



Donatella Castelli

Dr. Donatella Castelli is a researcher of the "Istituto per la Scienza e le Tecnologie della Informazione, A. Faedo" of the Italian Council of Research, Pisa (Italy). Her main interest is on digital libraries and in particular on Digital Libraries architectures and models. She has participated in several EU funded Digital Library Projects (ECHO, Cyclades, Scholnet, Open Archives Forum, DELOS, D-Lib Center). She has participated to the design of the ERCIM Technical Reference Digital Library and now she is leading the design of the OpenDLib Digital Library Service System.

Introduction

Digital library (DL) systems have greatly evolved in the last few years. DLs are no longer only the digital counterpart of physical libraries (or physical museums, video archives, etc.). Rather, they are becoming complex networked systems able to support the communication and collaboration among different, worldwide distributed user communities.

The current activity on DL focuses on the definition of DL systems capable of handling "digital objects" that are not only the analogous of books, journals, videos, archival records, but also scientific data, programs and any other kind of multimedia documents the user communities may define as appropriate instruments for supporting their communication. The new DLs offer not only basic services such as search, browse and dissemination; they provide secure, controlled and customisable working environments where the users can access a number of services. These are both services capable of applying complex transformations on the digital objects, like translation services, authority registries, transcript generators, etc., and services that support the user activity, like recommenders and co-operative work supporting tools.

The new DLs tend to be very large. In order to reduce their cost, they are often built by federating a number of heterogeneous content sources and services made available by organisations that agree to join the DL under certain "access and use policies". Third-party organisations can also participate in these DLs by creating new content and implementing new advanced services that use the content and services provided by the other members. In this framework, small organisations, like educational centres, local research institutions, etc., can participate by exploiting the resources made available by the other organisations.

The new DLs are also required to be highly expandable, i.e. they must be able to aggregate additional content sources and services, and to serve new communities of users. Sometimes users are enabled to create their personalised virtual views of the digital library. These views hide the heterogeneity of the content and service space thus providing more familiar and efficacious virtual working environments.

The development of these DLs requires infrastructures capable of satisfying requirements like distribution, sharing, interoperability, expandability, scalability, availability, security, etc.

The definition of an infrastructure with these characteristics has been one of the aims of the Scholnet Project (<http://www.ercim.org/scholnet>). This project, which has been scientifically led by ISTI-CNR, has designed and implemented an ad-hoc infrastructure for supporting digital library services and users. The Scholnet experience has proven that many of the requirements that must be covered by a digital library infrastructure are actually a subset of those addresses in a larger and more general scale by a Grid infrastructure. Moreover, it is also clear that a consistent number of other requirements can be satisfied by implementing appropriate Grid services.

Grids and the future

This outcome has stimulated the CNR to further explore the use of Grid technologies for building new DLs. We believe that these technologies not only can provide more general and secure solutions for the implementation of DL infrastructures, but they can also offer a new environment for the realisation of more efficient DL services. Indexing and collection building, for example, can be supported by different algorithms that overcome many of the limitations and bottlenecks of the current implementations.

Certain capabilities, like constructing virtual digital libraries, can certainly be more easily implemented on a Grid infrastructure than on a traditional distributed one. Moreover, an infrastructure and a corresponding middleware that is potentially shared among several different application domains, create the condition for better synergies between these domains. A DL can, for example, exploit the content of an astrophysical data centre for creating new documents while the learning tools of an e-learning application can exploit the material maintained by a DL.

The application of Grid technology to DLs is already ongoing in the US. This research focuses mainly on the handling of large, persistent data. Very limited attention is, however, dedicated to services. In Europe the DELOS Network of Excellence on Digital Libraries (<http://delos-noe.iei.pi.cnr.it/>) has identified the merging between Grid and DL technologies as one of the most important research issues. Research in this area constitutes one of the key activities of the proposed IST 6th Framework DELOS II Network of Excellence.

