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Environmental Management of Water Data in EU using Agent Technology

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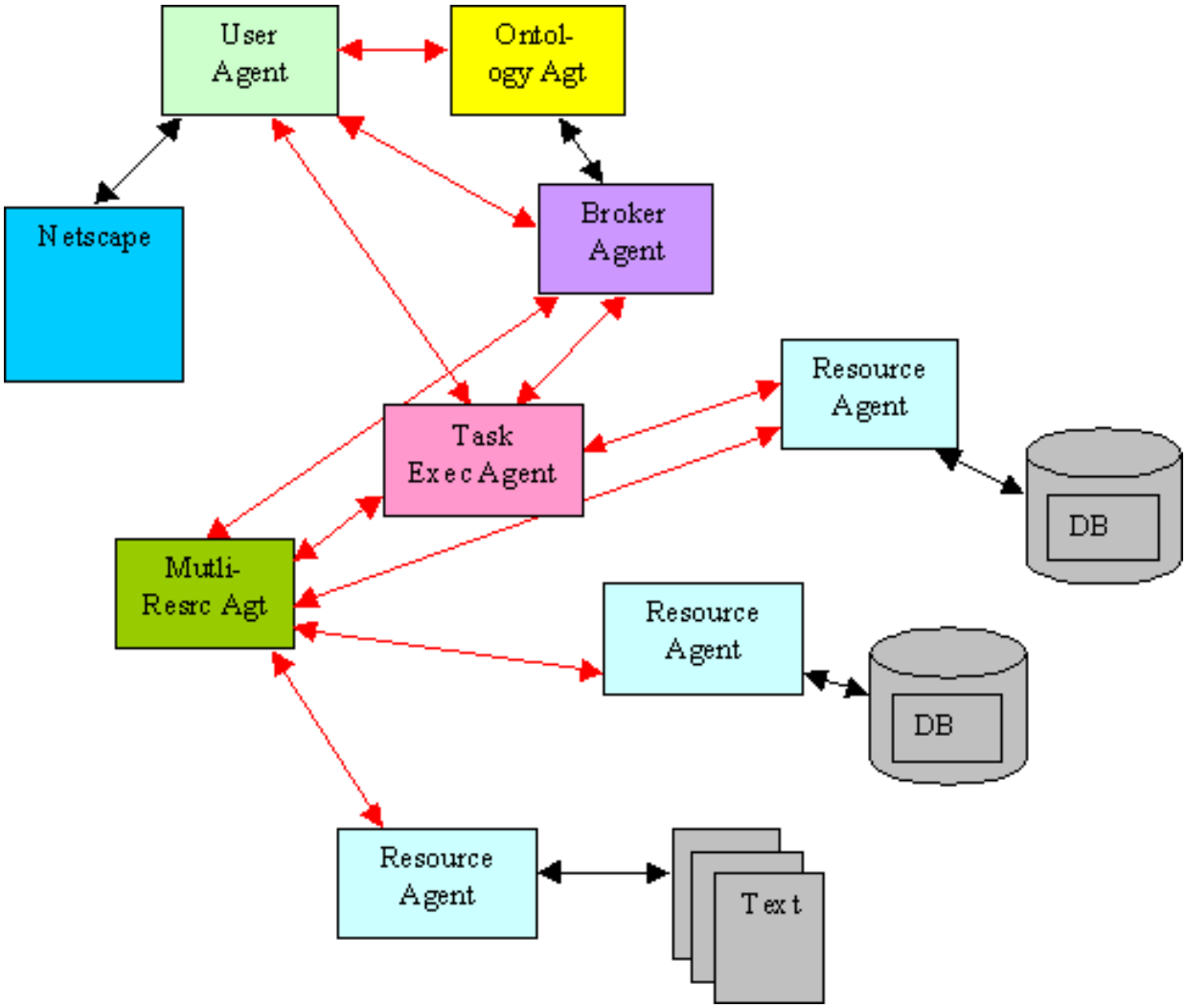
Abstract

A set of use cases for different user types has been defined for environmental issues related to inland water bodies within the EU. The following user types have been considered: Researchers, legislators/aggregators, policy-makers, commercial sector, and public. For each of these users, a typical question has been defined. On basis of these use cases, a technology was sought in order to retrieve the required information from the existing distributed environmental data available to the user.

In the paper will be described an environmental information system based on the technology of intelligent independent software agents. Each of the agents has a specific task in the complex process leading from the question raised by the user, through the formulation of specific (but database independent) queries, through to the specific queries sent to databases which the agents evaluate as potentially having an answer - or part of the answer - for the actual question. Such requests for information require a common “language”, a list of accepted and well-defined words, that is, the basis for an ontology, relevant for inland waters. When results are being returned, post processing will be performed in order to furnish the user with information in the most useful form. The post-processing consists of harmonising, aggregating, and presenting them in a consistent form, allowing variation in the level of detail presented, and integrating decision support tools for environmental management for the benefit of policy makers.

The technical approach is illustrated in the following diagram, where the various software agents each plays a role in assuring that the user gets the available data presented.

In the figure the user agent is the first to process the request from the user for a specific information. Depending on the situation, the request may then need to be translated through the ontology agent before it is passed to a broker agent and other agents which assures that the request is forwarded to the relevant databases. At the other end, the resource agents, specific to each of the databases to be accessed, are individual pieces of software, which are installed at the same computer as the database (resource) in question. On the way back to the user, the replies again may (or may not) pass the translator (ontology) agents to furnish a multilingual output as required.



Conceptual model of various possible intelligent independent software agents in an environmental information system.

The above technology will be exemplified by a demonstration of a pilot implementation, developed within the ongoing project EDEN-IW (Environmental Data Exchange Network for Inland Water), sponsored by the EU Commission (DG INFSO). The implementation is done in the FIPA-OS (Foundation of Intelligent Physical Agents – Open Source) open source environment - facilitating later applications in other areas. The implementation consists presently of the following agents: a user agent, a resource agent, an ontology agent, a broker agent, and a quality agent.