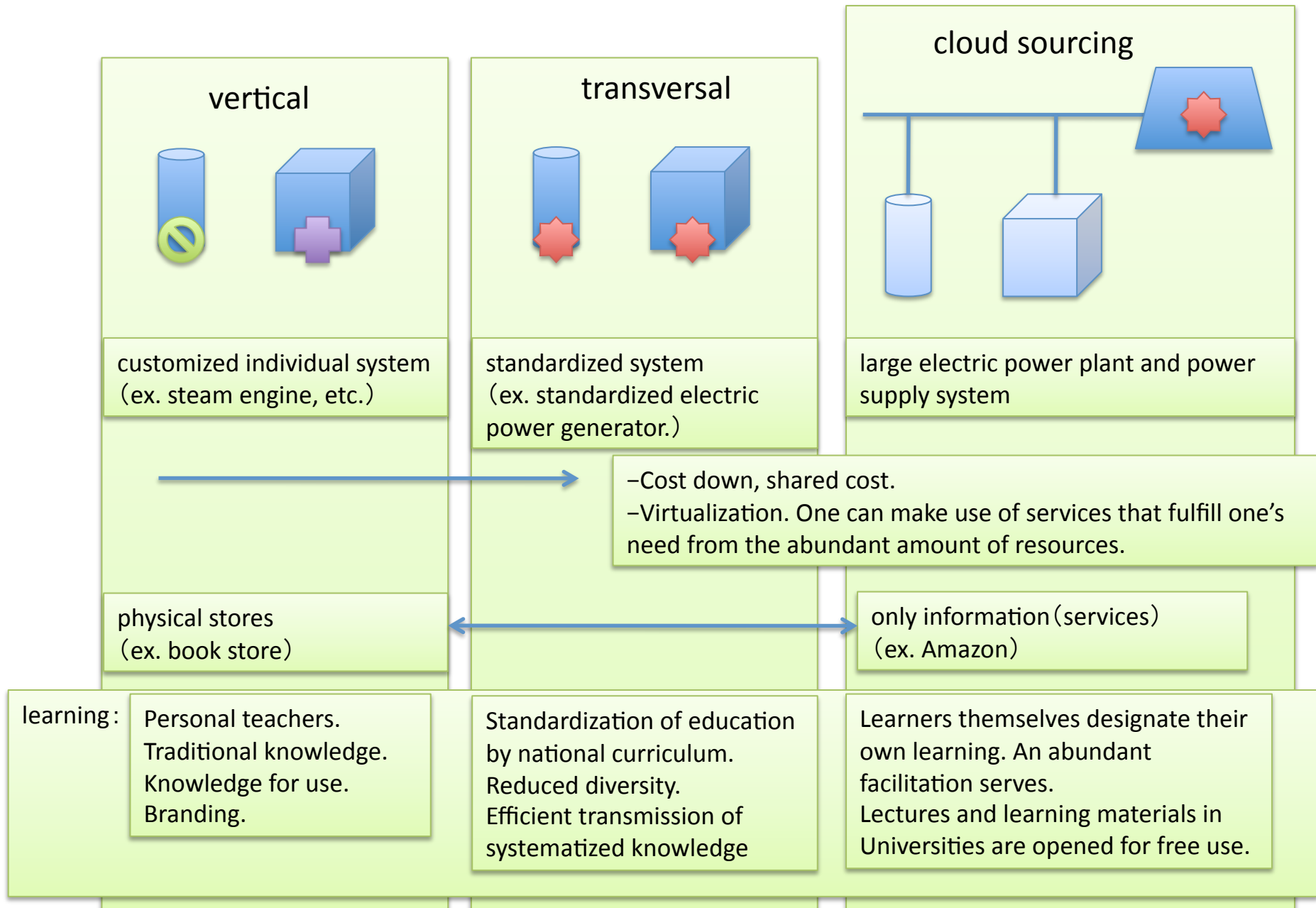
S. Pepper, "The TAO of Topic Maps –Finding the Way in the Age of Infoglut",
<http://www.ontopia.net/topicmaps/materials/tao.html>

Toward the “cloud” of learning resource



- Structure the online resource to be used easily.
- Raise the weight of “relationships” in the learning.
- Make a style of explorative learning.

Cloud



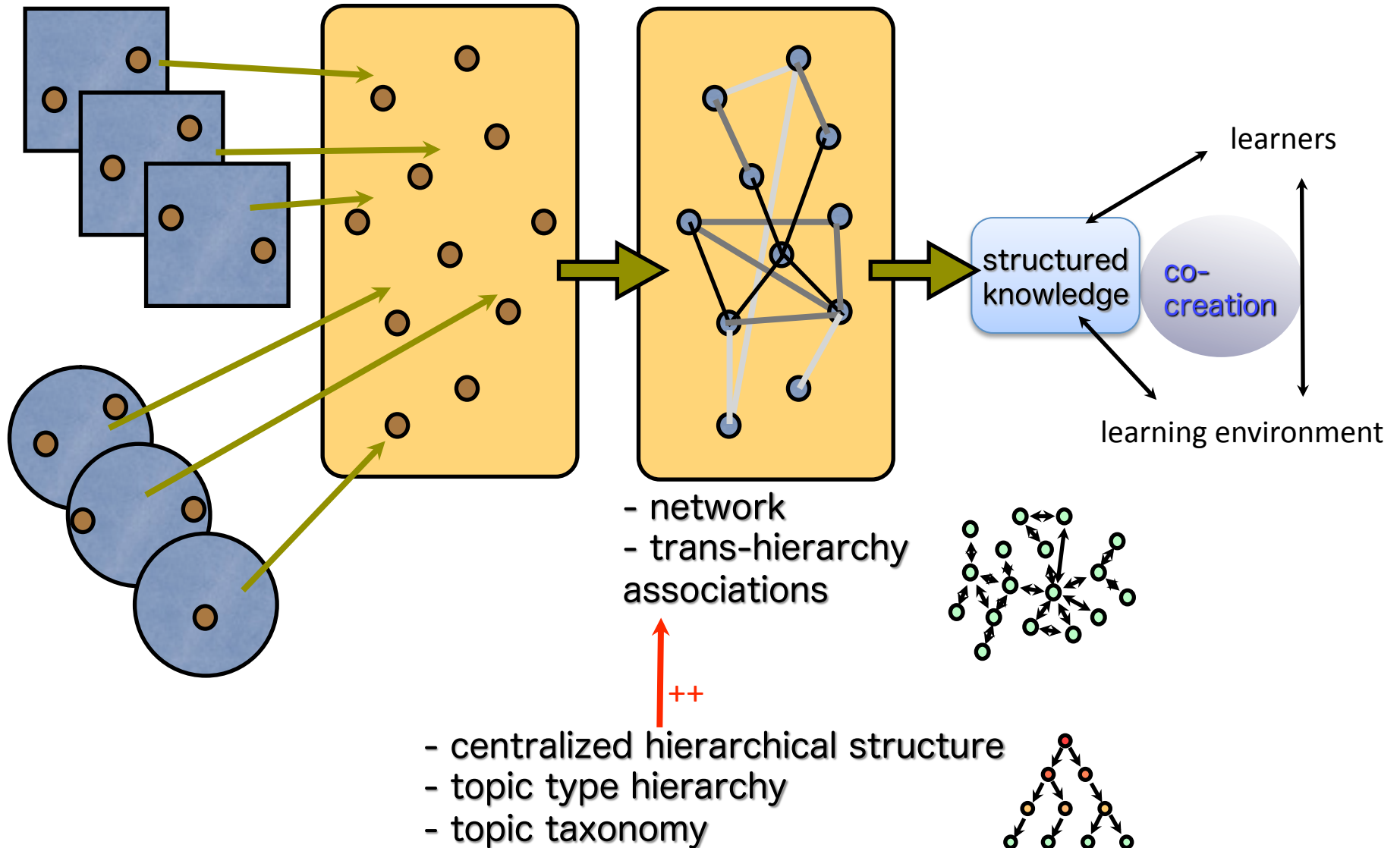
analysis

synthesis

collection

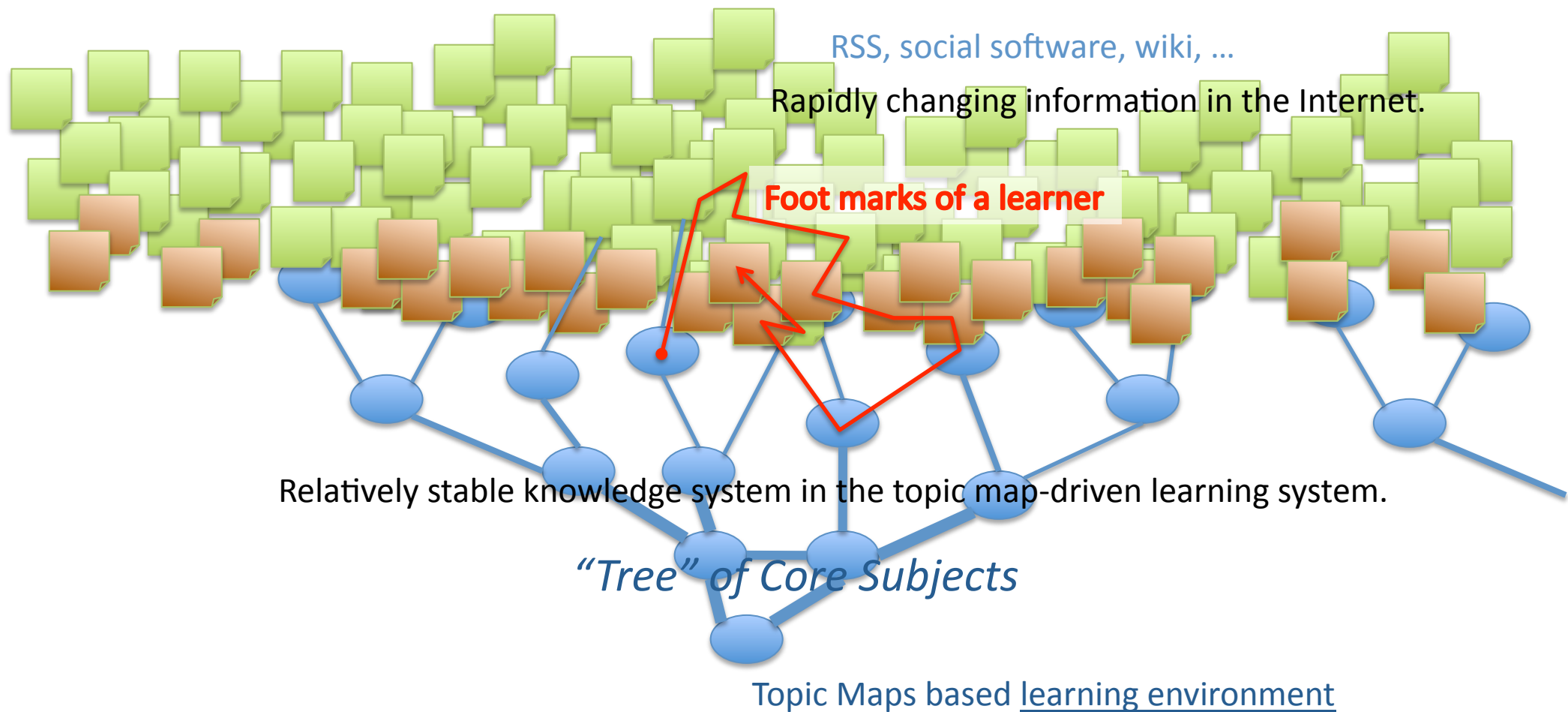
selection

design



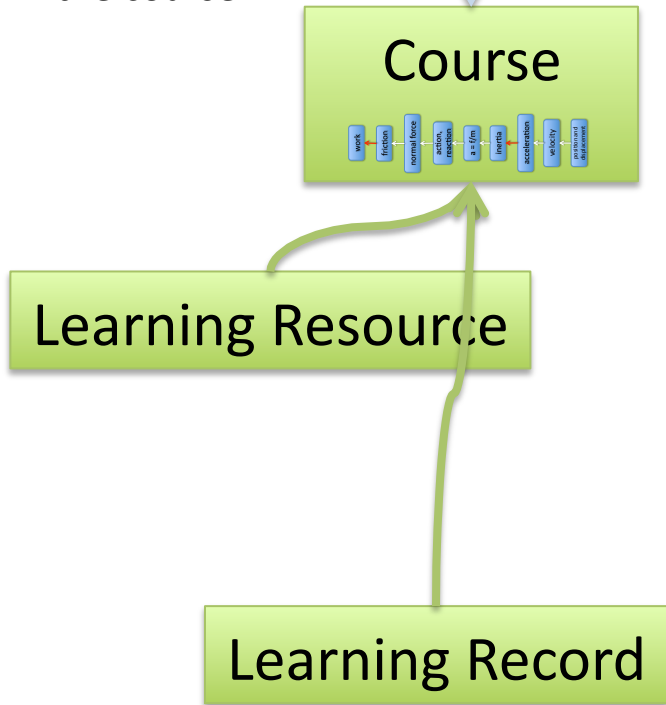
Topic map-driven learning system as a tree in the Internet

Learners may get out of “the tree” and come back to it, and organize thinking.



Course-centric Learning Management System

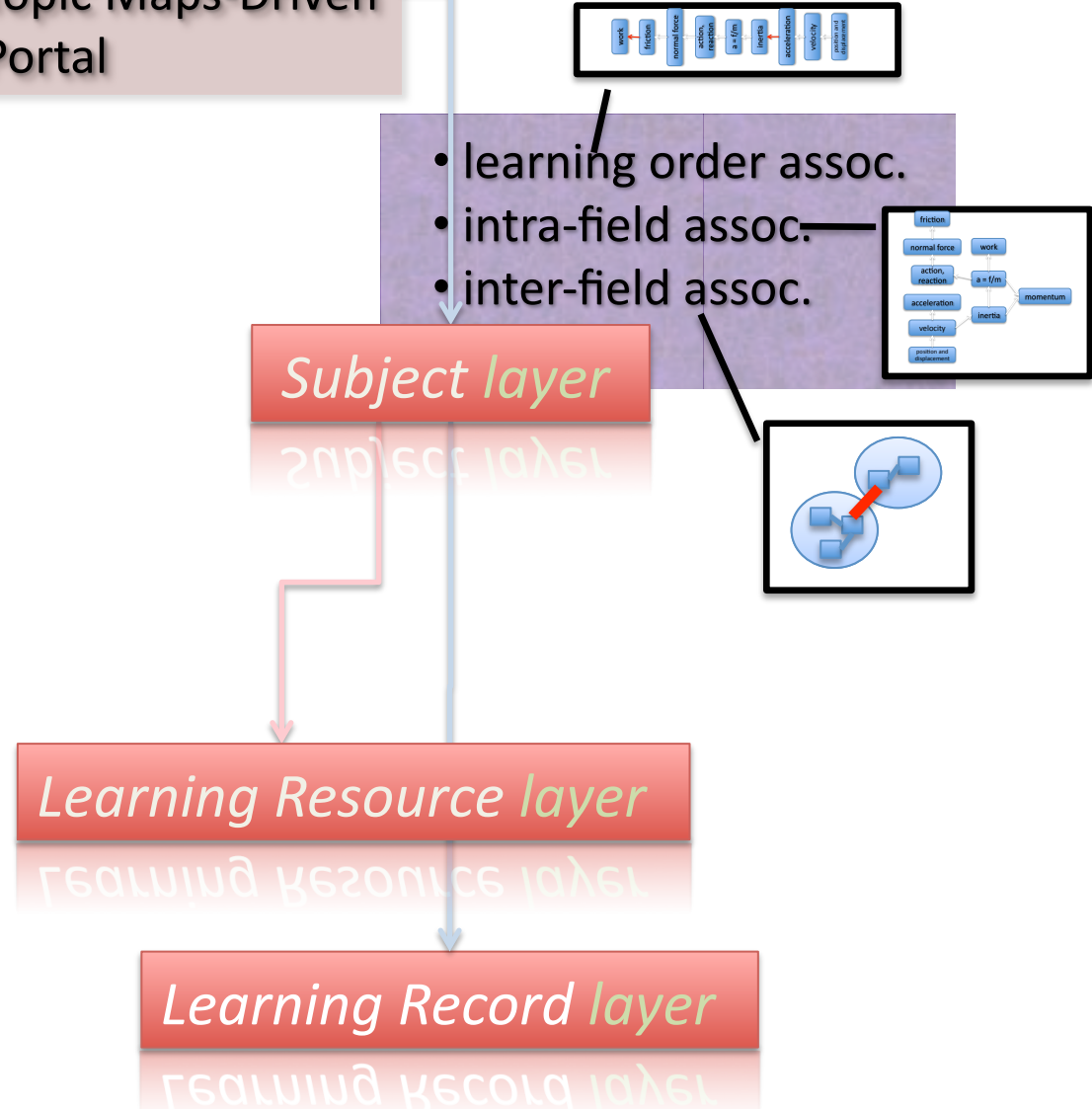
“Subjects” are embedded in the course.



Course-centric LMS tends to restrict the range of study.

Our Topic Maps-Driven Portal

“Courses” are embedded into the association “preceding_following”.

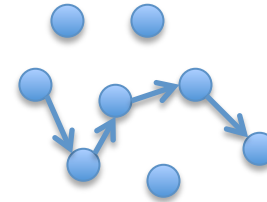


Topic maps-driven learning system will be appropriate to free-style self-learning.

“Understanding” and “Convincing”

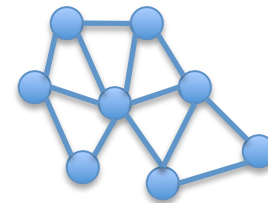
Understanding

1. recognize logically, universality
2. recognize principle
3. recognize a path to the conclusion



Convincing

1. necessity of individual recognitions
2. construct knowledge and reality by oneself
3. networking of knowledge with one's individual knowledge




Why taxonomy (as topic hierarchy)

Our topic type hierarchy of subject topic are taxonomy rather than true type hierarchy.

This is fundamentally due to the difference of types of domain knowledge, as below.

abstract



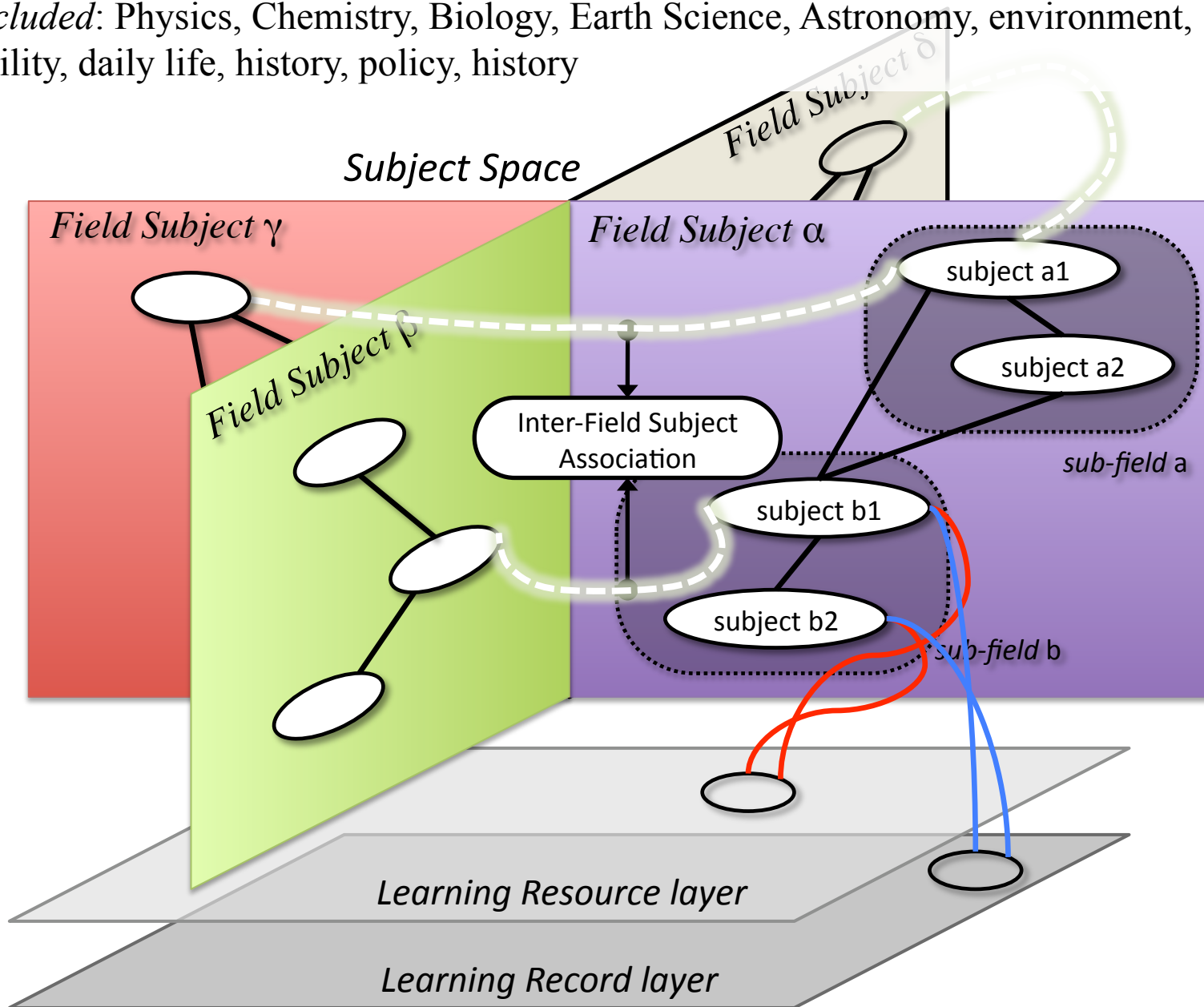
base	domain
laws of nature	Physics
taxonomy	Chemistry
descriptive	Geology
conduct	Engineering

Cf. Charles Sanders Peirce

Making “association”
to interlink various fields.

An illustration of our trans-field topic map

Fields included: Physics, Chemistry, Biology, Earth Science, Astronomy, environment, sustainability, daily life, history, policy, history



Two Associations

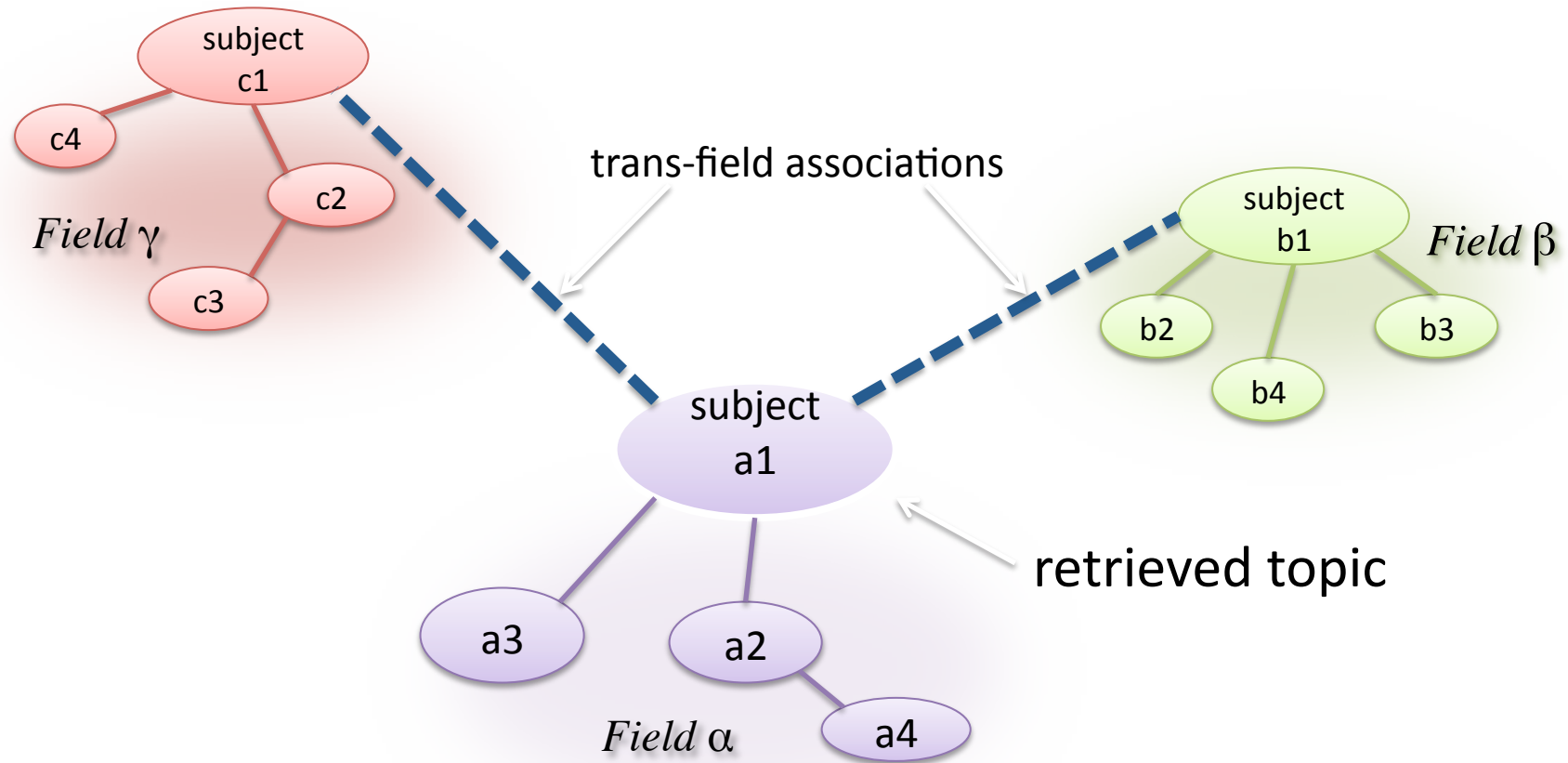
- trans-field interlinking

“TransSubject_is_related_with”

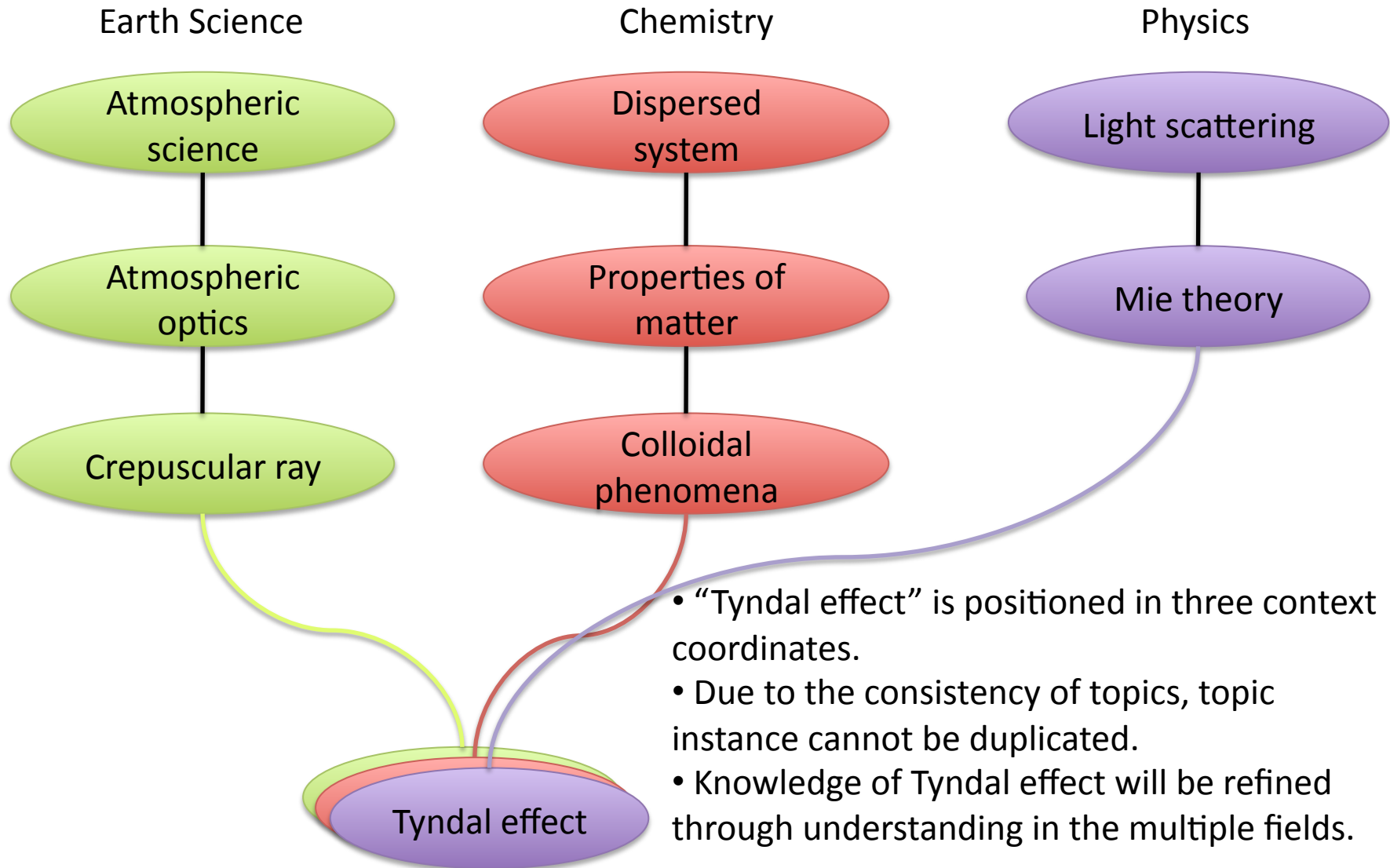
- sharing a topic among different fields

“Subject_is_shared_with”

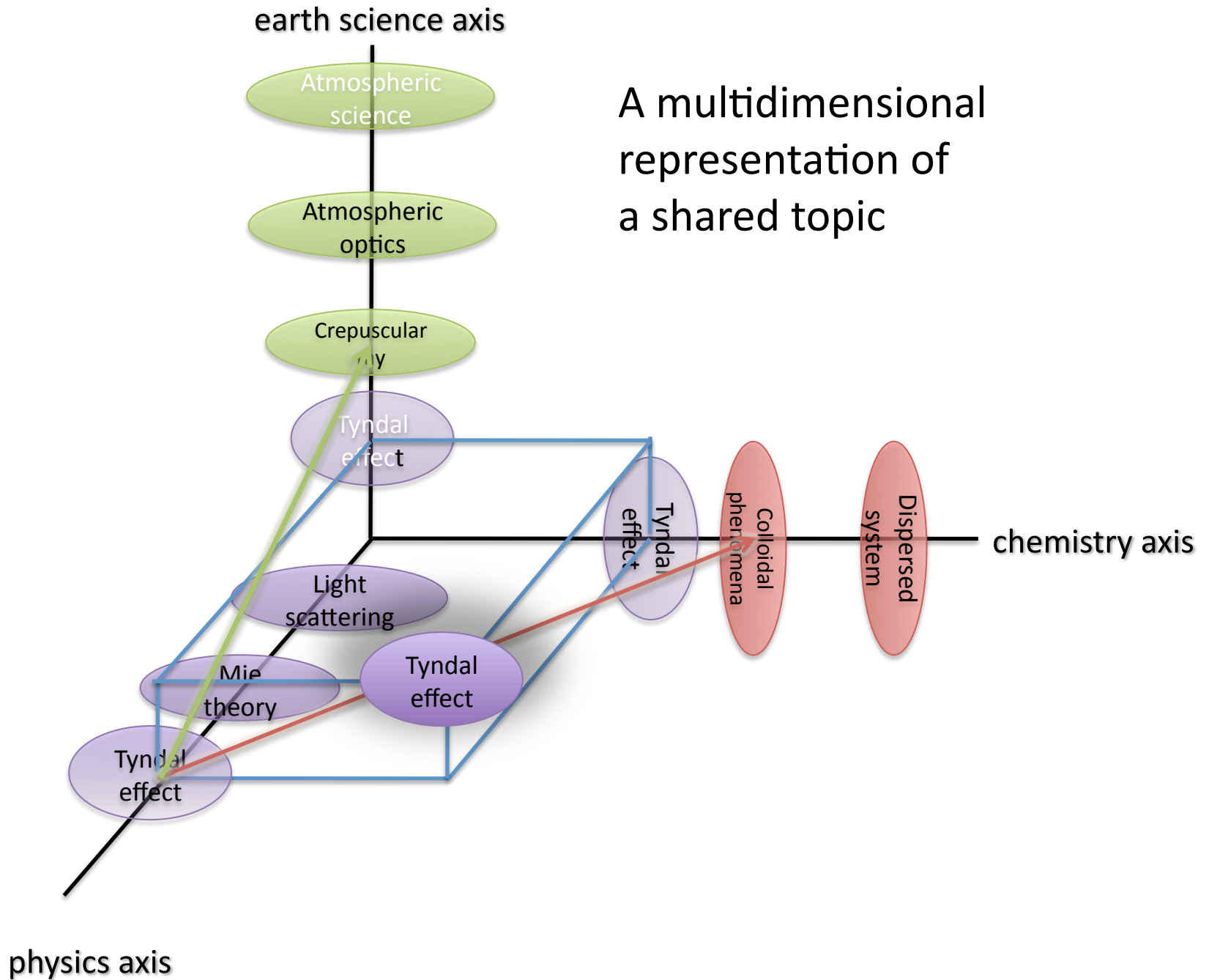
Image of a possible visualized interface for trans-field association.



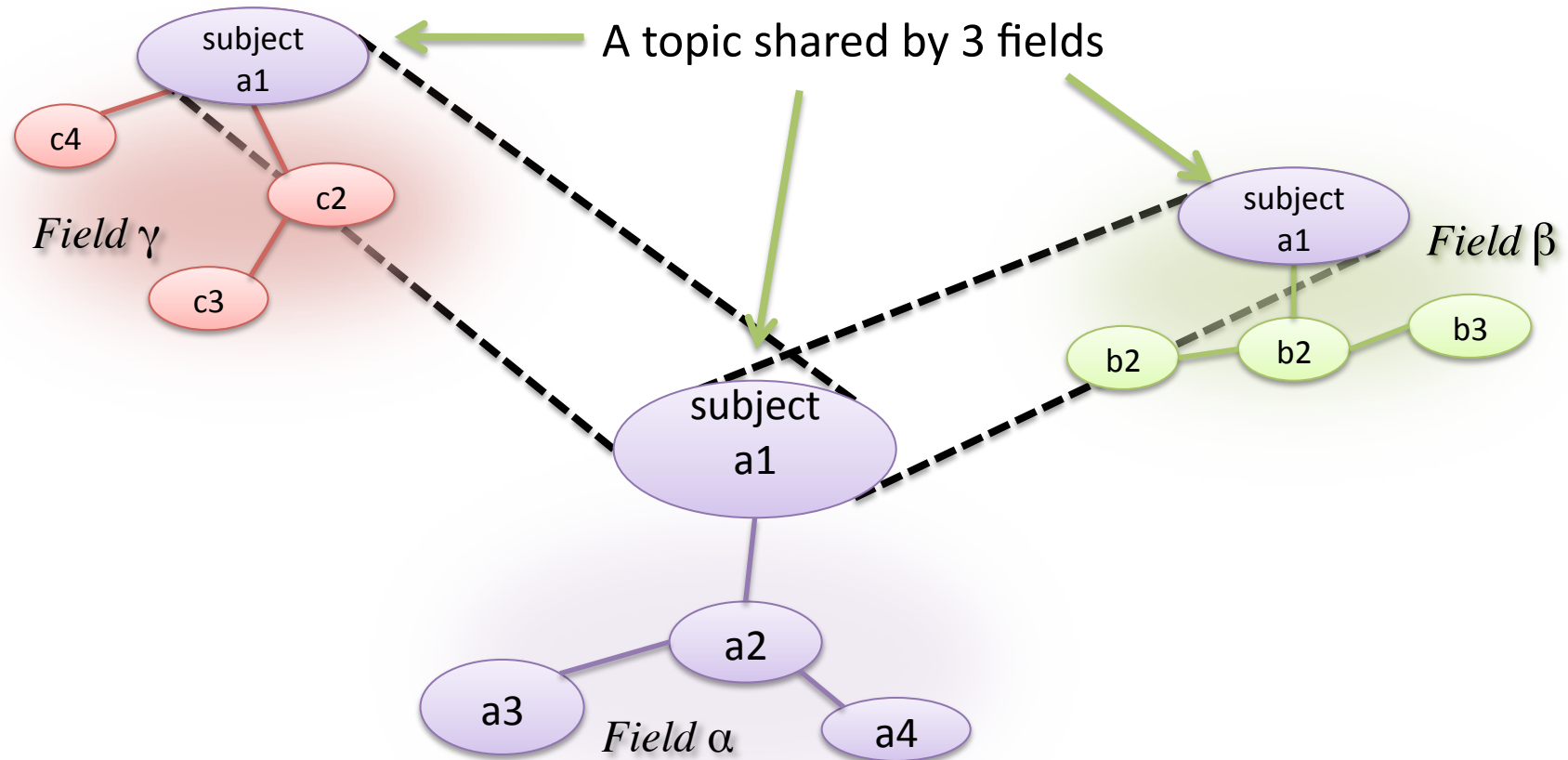
A shared topic



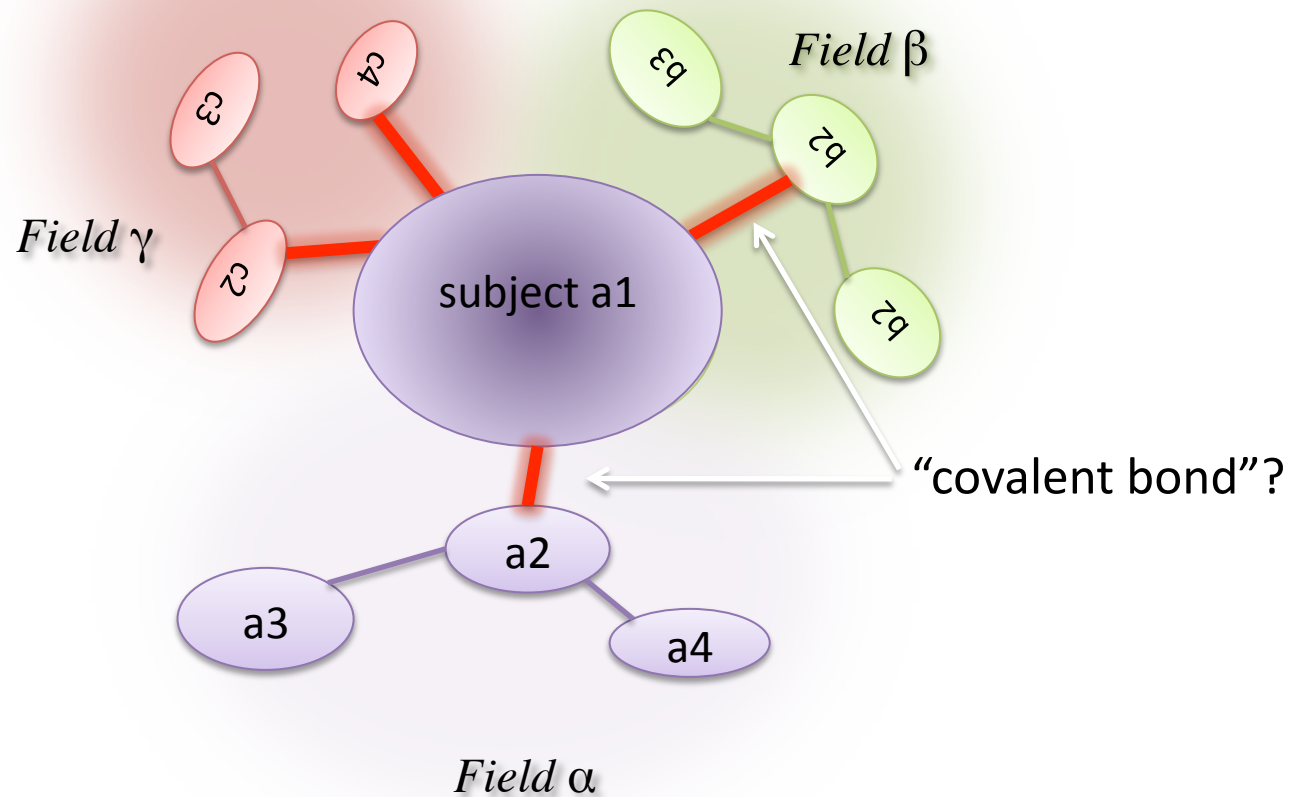
A multidimensional representation of a shared topic



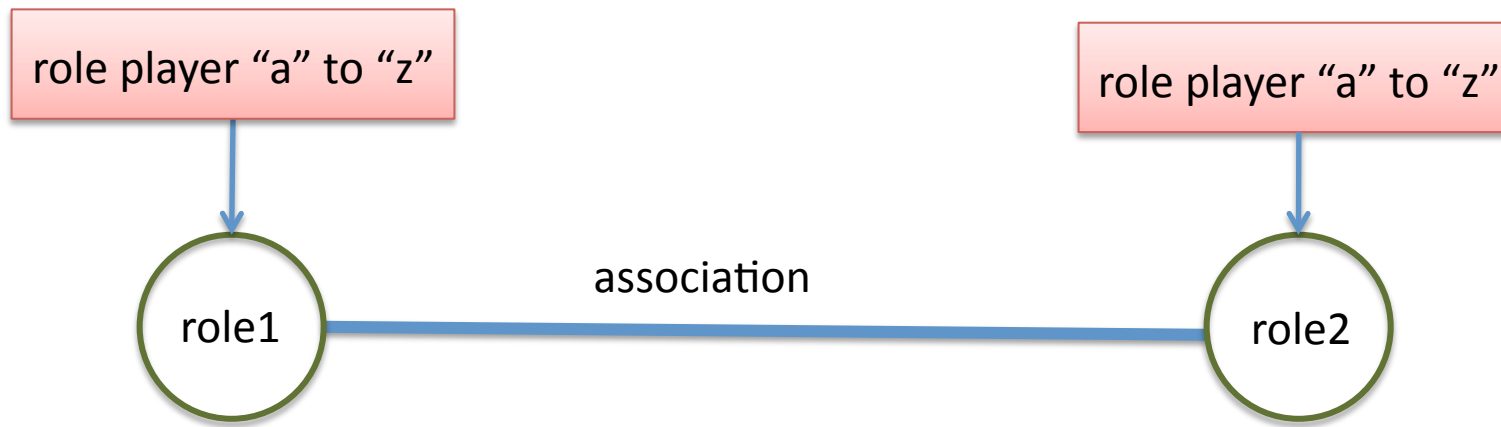
A shared topic is located at several corresponding fields.



An image of possible visualized interface for multidimensional association.



Think separately of association types and role-players.



-Association type is likely to increase, as the characteristics of role players are considered better.

-Often, use of a particular association type seems to depend on the role players in question.

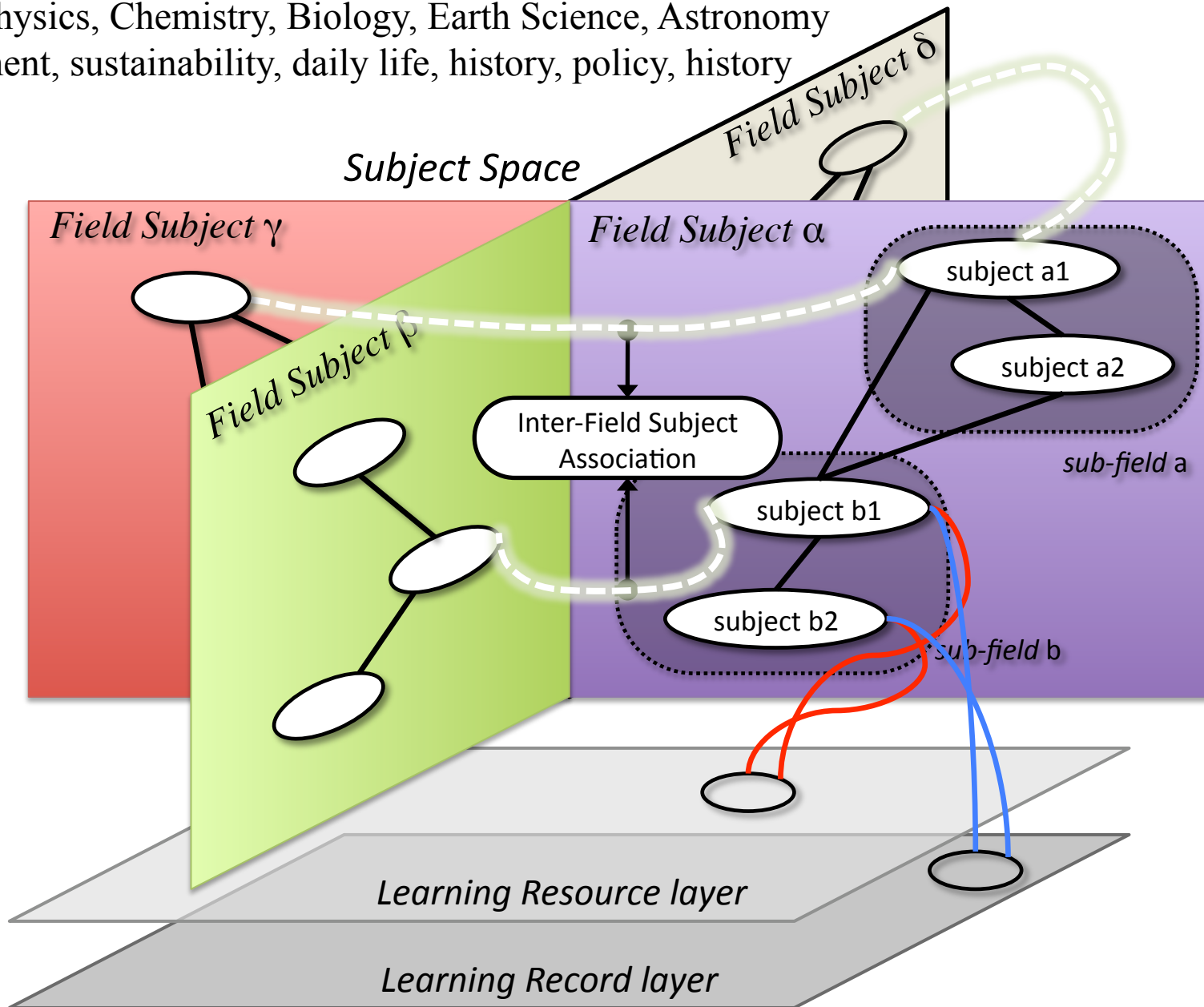
-At least, for the purpose of efficient editing, the domain specific associations should not be trans-field type.

Topic map exploration and page design

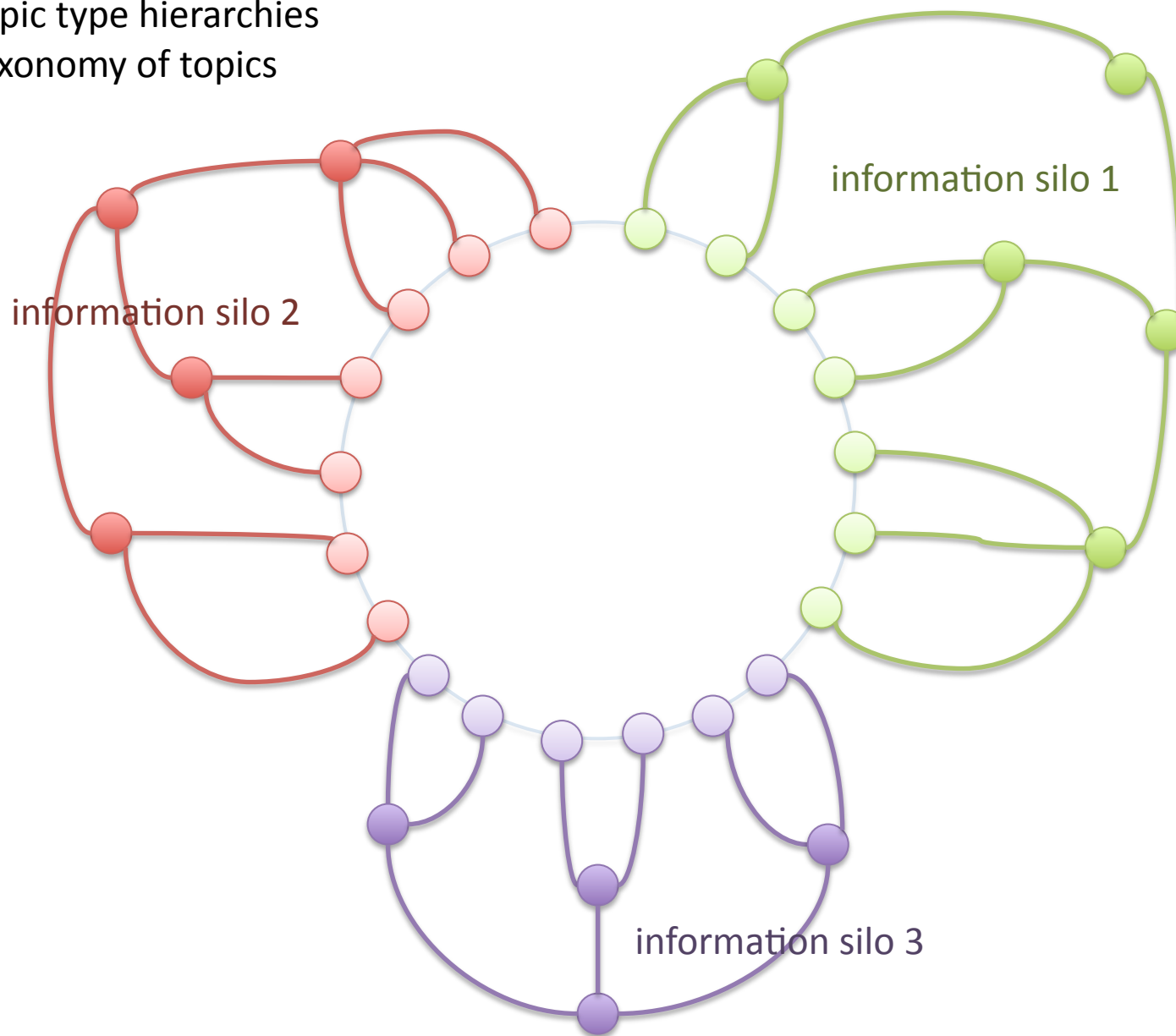
-form and function-

A schematic view of trans-field type topic map.

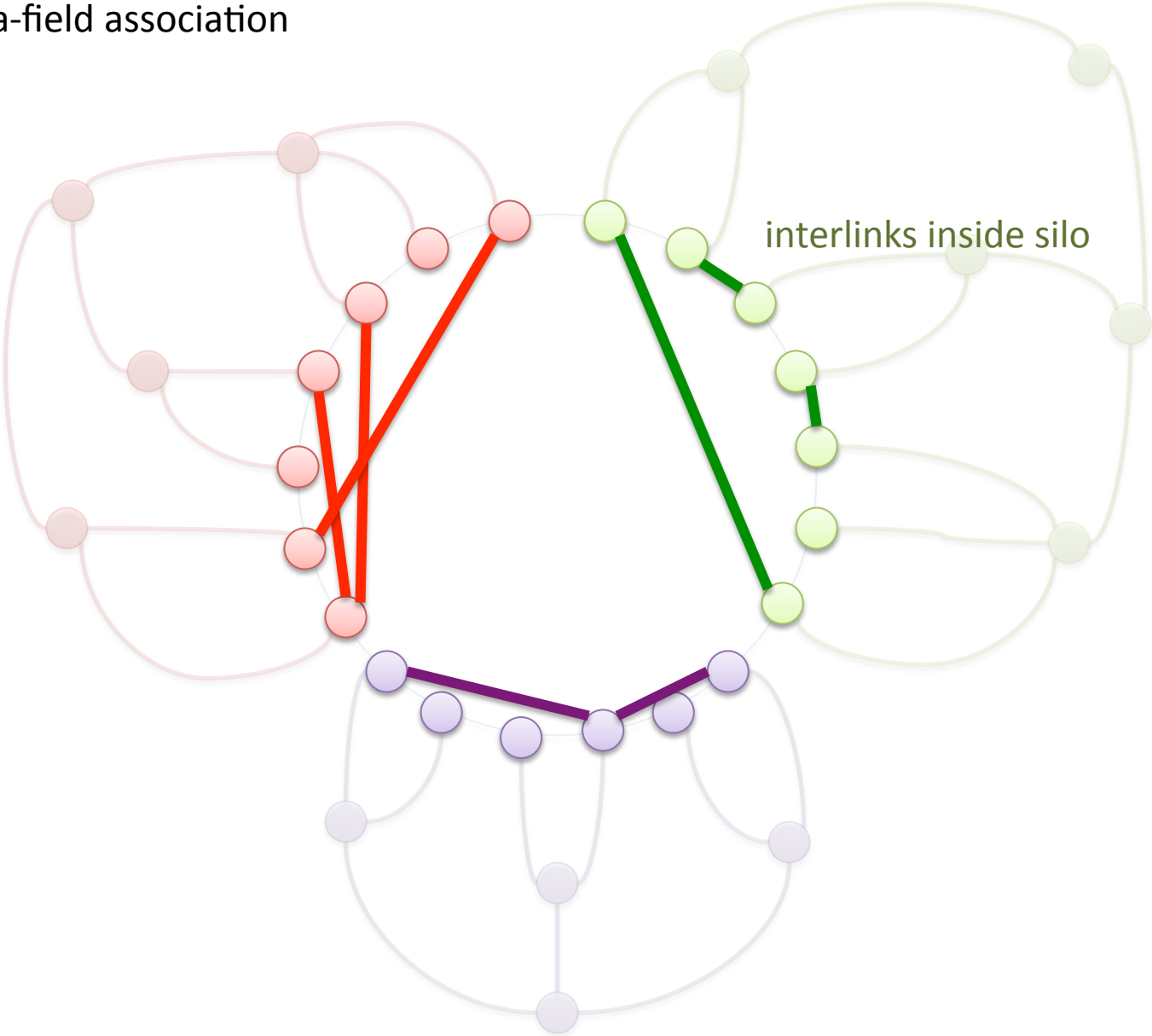
Fields: Physics, Chemistry, Biology, Earth Science, Astronomy
environment, sustainability, daily life, history, policy, history



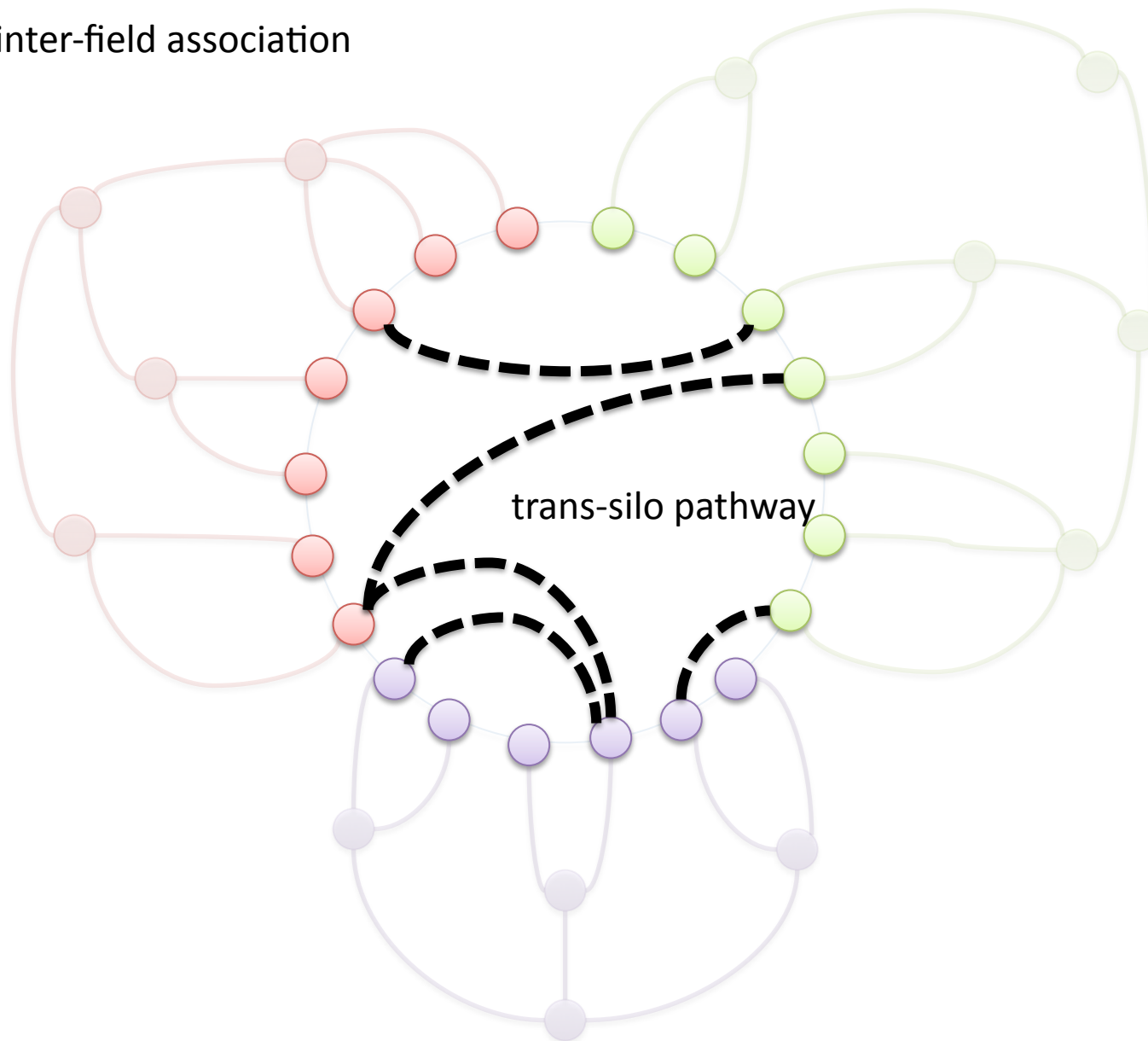
topic type hierarchies
taxonomy of topics



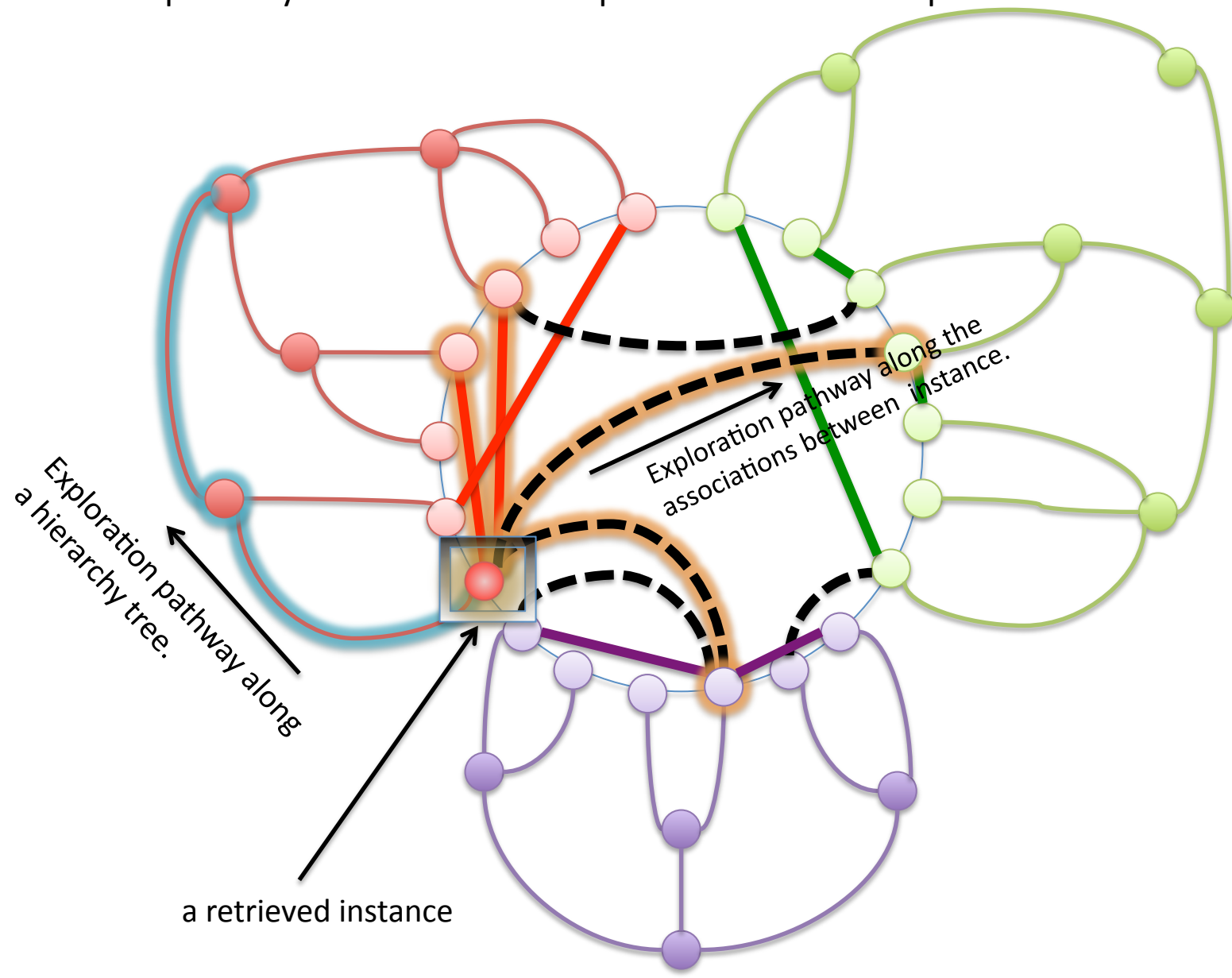
intra-field association



inter-field association



Two main pathway from a retrieved topic instance out to explore.



Page layout: instance page

More apparent expression to exhibit the multi-field constituent is required.

Everyday Physics on Web Topic Map
Topic Maps, a bridge between Information and Knowledge.

Topic Maps可視化 (Vizigate) Tologクエリ (Tolog query) トップページへ (Go to top)

Single Type Menu:

- Sci. Experiments
- History of Sci. & Tech.
- Astronomy
- Sustainability
- Environment
- Person
- Occupations
- Place
- People of This Site

Topic Types:

- ▶ Show Hierarchy
- ▼ List of Topics
- 物理, Physics
 - Advanced Physics Subject
 - Applied Physics Subject
 - Basic Physics Subject
 - Physics Experiment
- 化学, Chemistry
 - Advanced Chemistry Subject
 - Applied Chemistry Subject

トピック(instance topic): "laws of thermodynamics"

occurrences

association list

type menu

occurrences

association list

intra-field

inter-field

type menu

association list

intra-field

inter-field

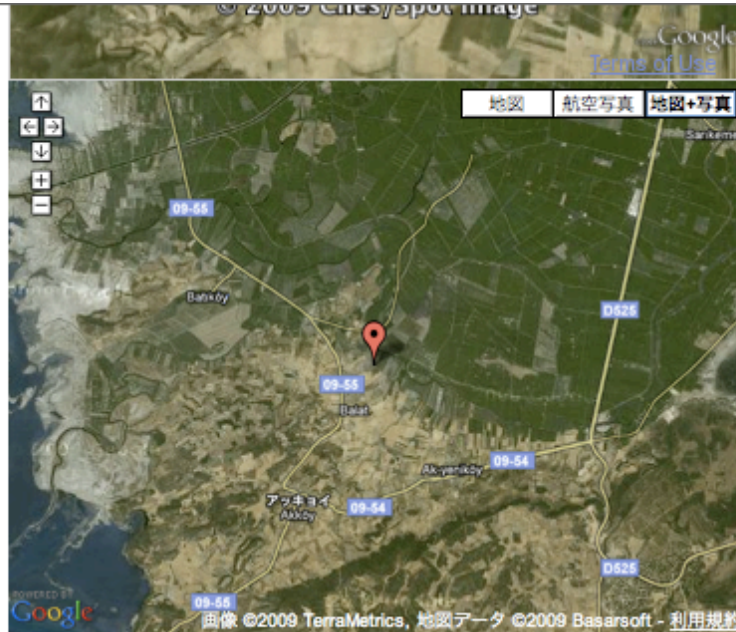
Semantic Mashup

- also, toward Linked Topic Maps -

We have a lot of resource aggregations,
and many of these sites provide API to utilize the resource.



- Geology
- Glaciology
- Limnology
- Oceanography
- Soil Science
- 天文学, Astronomy
- Constellation
- 歴史, History
- History of Science and Technology
- 日常生活, Daily Life
- Accident
- Air Conditioning
- Bathing
- Cooking
- Domestic Cleaning
- Domestic Communication
- Food Storage
- Gardening
- Home Maintenance
- Household Waste
- Knitting
- Security
- Sewing
- Stationery
- 産業, Industry
- Co-creation
- Industrial Design
- Industrial Processing



Μilesian school に関連するひとびと
People who are related with "Milesian school"

- [Anaximenes:アナクシメネス](#) [philosopher:哲学者](#)
- [Thales:タレス](#) [philosopher:哲学者](#)
- [Anaximander:アナクシマンドロス](#) [philosopher:哲学者](#)

Milesian school



An example of aggregated page

Google Earth, Map & YouTube as occurrences of the topic instance.

We are making,,,

a navigation utilities that can be driven intuitively by controllers such as the WiiRemote.

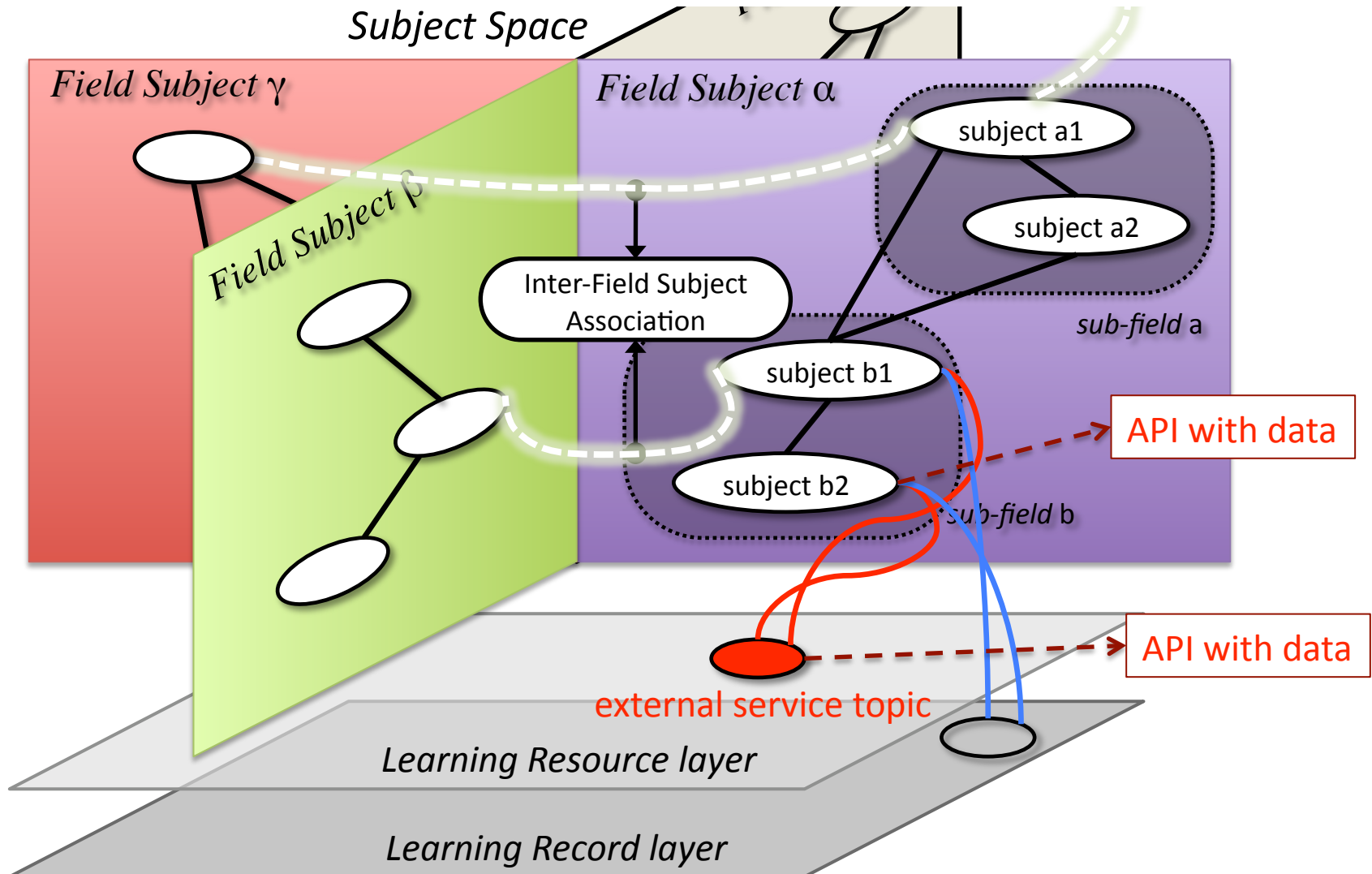
- constellation and mythology

- geo-park

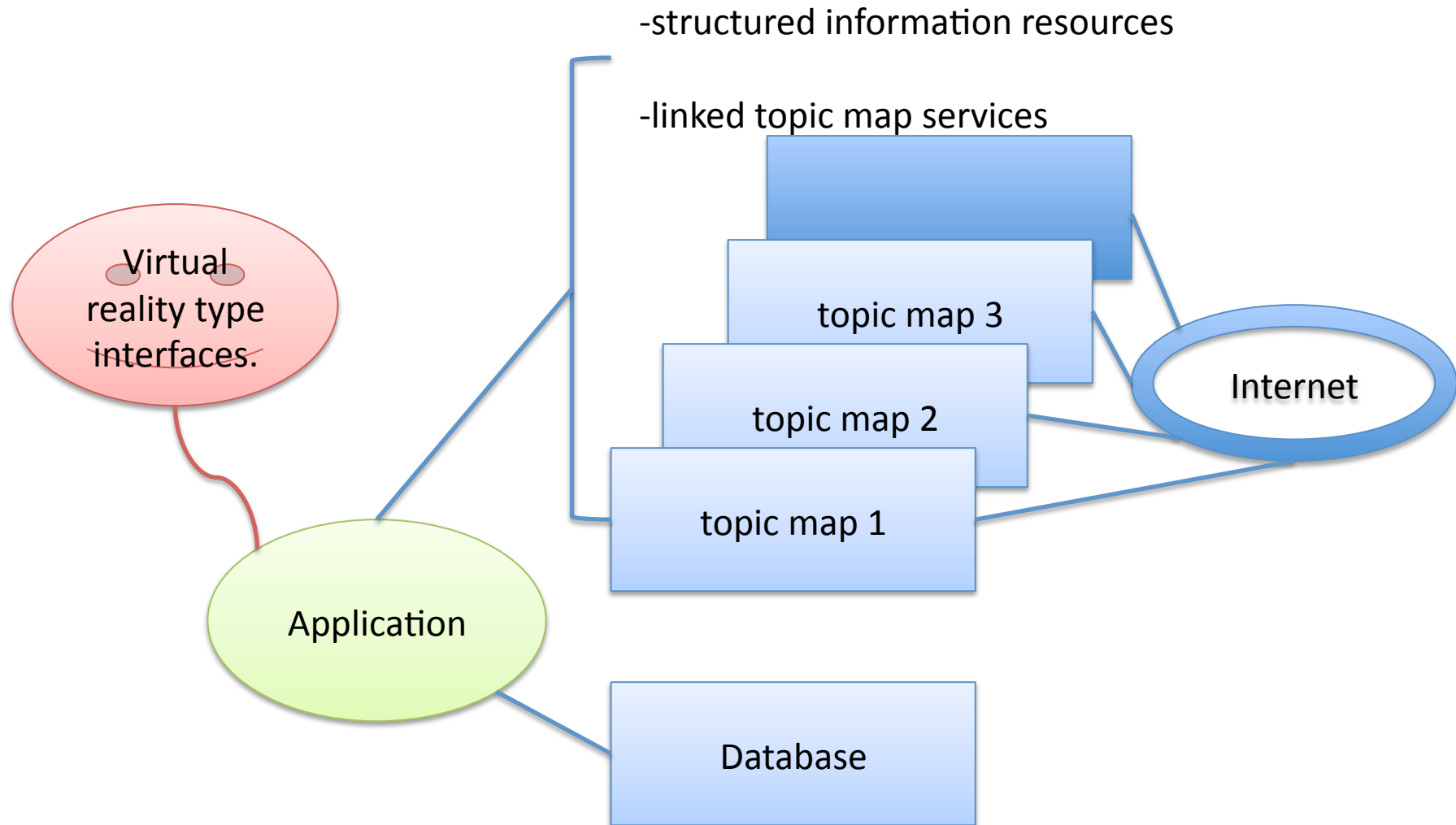
- history of science

Where to locate the API service in the topic map? Two possible ways.

1. Connect directly with to instance. (Easier)
2. Connect to the external service topic instance in the learning resource layer, and associate the service topic instance with the topic in the subject space. (Logical, since the external service is an “*expression*” and not field “*knowledge*”



If we consider a linked topic maps system, external services are regarded as topics, and the service instances are linked to the subject topic.



summary

- **Trans-field Ontology:**
For the purpose of learning, taxonomy-based ontology is thought to be appropriate.
- **Trans-field Association :**
 - “TransSubject_is_related_with”, “Subject_is_shared_with”
 - Separate the association type and the role-player.
- **Design :**
 - Pathway along hierarchical order and associations.
 - More research on web design is necessary to make full use of ontology.
- **Service Mashup and Linked Topic Map :**
External services are deployed as the topics of learning resource, and associated with the subject topics.