

# Topincs Wiki

## A Topic Maps Powered Wiki

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**Abstract.** Topincs provides a RESTful web service interface for retrieval and manipulation of topic maps. A Topincs Server implementing the interface can host many stores, which are collections of topic maps. The Topincs Editor is a browser-based application that allows editing of topic maps. In this paper, the Topincs Wiki, another view on the content of a Topincs Store, is presented. Its purpose is to hide the Topic Maps paradigm from the user, thus simplifying the collaborative creation of topic maps. The Wiki still emphasizes formal statements. It uses *ontological reflection* to guide users to data conformity rather than enforcing it with a schema.

## 1 Introduction

With the advent of the Internet in the early nineties of the last millennium, Ward Cunningham took the next step to simplify the creation of web content. He designed and implemented a system for authoring and linking web pages using a web browser only. He describes a Wiki to be “the simplest online database that could possibly work” [5].

Since 1995, users of the original Wiki, the *Portland Pattern Repository's Wiki*<sup>1</sup>, are discussing the topics *people, projects and patterns* in the area of software development [4]. Their collaborative effort produced tens of thousands of pages [5]. Since this content repository has been first used, the Wiki idea has found wide acceptance, first within the technical communities and then within the general population. Wikipedia<sup>2</sup>, the free encyclopedia, currently contains over 2 million pages [6] and is arguably the most accessed source of facts today.

The essence of the Wiki idea has been summarized on many occasions. For the sake of the argument of this paper, we are condensing the Wiki concept as follows:

- Wiki users author pages by making *statements* about the subject of the page in *natural language*, supported by a simple markup language.

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<sup>1</sup> <http://c2.com/cgi/wiki>

<sup>2</sup> <http://en.wikipedia.org>

- Some of the statements on a page refer to subjects that are discussed on other pages. Users have the option of connecting pages with *untyped* and *unidirectional* links.
- Wiki users discuss the statements regarding their truth value, appropriateness and style.
- The Wiki software keeps track of the changes the users make.

### 1.1 Semantic Wikis

The use of *natural language* makes it easy for users to contribute to the knowledge sharing effort in a Wiki. The use of natural language, on the other hand, restricts the possible knowledge providers and consumers to people who speak the language.

Hyperlinks allow navigation between the pages of a Wiki. These links are *untyped* and *unidirectional*. The nature of the relationship between two pages is only accessible by a person who reads and understands the statement in which the link is rendered. Because the association between pages is unidirectional, the link target is not connected to the source page, leaving the reader of the target page unaware of its relationship to the source page<sup>3</sup>.

By using a knowledge representation formalism it is possible to overcome these weaknesses. A system that does not encode information primarily in natural language gains the following features:

- Humans and machines can act as content providers and consumers.
- Connections between subjects are *typed* and *multidirectional*.
- Less effort is needed to translate the content to different languages.

A Wiki system that supports encoding of information in a formal way is referred to as a *Semantic Wiki*. Most existing Semantic Wikis use RDF and related technologies to achieve machine processability. Some solutions in this area are Semantic MediaWiki [9], Platypus Wiki [8] and IkeWiki [7].

This paper presents a solution based on Topincs, which uses the Topic Maps Data Model [3] to encode knowledge. Another project that uses Topic Maps technology in the same area is the Ceryle Wiki<sup>4</sup>. Benjamin Bock and Lars Marius Garshol presented their two separate Wiki approaches, based on Topic Maps, in the Open Space Session of the TMRA 2007 [10]. Tobias Redman and Hendrik Thomas laid out their ideas for the design principles of a Topic Maps based Wiki [12].

## 2 The Topincs Wiki

The *Topincs Wiki* is part of a larger software system called *Topincs*<sup>5</sup>[1]. It consists of a Web Service Interface, a Server, and different clients. At present there

<sup>3</sup> Most Wiki systems offer a *What links to this page* function.

<sup>4</sup> <http://www.altheim.com/ceryle/>

<sup>5</sup> <http://www.cerny-online.com/topincs/>

are the Editor and the Wiki. One Topincs installation can host many stores, which are collections of topic maps, that expose their items through URLs. The *Topincs Interface* defines the meaning of the application of the HTTP verbs POST, GET, PUT and DELETE on the URLs (item identifiers) that a store exposes. The *Topincs Server* implements the Interface. The current Topincs implementation uses PHP for request processing and MySQL for persistence. It supports JSON Topic Maps (JTM) on writing requests and JTM, XTM 1.0 and XTM 2.0 on reading requests. The *Topincs Editor* is a browser-based user interface for editing topic maps. It is an Ajax application and allows editing of all features of the TMDM [3] except variants and reification.

The *Topincs Wiki* offers another user interface for editing the content of a Topincs Store. It completely hides the Topic Maps paradigm from the user. Whereas other Semantic Wikis offer the creation of formal statements as an add-on to the article writing in natural language, the Topincs Wiki puts formal statements in the center of attention and tries to simplify the creation of these as much as possible. The user is completely unaware that he is using a knowledge representation formalism.

In comparison to the Editor, the Wiki consists of web pages, which are supported in their functionality by Ajax. However, it is not implemented as an Ajax application, because a web browser offers a lot of navigational infrastructure which is hard to incorporate in an Ajax application that loads only once and remains on the same URL during its entire lifetime.

Currently the Wiki allows viewing and editing of articles, but lacks support for discussion and versioning. An implementation of these important features is planned.

## 2.1 Viewing an article

In Figure 1, an article about the TMRA 2007 is shown<sup>6</sup>. The content of the page is easily understandable. The reader does not notice a distinction between different statement types. The occurrences *Homepage*, *Start date*, and *End date* look similar to the associations *Organized by*, *Chaired by*, *Takes place at*, and *Consists of*. The players of the associations are rendered as links. By following a link the user navigates to the Wiki page of the player. The locale dependent information is displayed according to the settings of the web browser<sup>7</sup>.

Every article is based on a topic map. For latency reasons, all information is delivered within the first page load. This *virtual topic map* integrates information of all *physical topic maps* in the store. It consists of

- the main topic with all names and occurrences,
- all associations that have the main topic as a player, and
- all typing topics and players with minimal information for display.

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<sup>6</sup> This article is available at <http://www.topincs.com/tmra/2007/wiki/id:142>

<sup>7</sup> The implementation supports currently only the German and US date format.

The screenshot shows a Wiki page for 'TMRA 2007' with the following content:

- Homepage**: <http://www.informatik.uni-leipzig.de/~tmra/2007/>
- Organized by**: Lutz Maicher
- Chaired by**: Lutz Maicher, Lars Marius Garshol
- Takes place at**: Media Campus Villa Ida, Leipzig
- Consists of**:
  - Applied Topic Maps in Industry and Administration
  - Visualisation and Representation of Topic Maps
  - Collaborative Applications
  - Standards Related Research
  - Demonstrations
  - Poster Session
  - Open Space Session Day 1
  - Social Software
  - Information Integration with Topic Maps
  - Topic Maps and Dublin Core
  - Topic Maps Engines
  - Open Space Session Day 2
  - Information Management with Topic Maps
- Start date**: 10.10.2007
- End date**: 12.10.2007

**Fig. 1.** The Wiki displays a topic map as a list of occurrences, names, and associations. Players are rendered as hyperlinks.

The screenshot shows the editing interface for the 'TMRA 2007' page. A dropdown menu is open, listing possible options for new statements:

- Chaired by
- Consists of
- End date
- Homepage
- Instance of
- Organized by
- Sponsored by
- Start date
- Takes place at
- Topic name

The main editing area shows the following fields:

- Organized by**: Lutz Maicher
- Chaired by**: Lutz Maicher, Lars Marius Garshol
- Takes place at**: Media Campus Villa Ida, Leipzig

Buttons for '+ New statement', 'Delete selected', 'Preview', and 'Save' are visible at the top of the editing area.

**Fig. 2.** When editing an article, possible options for new statements are listed using ontological reflection.

## 2.2 Editing an article

Since our goal is to hide the Topic Maps paradigm from the user, we need to make it transparent whether an occurrence, an association, or a name is edited. We achieve this by simply offering him all choices for new statements about the subject of the page in one control as shown in Figure 2. The Topincs Interface allows the querying of possible statement types for a topic based on its type. Which algorithm is used to create the list of possible statements is up to the server. The current implementation uses *ontological reflection*. If there exists a *Conference* with a *Homepage* within the system, it will offer this statement type when editing any *Conference*. At a later stage it is possible to base the responses to these queries on a schema.

## 2.3 Editing occurrences

Occurrences and names are statements within the TMDM, which deal only with one topic. They are attached directly to the topic and connect it to some data, which is represented as a string. Every occurrence has a datatype. The TMDM specifies a set of standard datatypes, which are the XML Schema datatypes [3]. For some of them Topincs Wiki uses specialized input elements. For example, a control for editing dates is shown in Figure 3. In addition to the standard datatypes, Topincs uses the datatype `http://tmwiki.org/psi/wiki-markup` to allow the usage of Wiki markup in occurrences.

**Fig. 3.** Editing an occurrence of datatype date

## 2.4 Editing associations

Creating a user-friendly control for editing associations is in our case particularly difficult. Since Topincs does not use a schema, the set of topics to choose from consists of all topics in the store. Furthermore, the user should be able to create a new topic on the fly. Since assigning a type is important, the control needs an additional input element, which appears only if the user refers to a new topic. This control allows him to specify a topic type, which again can be new.

Any input element in our association control will expect the user to start typing. Once the user pauses, the input element will query the Topincs Server

for topics with a matching name. The result will be displayed in a drop down box. If no topic matches, the control switches to the *New topic* mode as shown in Figure 4.

The screenshot shows a web form with the following elements:

- A label "Organizer of" above a text input field containing "TMRA 2007".
- A label "Of which type is the topic?" above a text input field containing "Conference".
- To the right of the second input field, there is a "New topic" button.
- Below the "New topic" button, there is a blue bar with the letter "N" on it.

**Fig. 4.** Editing an association and creating a new topic on the fly

## 2.5 Saving changes

Once the user decides to save his changes, the JavaScript program splits up the changes into atomic operations according to the Topincs Web Service Interface [1]. Additions result in a POST request to the topic in case of occurrences and names or to the topic map of the topic in case of associations. Deletions will be DELETE requests to the item identifier of the deleted item, and modifications will PUT a new representation of the item to its item identifier. The user is informed of the saving progress by a bar in the lower right hand of the page.

## 3 Modelling

Modelling knowledge in Topincs is a continuous process. Topincs was originally designed to support personal knowledge management [1, 11]. A human being encounters information from various domains in his everyday life. There are no strict boundaries on the conceptual level, therefore we chose an approach which we call *ontological reflection*. For a topic of type *Person*, statement types are suggested that are already in the store for topics of that type. In order to extend the options for new statements in the Wiki, one has to use the Editor to model the first statement after the creation of the necessary types. From then on the statement type will be offered in the *New statement* menu in the Wiki.

If we want to state that *Thomas Vinterberg is the director of the movie "Dear Wendy"*, we need to create an association type *Director/Directed thing* and two role types *Director* and *Directed thing*. The role names do not matter. We need to name the association type from the perspective of both roles. Therefore we create the name *Director of* in the scope of *Director*, and the name *Directed by* in the scope of *Directed thing*. After this we can create the statement we want to express. All this has to be done in the Topincs Editor. From now on, all statements of the same form can be created in the Wiki.

With this simple methodology it is possible to offer the user some guidance about what statements can be expressed about a topic of a certain type. *Ontological reflection* could as well be used to fill drop down boxes with candidates for

a role. Yet, it is not possible to model restrictions on cardinality, e.g. a *Person* can have three birth dates and two mothers. We have been reluctant in implementing a schema language in Topincs because we take the position that we are not modelling reality, but rather what people say about reality. Furthermore the need for conformity of data only arises with computation. Therefore programs should check the validity of their input. Human consumers can, depending on the area of application, deal with missing and contradictory information. For people *trust* is more important than *logic*. The reification mechanism of Topic Maps supports us in keeping track of our encounters with a statement, but also allows us to express statements like *Harry believes that John is born in 1975*. Therefore the integration of reification in the user interfaces of Topincs will be introduced in one of the next versions.

## 4 Language Independence

Information in a topic map is stored independent of any natural language. Together with the scoping mechanism of Topic Maps, it is possible to present information in different languages. As soon as the ontology is translated, the information of a topic map is intelligible to speakers of that language, because names of individuals do not need translation in most cases. In our context, an ontology is a set of topic types, occurrence types, name types, association types and role types [2].

To use this feature of Topic Maps, Topincs will receive a view to translate names from one language to another. The view will work on a customizable set of topics. The Topincs Server will choose the display names according to the language settings of the web browser. It might be useful to allow the user to override that setting within the web page. It is important not to break the caching mechanism of the HTTP protocol when serving items in a specific language. It must be clear that a proxy cannot satisfy a request, if the locale information does not match. Another option would be to deliver the topic map that makes up an article and fetch the display names in separate requests. Even though we like this idea conceptually better, we did not implement it, because of the impact on the usability of the Wiki. Since the information can only be displayed with names, the page rendering would have to be stalled until all names have arrived. Since browsers usually process only a few requests simultaneously, it might be very unpleasant for the user, since there are many names to be fetched.

With this solution in place, it will be possible for people to collaboratively create information over the world wide web across language boundaries.

## 5 Application of Topincs at TMRA 2006 and 2007

In 2006 and 2007, Topincs was used to record knowledge about the TMRA conference, its presentations and the content thereof<sup>8</sup>. This initiative was driven

<sup>8</sup> Available at [http://www.topincs.com/tmra/200\(6|7\)/wiki/](http://www.topincs.com/tmra/200(6|7)/wiki/)

by the conference organizer Lutz Maicher and the author. Both years participants were encouraged before the keynote to actively take part in this documentation effort.

Tables 1 and 2 show the number of items created during the two conference days in 2006 and 2007. This information was pulled out of the database of the Topincs Stores for the two years by counting the items that were created during the two day conference. A comparison is somewhat difficult. In 2006, the Editor was used, whereas in 2007, the Wiki was used. The Wiki creates more statements automatically. For the author, who was also a main content contributor, network connectivity was worse in 2007.

**Table 1.** Number of items created during TMRA 2006

	Topics	Occurrences	Associations	Total
Day 1	89	42	80	211
Day 2	19	4	33	56
Total	108	46	113	267

**Table 2.** Number of items created during TMRA 2007

	Topics	Occurrences	Associations	Total
Day 1	57	21	113	191
Day 2	32	8	67	107
Total	89	29	180	298

## 6 Summary and Plans

The Topincs Wiki is a semantic Wiki based on Topic Maps. It emphasizes formal statements, because they are machine processable and language independent. It uses *ontological reflection* to guide users in their knowledge sharing endeavour.

The Topincs Wiki needs a page to discuss a topic and the statements about it. In order to support versioning the Topincs Interface has to be extended to allow retrieval of specific versions. The persistence layer of the server has to archive the current version of an item before replacing it on PUT requests. DELETE requests have to take into account that an older version might be restored.

Topincs proves itself as an invaluable tool to the author. An issue tracking system<sup>9</sup> was set up within a few hours and is extended on demand. At the same

<sup>9</sup> <http://www.topincs.com/issues/wiki/>

time the need for queries becomes evident, e.g. to display all unsolved issues. Therefore we are considering the integration of a query language into Topincs.

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