# Chapter VI
# ALBA Architecture as Proposal for OSS Collaborative Science

**Andrea Bosin**
*Università degli Studi di Cagliari, Italy*

**Nicoletta Dessì**
*Università degli Studi di Cagliari, Italy*

**Maria Grazia Fugini**
*Politecnico di Milano, Italy*

**Diego Liberati**
*Italian National Research Council, Italy*

**Barbara Pes**
*Università degli Studi di Cagliari, Italy*

## ABSTRACT

*A framework is proposed that would create, use, communicate, and distribute information whose organizational dynamics allow it to perform a distributed cooperative enterprise also in public environments over open source systems. The approach assumes the Web services as the enacting paradigm, possibly over a grid, to formalize interaction as cooperative services on various computational nodes of a network. A framework is thus proposed that defines the responsibility of e-nodes in offering services and the set of rules under which each service can be accessed by e-nodes through service invocation. By discussing a case study, this chapter details how specific classes of interactions can be mapped into a service-oriented model whose implementation is carried out in a prototypical public environment.*

## INTRODUCTION

Open source software (OSS) for e-e-science should make reference to the paradigm of a distributed infrastructure over a multi-system grid, allowing data exchange through services, according to standard proposals in the areas of grid computing (Pollock & Hodgson, 2004) and service-oriented computing (SOC). In fact, biologists, medical doctors, and scientists in general are often involved in time consuming experiments and are aware of the degree of difficulty in validating or rejecting a given hypothesis by lab experiments.

Lab experiments are often still developed in isolation and tend to be small scale and specialized for ad hoc applications; there is limited potential for integration with broader reuse. One of the reasons for this lack of integration capability is that researchers need to be inter-networked in a cooperative enterprise style, although sharing data, programs, and resources in a nonprofit network of collaboration. Cooperative OSS environments can be a feasible solution for interconnection, integration, and large information sources sharing during experiment planning and execution. It is a common situation that information source owners, even members of a coalition, are not keen to delegate control over their resources to any common server. However, as long as ICT models, techniques, and tools are rapidly developing, there is a true hope to move towards the realisation of effective distributed and cooperative scientific laboratories. In fact, the concept of "what an experiment is" is rapidly changing in an ICT-oriented environment, moving from the idea of local laboratory activity towards a computer and network supported application including the integration of:

- A variety of information and data sources
- The interaction with physical devices
- The use of existing software systems allowing the potential deviation from a predetermined sequence of actions as well as the verifiability of research work and accomplishments
- The peculiar and distributed expertise of the involved scientists

In general, scientific experiments are supported by activities that create, use, communicate, and distribute information whose organizational dynamics are similar to processes performed by distributed cooperative enterprise units.

According to the frame discussed in Bosin, Dessi, Fugini, Liberati, and Pes (2005), in this chapter we stress the benefits of OSS for e-science considering that as many operating nodes as possible can work cooperatively sharing data, resources, and software, thus avoiding the bottleneck of licences for distributed use of tools needed to perform *cooperative scientific experiments*. In particular, this chapter presents an architecture based on nodes equipped with a grid and with Web services in order to access OSS, showing how scientific experiments can be enacted through the use of cooperation among OSS sites. Such a choice, besides reducing the cost of the experiments, would support distributed introduction of OSS among other actors of the dynamical networks, thus supporting awareness of OSS and their diffusion.

Specifically, this chapter describes the ALBA (Advanced Labs for Bioinformatics Agencies) environment aimed at developing cooperative OSS models and processes for executing cooperative scientific experiments (e-experiments). Cooperative processes, e-services, and grid computing are the basic paradigms used in ALBA, which can effectively support, through OSS, the distributed execution of different classes of experiments, from visualization to model identification through clustering and rules generation, in various application fields, such as bioinformatics, neuro-informatics, telemonitoring, or drug discovery. By applying Web services (Alonso, Casati, Kuno, & Machiraju, 2004) and grid computing, an experiment or a simulation can be executed in a cooperative