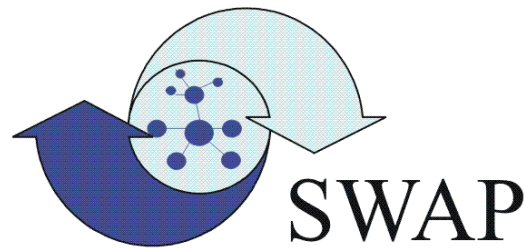


SWAP: Semantic Web and Peer-to-Peer

Annual Report 2002



<http://swap.semanticweb.org>

Today's societies depend predominantly on innovation as a generator of growth. Most innovation takes place within highly educated and interconnected groups. Innovation in a sophisticated environment as ours needs incorporation of existing knowledge and the collaboration between many groups. SWAP is an EU-funded project with the goal to develop highly innovative technology in the area of knowledge management and peer-to-peer to serve this objectives.

One prospective benefit will be facilitation of knowledge sharing between individual person. The user can easily provide information from his own personal computer, and search and retrieve information from other PCs e.g. in the department. The information exchange will be realized via an Open Source peer-to-peer network, which has the advantage of not requiring any central server and administration. The second benefit will be the individualization of work views. SWAP focuses on the use of Semantic Web technology, which allows computers to actually comprehend the meaning of its processed data by using ontologies. As a result SWAP can translate between the different individual users and they no longer have to adapt their information to a given structure.

SWAP will tackle the challenges brought up by this novel combination of the Semantic Web and Peer-to-Peer paradigms such that knowledge finding and sharing is effectively possible.

Summary of 2002 Activities

The SWAP project started work in 2002. Several focus areas were chosen for this year. The introduction comprised an analysis of the market of distributed knowledge management systems. Semantic Web and peer-to-peer technologies were closely researched. The case study partners performed detailed investigations of their requirements which are taken as basis for project developments. Ideas for realizing the requirements can be grouped in three areas: use of the standardized JXTA peer-to-peer platform, methods for the extraction of information from individual users, and the development of semantic search strategies in a peer-to-peer network. By the end of the year the architecture of the SWAP system was discussed and designed.

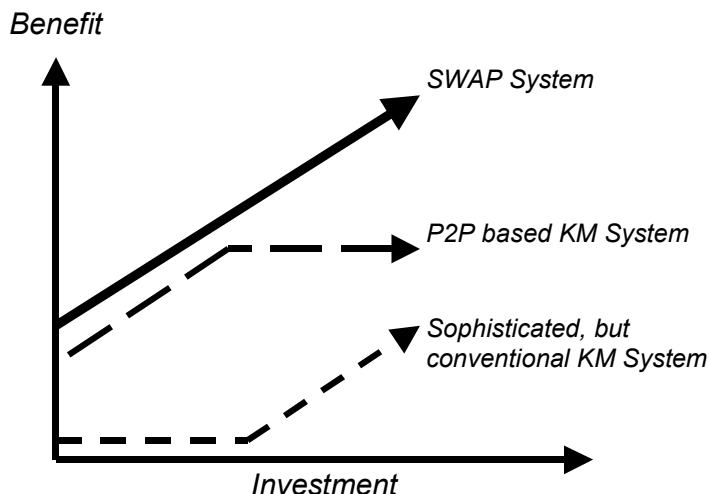
The project is heading for an easy-to-use distributed knowledge management system. For the year 2003 SWAP plans to implement the methods into a first prototype. This prototype will be evaluated in case studies and further enhanced.

The market of Distributed Knowledge Management systems

We found in a first examination of the distributed knowledge management market that the demand is huge, but there is scarce supply (see links at User involvement). The Groove system is among the first P2P based KM Systems. However, it uses conventional (like key words) search techniques. For the market size, at the current stage of the project it is hard to predict any market volume. This will follow, when the feasibility of our ideas has been proven.

The markets which seem promising at the moment are the tourism and the investment banking sector. The case studies will give us more insights about this assumptions. Among other sectors with a need for distributed knowledge management are consultancies and health care because of their dependency on knowledge and organization.

Knowledge Management needs a short term return on investment and an increasing benefit in the long term. The SWAP system will provide this, as shown in the figure. The rapid adoption of music sharing software like Kazaa just gives a hint of the growth potential achievable with P2P based systems. The market in itself for such enabling technology will be huge, still more important will be the value generated by the use of the technology.



Case studies: Information enabling Sustainable Development and analyzing companies

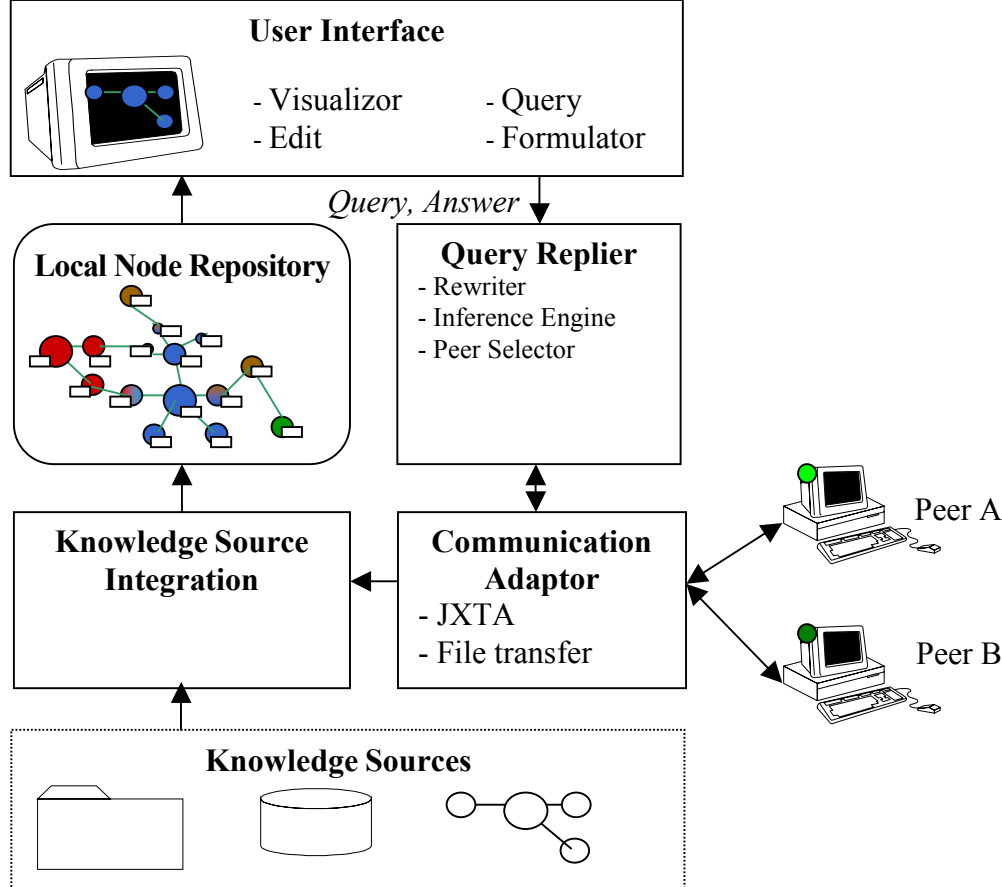
An often criticized point of existing knowledge management systems is, that they are IT driven and solve problems which the user did not have before. We will thoroughly examine our technologies in small case studies to meet user expectations and to show the effectiveness of our approach.

Majorca as one of the most popular holiday resources for Europeans is currently facing increasing competition from locations in countries with lower wages. A main strategic objective of the government is to create a better value proposition through the offer of Sustainable Tourism. Thereby the long-term success of the local tourism industry shall be guaranteed. This industry is dominated by small and medium enterprises. Information about best practices must be distributed among these highly decentralized actors. Further, information to monitor the transition must be collected from the different party, where the only common infrastructure are the open standards of the internet. A distributed knowledge management system in this environment must provide access to information from documents and legacy systems within a distributed infrastructure. Further, the exchange of information between different structures must be enabled.

We apply our system to a different situation in the Dresdner Bank case study. The SWAP system will support business analysts in their daily work. For a world wide acting company as Dresdner Bank the correct analysis of huge amounts of market information is of paramount importance for the lasting success of the bank. Business analysts collect and aggregate this unstructured information and provide the management with just the relevant information. Enabling access to different knowledge sources with independent structures in a secure way will help the Dresdner Bank to make better use of the generated knowledge.

Peer-to-Peer technology

The basic architecture of computer systems has evolved from the main frame architecture to the currently widely accepted client server architecture. Peer-to-peer network architecture is the natural successor in this development. The main idea in peer-to-peer networks is, that each peer has the same rights and capabilities as any other peer, which better reflects the actual situation of knowledge workers in the IT system they use. Existing peer-to-peer systems enable the user to send messages instantly (MSN messenger), to share files (gnutella) or to share computing power (SETI@home). However, query possibilities are very restricted and they all build on proprietary protocols. The SWAP system will be build upon the JXTA protocol which is an open protocol proposed by Sun Microsystems as a standard to exchange information in a peer-to-peer



environment. The figure shows the general architecture of the system. To enable the user to ask meaningful queries we use techniques known from the Semantic Web community.

The Semantic Web approach

The main problem of sharing knowledge with people via the computer, raises from the missing capabilities of the machine to recognize the meaning of the processed information. The most advanced approach to overcome this barrier is the application of ontologies to formalize knowledge in a machine and human readable form. This enables the user to search for information on the basis of meaning rather than syntax. One of the goals of the semantic web initiative of the W3C is to define a common language to represent ontologies. The unavailability of existing ontologies is currently a bottleneck for the wide application of them. One of the major innovations of the project is to develop techniques which enable the automatic generation of ontologies from existing structures. Through their interaction with the computer humans attach meaning to the documents they are working with. This information remained unused until now. For example, the information of receiver and subject of an email is not assigned to the attached document. This information and knowledge which was previously gathered in other circumstances might help to characterize the document in a better way. This was just one example of the unused resources which we can exploit to create ontologies and better the machine understanding about what we mean. The combination of information within the peer network will further augment the process.

User Involvement, Promotion and Awareness

The project participants cover a wide spectrum. The Vrije Universiteit Amsterdam and the University of Karlsruhe are the main research partners. Empolis UK Ltd., Empolis Polska Sp. Z. o. o. and, Meta4 Spain S.A. focus on development and exploitation. The case studies are provided by the Dresdner Bank AG and the Fundación IBIT (Spain). This spread of interests ensures a highly innovative working environment. From the project goals SWAP has similar interests as EDAMOK (ITC-IRST, Trento) and PADLR (L3S, Hannover). EDAMOK uses an approach with an own language to model context and focuses less on search strategies. PADLR provides personalized access to distributed learning repositories with a specific focus on searching learning material over a wide network.

The SWAP project was presented on conferences, mainly to the research community. Nevertheless especially peer-to-peer is a topic heavily discussed by the public. Activities like [Sun's JXTA initiative](#), [IBM Grid initiative](#), [HP Shock project](#), CSC report on [Knowledge Management and Peer-to-Peer](#) show the interest and involvement of companies in the peer-to-peer paradigm.

Future Work

Immediate future steps of the project are on a technical level, i.e. developing algorithms and implementing them into a prototype. This prototype will be thoroughly evaluated in the case studies. Refinement steps will follow. Product development and exploitation are planned for the last phase of the project. The idea of the project was accepted at several upcoming international conferences, which will considerably raise awareness. This also states that the research community is highly interested in Semantic Web and peer-to-peer problems and systems. Interest and research in this sector will continue on a long-term basis.

Further Information

Additional information can be found via our web page: <http://swap.semanticweb.org>.