Semantic Knowledge Sharing

Nick Kings[1], Deborah Diduca[2], Alistair Duke[1]
[1]Next Generation Web Research Group, BT
{nick.kings,alistair.duke}@bt.com
[2]Chimera - Institute for socio-technical research and innovation, Essex University
Adastral Park, Ipswich, UK, IP3 5RE
djdidu@essex.ac.uk

Abstract

This document details the initial design for the knowledge sharing tool, being developed under SEKT. The sharing tool aims automatically classify web pages against an ontology, and share comments made about those pages to members of a community. As the user browses web pages, recommendations for further documents are produced, based upon both the user's social network as well as the semantic content of the pages currently in view.

1 Introduction

The Semantic Web [Berners-Lee *et al.*, 2001] provides enhanced information access based on the exploitation of machine-processable meta data. Central to the vision of the Semantic Web are ontologies. These are seen as facilitating knowledge sharing and re-use between agents, be they human or artificial [Fensel, 2001].They offer this capability by providing a consensual and formal conceptualisation of a given domain. As such, the use of ontologies and supporting tools offer an opportunity to significantly improve knowledge management capabilities on the intranets of organisations and on the wider web.

The use of ontologies and associated metadata can allow the user to more precisely express their queries. Users can choose ontological concepts to define their query or select from a set of returned concepts following a search in order to refine their query. This can improve the accuracy of a search and searching can also be extended, as we will see, by the use of a user profile or the context of a search – making searching personalised and aiding integrated and seamless searching.

Information sharing and information searching are separate but linked activities [Hyams and Sellen, 2003a, Hyams and Sellen, 2003b]. Information sharing is undertaken within a particular context. In order to undertake an activity, a user needs to gather information, such as facts, opinions, rules and procedures. Once that information has been gathered, as part of a user's day to day activities, the information may be shared with colleagues. In the simplest case, a user may just notify her colleague that a particular web page exists, or even email her colleagues a PDF file that may or may not be directly useful to their activities. Knowledge sharing takes place with the need for sophisticated tools.

A user's context is defined in two ways: firstly, by the social context in which an activity is undertaken; and, secondly, the information being used can be classified against the community's domain ontology. This paper proposes that the knowledge sharing tools could makes that link explicit by automatically gathering information, based upon a user's current browsing, and making the activity of sharing easy. The secondary purpose of the knowledge sharing tool is to allow a user to discover new social contacts or sources of information, by publishing comments about URLs.

2 Knowledge Sharing

Shneiderman [2003] proposes a model of knowledge and information sharing that incorporates the idea of a "social context" for information usage. Sheiderman's model suggests that users follow a sequence of "collate, relate, create, donate" for information sharing. A user may gather information for one purpose but may subsequently share that information to a wider group of people. The wider the information is shared, the greater the effort is involved in either the recipient understanding the information or in preparing the information with appropriate meta-data.

Marshall and Bly [Marshall and Bly, 2004] examined the behaviours associated with sharing clippings taken from paper and online magazines. Marshall and Bly identified that sharing of information was not solely based upon the information needs of the recipient: the information shared would often appear to serve a different function to that of satisfying an expressed need for advice or references. Furthermore, four main reasons for sharing were identified: information was shared to raise mutual awareness of a subject; clippings were shared to educate the recipient; information clippings were sent to develop rapport between the parties; and, clippings were shared to demonstrate knowledge about the recipients' respective interests. Therefore, the sharing of information, through clippings, had a joint purpose of re-enforcing and building social contacts, as well as explicitly transferring information; a knowledge sharing tool should also support the building of social networks.

Knowledge sharing is more successful as a dialogue, with both sides learning as part of the exchange [Rafaeli and Raban, 2005]. A person is more likely to contribute if they feel they have a contribution to make. Contrary to expectations, a person is more likely to share "unique" information that they hold rather than "public domain" information (which they feel is already "common knowledge"). The public goods theory of collective action postulates how to encourage members of a community to contribute to a shared resource, where the resource is available to all members of the public [Fulk *et al.*, 1996].

3   Knowledge Sharing Tool

SEKT has developed the PROTON ontology to describe information objects shared within organisations [Terziev *et al.*, 2005]. Within PROTON, a Person has a Profile which defines the user's interests in certain Topics; each user is specified as belonging to a number of groups or communities. Each Document is classified as belonging to a number of Topics.

The knowledge sharing tool allows web pages to be shared to other members of the user's immediate Team, looser communities of which they are a member or more widely. By sharing a web page, the user is also given the opportunity to state that the page belongs to their own local Topic, in parallel to the official Topic set, which allows a community to have its own vocabulary.
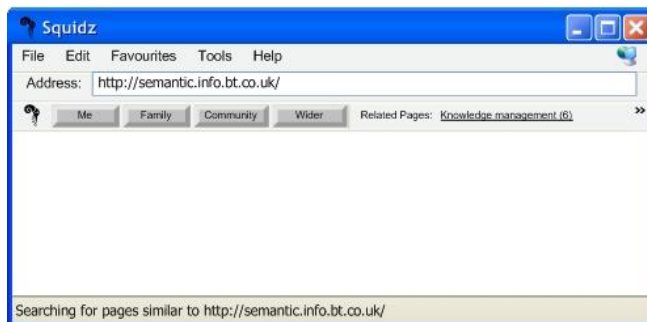

Figure 1: Initial user interface

As a user browses the internet or intranet, the knowledge sharing tool will classify the current page against the Topic hierarchy, and automatically fire a query to fetch other pages in related Topics, as defined by the current domain of interest. Furthermore, as the user browses web pages, the knowledge sharing tool will give priority to web pages the user's team members have chosen to share. By following the related pages, the user can make and amend comments or read comments left by their colleagues about those web pages. Importantly, the user can share pages to herself, which makes the software useful even if no contributions are made by members of the wider community.

Acknowledgments

Further project details may be found at http://www.sekt-project.com/.

References

BERNERS-LEE, T., HENDLER, J. & LASSILA, O. (2001) The Semantic Web. *Scientific American,* May, 2001.

FENSEL, D. (2001) *Ontologies: Silver Bullet for Knowledge Management and Electronic Commerce*, Springer-Verlag, Berlin.

FULK, J., FLANAGIN, A. J., MONGE, P. R. & RYAN, T. (1996) Connective and Communal Public Goods in Interative Communication Systems. *Communication Theory,* Six**,** One, 60-87.

HYAMS, J. & SELLEN, A. (2003a) Gathering and sharing Web-based information: Implications for "ePersons" concepts. HP Laboratories, Bristol. Web page http://www.hpl.hp.com/techreports/2003/HPL-2003-19.html, viewed on 27th April, 2005.

HYAMS, J. & SELLEN, A. (2003b) How Knowledge Workers Gather Information from the Web: Implications for Peer-to-Peer File Sharing Tools. *HCI 2003: Designing for Society.* Bath, UK. Web page http://www.hpl.hp.com/techreports/2003/HPL-2003-95.html, viewed on 27th April, 2005.

MARSHALL, C. C. & BLY, S. (2004) Sharing Encountered Information: Digital Libraries Get a Social Life. *Proceedings of the ACM/IEEE Joint Conference on Digital Libraries (JCDL04)*, 218-227. Web page http://www.csdl.tamu.edu/~marshall/pubs.html, viewed on 9th June, 2005.

RAFAELI, S. & RABAN, D. R. (2005) Information sharing online: a research challenge. *International Journal of Knowledge and Learning,* 1**,** 2, 62-79. Web page http://www.inderscience.com/search/index.php?mainAction=search&action=record&rec_id=6251, viewed on 3rd May, 2005.

SHNEIDERMAN, B. (2003) *Leonardo's Laptop: Human Needs and the New Computing Technologies,* London, England, MIT Press.

TERZIEV, I., KIRYAKOV, A. & MANOV, D. (2005) Base Upper Level Ontology Guidance. SEKT. Web page http://proton.semanticweb.org/, viewed on 25th July, 2005.

Demonstration – SEKT Knowledge Sharing Tool

The knowledge sharing tool has a browser based user interface, relying on a local browser proxy on the user's PC.

The knowledge sharing tool is currently under development, but it is envisaged that the system would operate in the following manner:

- A local proxy analyses the current web page, as well as a number of pages in the user's history.
- The knowledge sharing tool fetches pages based upon which pages have been denoted as useful from the user's community of peers.
- Pages annotated by INSPEC and ABI will also be available to the user (as described in SEKT's Digital Library case study) [Alsmeyer *et al.*, 2004].

The demonstration will show how comments can be made, as well as showing that pages visited are being semantically classified against a wider Topic ontology.
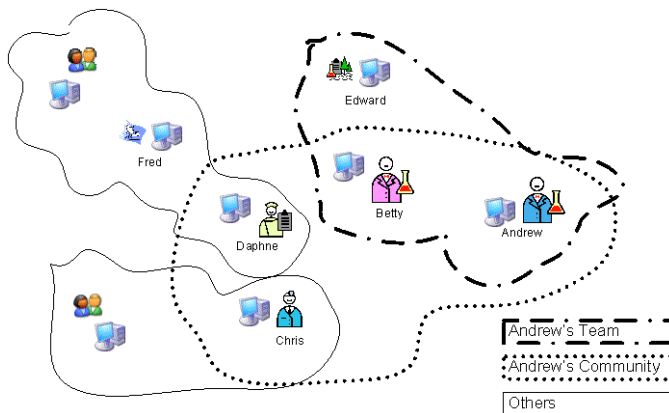

Figure 2: Social Networks

The demonstration will show a user can access their own annotated pages, as well as annotations and web pages shared by other people. Annotations propagate over the "friends of friends" contacts created by the overlapping groups of teams and communities.

References

Alsmeyer, D., Cheung, A., Kings, N., Skinner, F., Thurlow, I. and Warren, P. (2004) BT Digital Library Initial Analysis. SEKT Deliverable D.11.1.1. Web page: http://www.sekt-project.org/resources/publications/D11.1.1.pdf, viewed on 21st July, 2005.