Data e-Infrastructure Initiative for Fisheries Management and Conservation of Marine Living Resources

# A Service for Statistical Analysis of Marine Data in a Distributed e-Infrastructure

Gianpaolo Coro, Antonio Gioia, Pasquale Pagano, Leonardo Candela

Istituto di Scienza e Tecnologie dell'Informazione A. Faedo - CNR, Pisa, Italy

## Context

In the Computational Statistics domain, experts need environments in which they **can easily manipulate data** and **run experiments** by themselves.

This is the case of Computational Biology, in which data mining procedures are usually applied to big datasets.

In such domain, Distributed e-Infrastructures have been yet indicated as possible enabling layers for scientists who want to **share data and results with other remote collaborators** and **run experiments in easy way**.

## Proposal

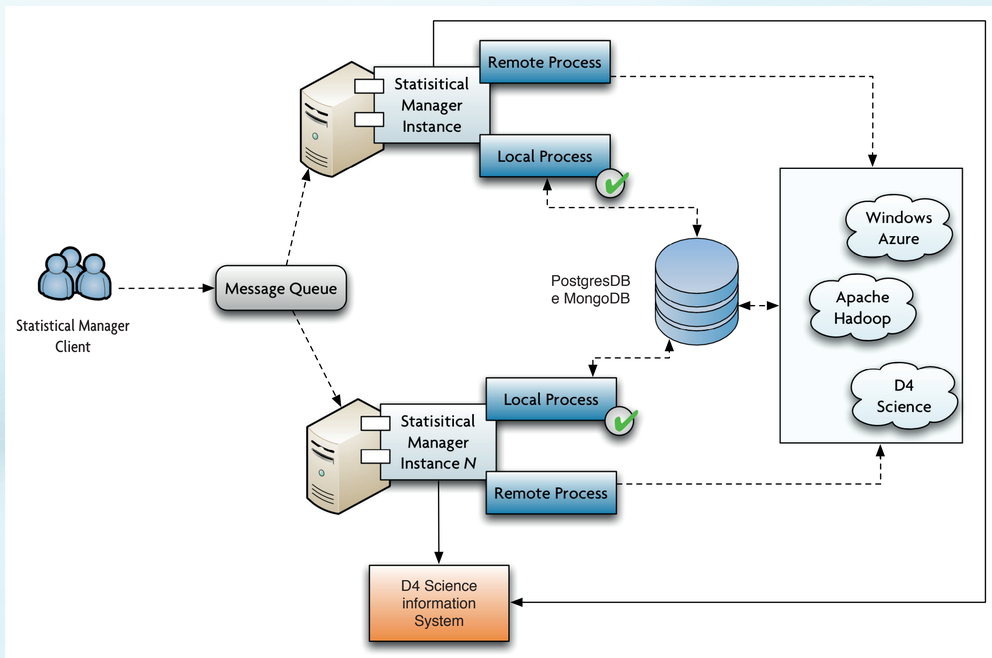
We propose a workbench software, named **Statistical Manager (SM)**, that offers a rich array of statistical computations and data mining applications for a variety of **biological and marine related problems**.

Capabilities:

- supplied "**as-a-Service**" via the D4Science distributed e-Infrastructure;
- **parallel and distributed computing** of demanding tasks on large datasets;
- **comprehensive and open set of off-the-shelf state-of-the-art implementations** of approaches to biological problems, that include: environmental features clustering, simulation of biology-related functions, simulation of climatic scenarios, niche modelling;
- **integrated with Virtual Research Environments**, that support workspace and storage systems to share large datasets, experimental parameters and results;
- exposed for programmatic consumption through **Java APIs** and **SOAP protocol**;
- endowed with an **automatically generated Web interface.**

## Statistical Manager Workflow:

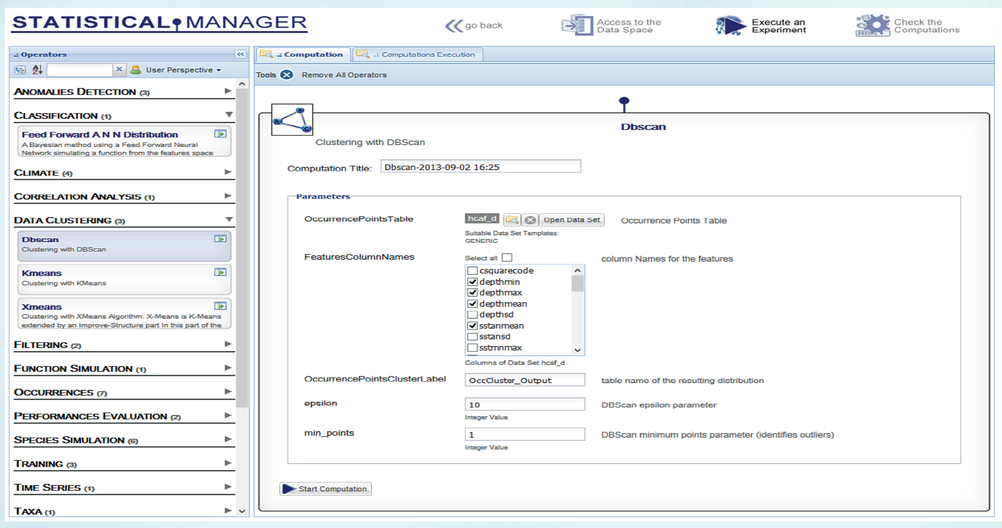
- The requests coming from the clients are distributed to the available services.
- The first SM instance that has free computational resources accepts the request and notifies its status to the D4Science Information System.
- This SM executes the algorithm on local or distributed computational resources.
- The outputs are stored as tables or files.




## Features

The Service defines five base operations that can be requested by clients:

- **GetCapabilities**: to retrieve service metadata (Capabilities), which describe the algorithms supplied by the service.
- **GetProcessDescription**: to retrieve detailed information about the processes that can be executed through the service. E.g. inputs and outputs descriptions based on an xsd schema.
- **Execute**: to run one of the processes listed among the Capabilities.
- **GetProcessStatus**: to check the completion status of a computation.
- **GetProcessOutput**: to retrieve the process output.




## Statistical Manager Web Interface:

On the left side: the list of Capabilities is grouped according to a user's oriented perspective.

On the right side: the GetProcessDescription is called to get the types of the inputs and outputs for the selected algorithm (DBScan). The GUI generates the required fields "on the fly" and displays them with the proper format.

## Highlights

SM implements a simple approach to integrate algorithms, including R scripts;

The Web GUI is automatically generated based on the algorithms inputs and outputs declarations. It allows scientists to execute and monitor the algorithms;

The parallel executions through D4Science are transparent to the user;

The features can be mapped onto OGC WPS specifications;

SM is a component of the gCube open source software system, that supports the development of Distributed e-Infrastructures and the definition of Virtual Research Environments.

www.d4science.org | www.gcube-system.org

Contact Person: Gianpaolo Coro, gianpaolo.coro@isti.cnr.it

iMarine Consortium

www.i-marine.eu ~ info@i-marine.eu

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