

<OpenAdap.net> : a dynamic Middleware for Knowledge Production and Distribution

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The Cyberspace has become the main site of information exchange and its extension in terms of bandwidth is opening the way equally to all media of information. However, most of this information flow still remains associated to a 'declarative' approach, i.e. associated to the knowledge of 'what', as illustrated by the access of web portals built around search engines of any kind. Thus, Internet has still a huge unexploited potential in applying the 'procedural' approach, complementary to the declarative one, based on the knowledge of 'how'. The procedural approach necessarily relies on a *trial-and-error* paradigm that may be achieved more efficiently when the results are shared within a community of agents, independently of their human or non-human nature. The benefits in terms of education, business developments, market diversification and creation of employment generated by the fast circulation and ease of access to the results of trial-and-error procedures clearly emphasizes the importance of the society, beyond the community of agents.

Knowledge sharing leads to share the methods of information processing and a true socialware develops becoming the vehicle for a user adaptive collaborative support. Despite the immediate worldwide availability of new information published at Internet, the tools of information processing (e.g., software programs and methods of data processing developed and provided by the academic as well as by the commercial communities) are generally released in small niches delimited by communities of interest. Potential meaningful contributions from the Cyberspace may remain unexploited, or even forgotten, within the same field of competence and their availability is severely restricted in particular for cross-fertilized applications to other fields. This situation often leads to the delayed re-invention of similar (if not the same) methods of information processing and, to some extent, the re-discovery of the same knowledge. Thus, the development of added-value activities created by sharing the knowledge is impaired and repeated unnecessary expenses are generated at worldwide scale with tremendous impact on the less favored countries. In addition, the current situation tends to create an artificial distance between those who 'produce' information and are keen to make it available and those who know how to process the information, with risk of erroneous applications of the available knowledge and false evaluation of its value.

<OpenAdap.net> is an Open Source middleware aimed at breaking the barriers existing in the flow of access to knowledge and information processing. These barriers increase the overall cost of knowledge production and distribution, thus restricting its availability to less favored communities and organizations. The middleware is designed to facilitate the dissemination of knowledge as well as its exposure to evaluation in ways that might be unanticipated and hence support the emergence and development of dynamic communities of users. The ability to evaluate and to find the best available solution to a given problem may have significant impact on a broad spectrum of areas such as economics, physics, environmental sciences, meteorology, and health care sciences, among others. By offering systems which aim to support community activities on network, it is possible to test alternative solutions and choose the most appropriate to one's need from its overall performance to solve specific problems. A direct benefit is to decrease the chance of re-invention of existing software and save time and expenses by the whole society.

The key to this vision is the development of a sharing architecture independent of a specific type of information and <OpenAdap.net> claims to fulfill these goals. Through programs like web portals and standalone applications interacting with the system, the community is allowed to share resources and tools that each of these domains typically use through their members contributions. Individual users of <OpenAdap.net> can be classified as either contributors of shared resources, or end-users. People who

develop and provide new methods of data analyses are able to share their contribution and people interested in processing their own data or access data stored elsewhere (e.g. in a community database) can extract the results of their analysis. In addition to individual use, <OpenAdap.net> is open to exploitation by networked organisations and alliances, by providing an infrastructure (the OAn-aware applications and plug-ins) with which they can share and integrate resources and develop new business solutions and opportunities.

<OpenAdap.net> being an Open Source project released under the GPL and LGPL licences, contributions are welcomed from developers and interested professionals. This is encouraged by the availability of publicly accessible development tools like a version control system, mailing lists and a bug tracker. By sharing a program and the computer running it, for example, contributors will keep complete control over their authorship as well as the source and binary codes for the software. At the same time, they will be responsible for maintaining and checking the quality of the results that the community will use and validate. From the viewpoint of contributors, <OpenAdap.net> makes possible the dissemination of resources and their exposure to application and evaluation by a broader community of users.

The support for broader evaluation of programs and data sets is particularly important in the social arena, as is the ability of other users to reproduce known results. Despite the emphasis of knowledge sharing the philosophy behind <OpenAdap.net> is that users' privacy is as important as contributors' traceability. We believe that any piece of information sent by an end-user for processing to a contributors' resource should be anonymized, yet the transactions are identified and that the activity is traced like in any computer system. Meta-information concerning the contributed resource like program authorship and version number should be made available to the end-user, as a mark of diligence to the contributor, but also to emphasize the responsibilities in the information processing chain and enhance quality assessment and reproducibility. As the users need to discern technological and informational elements to build the confidence in online services <OpenAdap.net> is designed to implement confidentiality (including identification, authentication, authorization and cryptography), integrity and traceability (including signature, responsibility and auditability). These are all security requirements necessary to keep confidence on e-services and e-business. Without confidence, knowledge production and distribution are not possible.

The <OpenAdap.net> Project stems from the collaboration between psychologists, economists, neurologists and information scientists having diverse interests and specialized backgrounds. We feel that such a transdisciplinary approach is a necessary way for the achievement of real advances in producing impacts in knowledge production and distribution. End-users are provided with the ability to browse and apply shared resources, and dynamically compose and integrate existing resources to leverage new research insights. When completed, the <OpenAdap.net> network of resource providers will be able to self-adapt via learning processes that could give rise to modifiable connections inspired by the way how the brain processes information. This approach makes <OpenAdap.net> closer to the complexity of a living organism and the socialware will benefit of the full range of advances achieved in the fast-growing fields of cognitive computation and computational intelligence.