Friend to Friend Social Network in Semantic Wiki

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1 Introduction

Software as a service is the current trend in software deployment where an application is hosted as a service and provided to users across the Internet. This model inspired the *collaboration as a service*, where a service provider offers collaborative and social network services.

The social relations provided by the social services are important to push further the collaboration between people. It is important to evaluate the location of actors in the network to understand networks and their participants. Measuring the network location is finding the centrality of a node. These measures give us insight into the various roles and groupings in a network, where are the clusters and who is in them, who is in the core of the network, and who is on the periphery?

However, having a social service provider arises privacy and censorship issues [1], since it can exploit the whole social network relations and interactions among the users.

In order to overcome these issues, new decentralized approaches were proposed. They provide collaborative services without a dedicated service provider. Users can create their own collaborative network and share the collaborative services offered by the system using their own resources. Skype [2] and Distributed Version Control Systems (DVCS) [3] (e.g. Git [4] and Mercurial [5]) demonstrated that it is possible to communicate and share data without the need for a collaboration provider. Although distributed systems provide the required collaborative services, they do not provide the social services offered by centralized systems. In distributed systems there is no central point with a global vision of the social network or which is able to build and reflect the social relations among people.

Other approaches use private peer-to-peer networks [6] where the resources and infrastructure are provided by the users. Groove [7] is a groupware for collaborative editing consists of isolated local networks. This system provides group-based network service which allows direct connections between the users of the group. Multi-synchronous semantic wiki [8] is another approach which allows direct connections between sites who know one another i.e. *friend to friend* network.

The multi-synchronous semantic wiki collaboration model hides the social relations among sites participating in the network. However, by analyzing the causal history we will be able to reveal these relations and reconstruct the social network graph. These relations will be represented semantically and we will be able to deduce them using a semantic reasoner. Such approach can enrich the collaboration among the sites with new services, while at the same time preserving the sites' privacy, since we have a local vision of the network, and we do not rely on a service provider to maintain the social network. Next sections will explain our contribution to multi-synchronous semantic wiki to reveal the social relations.

2 Multi-Synchronous Semantic Wiki

Semantic wikis such as Semantic MediaWiki [9], IkeWiki [10], SWooki [11] and SweetWiki [12] are new generation of collaborative editing tools. They support mass collaboration for editing structured and unstructured data. In a multi-synchronous semantic wiki approach [8], users are allowed to build their own cooperation network by explicitly declaring with whom they would like to cooperate. Every user can run a multi-synchronous semantic wiki server on her machine, and she can create and edit semantic wiki pages locally, then she can share these pages with others. Moreover she can decide with whom to share these pages, and from whom to accept modifications.

In fact sharing a modification in multi-synchronous semantic wiki is accomplished using a capability-based access control approach [13]. A user who modified a page can push a capability to users with whom she would like to share these modifications. This will permit the selected users to integrate the modifications into their local copies; if they decided to pull these modifications.

The push/pull operations in a multi-synchronous semantic wiki can be transformed into social relations among the users participating in this network. The next section presents how we can construct this social network among sites and visualize those relations.

3 From causal history to social relations

Although there is no direct friendship relation defined in a multi-synchronous semantic wiki, users can manage their relations with others implicitly by controlling from whom to accept modifications and to whom send or publish their modifications. This interaction is recorded in the causal history which is stored at each user's site. Each site participating in a multi-synchronous semantic wiki network keeps a complete causal history of all the operations it has received or generated locally. The causal history is necessary to satisfy the CCI criteria [14]. This causal history is expressed by the previous relation defined between patches[1]. The only implementation of a multi-synchronous semantic wiki to the best of our knowledge is DSMW [15]. DSMW is an extension to SemanticMediaWiki [9]. A snapshot of DSMW ontology is shown in figure1[2].

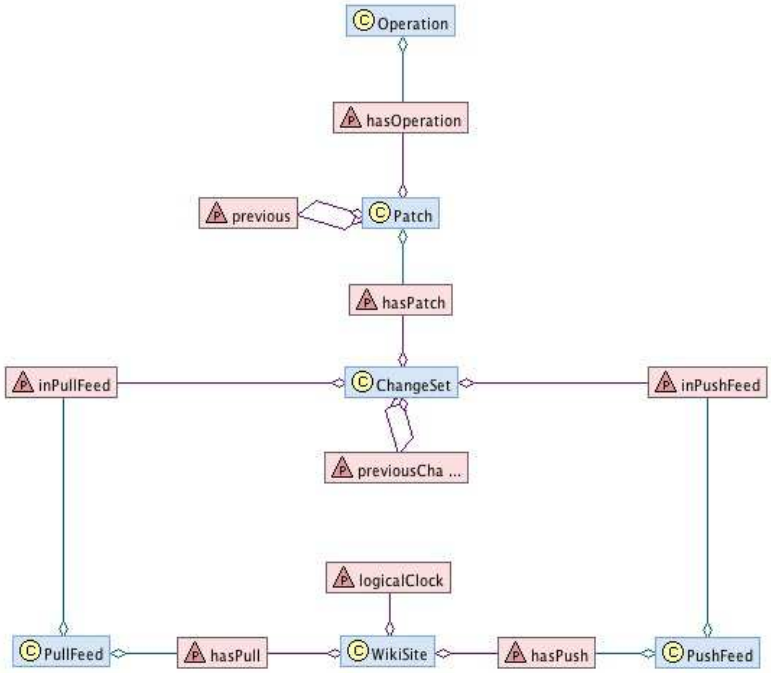

Fig. 1: DSMW ontology snapshot

According to DSMW ontology, a patch is a collection of operations generated at one site. Each patch contains the following information:

PatchID : which is a combination of the siteID and the site logical clock.

[1] Actually there is a changeset concept which contains the patches, we omitted the discussion of this concept for simplicity.

[2] The figure shows the entities that are of interest for our work only.

onPage : the page where the patch was applied.
hasOperation : pointer to the operations generated during the save of the page.
previous : pointer to the precedent patch.

In order to be able to build the social relation among the sites, we will extend DSMW ontology as follows:

1- We will define *hasSite* object property from Patch to WikiSite as follows:

$$hasSite \equiv \exists(hasPull^{-1}).\exists(inPullFeed).\exists(hasPatch^{-1}).Patch$$

2- We will add an object property *knows* which check if one site knows another site. This property is calculated using the following inference rule:

$$knows(S1, S2) \sqsubseteq \exists P1.(hasSite(P1, S1) \sqcap \exists P2.(hasSite(P2, S2) \sqcap previous(P2, P1)$$

Where $P1, P2$ are both patches, and $S1, S2$ are both sites.

By taking the previous modifications into account we can rebuild a "FOAF:knows" relation [16] between the sites based on the push/pull feeds with a simple inference from the history using a semantic reasoner. Figure2 shows these modifications.

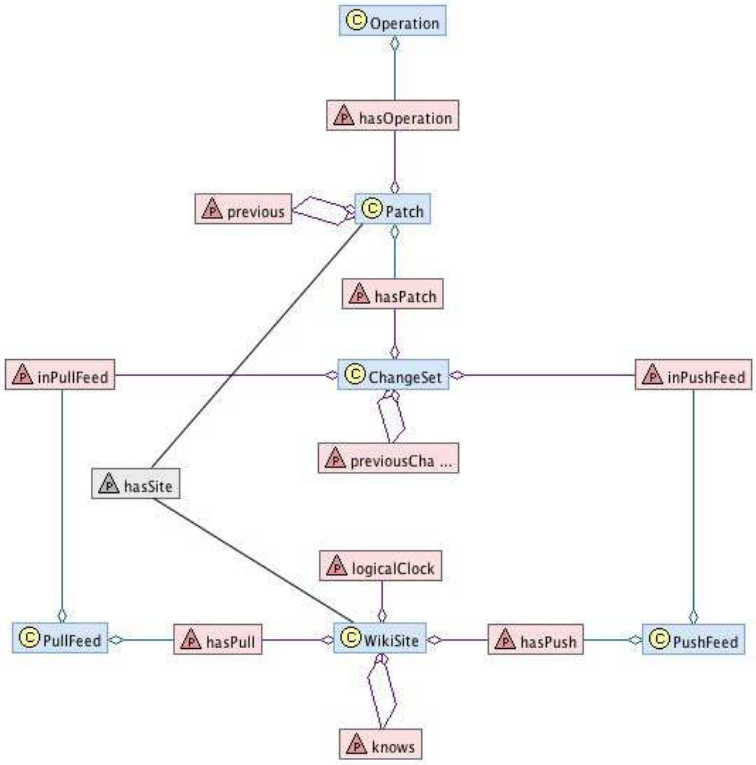

Fig. 2: DSMW ontology extension snapshot

The example in figure3 shows the interaction between three sites. *site*1 creates a wiki page, then it pushes the page to *site*2, eventually *site*2 does some modifications on the page and then pushes it to *site*3.

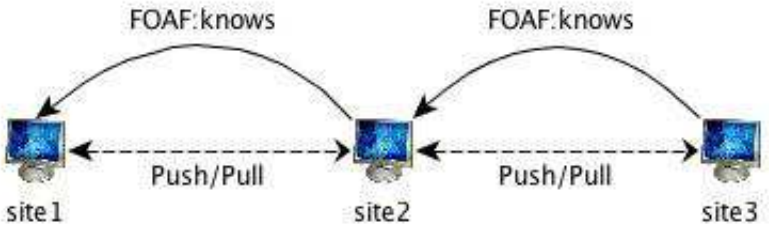

Fig. 3: Collaboration scenario

By investigating *site*3 history, we can find some patches generated by *site*1, although *site*3 never knew the existence of this site. Now *site*3 *knows* the existence of *site*1, moreover it can deduce that *site*2 trusts *site*1, since *site*2 allowed *site*1 operations to be integrated into its own copy.

Each site will have a local vision of the network. We should take into consideration that the causal history keeps on growing and it will not delete previous entries. This means that the local vision at one site of the network keeps on growing as much as the site consumes from other sites.

4 Conclusion

In this paper, we extended the collaborative services offered by multi-synchronous semantic wiki with new social services by exploiting the causal history using a semantic reasoner. Therefor, each site participating in this collaborative network can have a local view of its social network without the need for a third-party service provider, and using its own resources.

We will validate the approach using different sources of causal history, and by developing the approach further we can include the timestamps and the frequency of publishing/consuming among the different sites in order to quantize a proximity metric between sites.

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