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GRID COMPUTING FOR CLIMATE PROCESSING ON SOUTH AMERICA

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Abstract: The LAG-Clima project leads with web-computing environment for data-grid and processing-grid. The goal is to establish a computer network linking institutions on South America for climate prediction on meso-scale, and to share and analyze data. Software platforms: BRAMS meteorological meso-scale code, OurGrid middleware (grid computing), OAR system for managing the jobs.

Resumo: O projeto LAG-Clima quer estabelecer um ambiente de computação em grade de processamento e compartilhamento de dados. O objetivo é manter uma rede de interconexão entre instituições na América do Sul para previsão climática em meso-escala e disponibilizar dados. Plataforma de softwares: BRAMS (código meteorológico de meso-escala), OurGrid (computação em grade), sistema OAR para gerencia de tarefas.

INTRODUCTION

This paper presents a research development sponsored by some national agencies for funding: MINCyT (Argentina), CAPES (Brazil), CNRS (France), CONCYTEC (Peru), ANII

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(Uruguay). Among the goals of the project, we cite: connecting computer resources geographically spread, seasonal climate prediction on meso-scale, sharing data, and data analysis.

Applications in climate research require large amounts of data and computing power. For the execution of this type of applications on a grid computing environment, it is necessary to have available a tool for transferring and store the required files related to the climate data set. The OurGrid middleware is the software platform employed. The grid environment is designed for processing a climate prediction model on meso-scale domain, and for sharing observational and simulated data. The BRAMS (Freitas et al., 2007 - see also: www.ourgrid.org/) was selected as the meso-scale meteorological model. Two regions were chosen to study in the project: La Plata river basin, and the Peruvian Andes.

2. GRID COMPUTING FOR CLIMATE

One strategy for connecting computer centers is by using the grid environment. The Ourgrid middleware is adopted for the project. This software platform will be used as a processing grid, as well as a data grid.

OurGrid middleware is organized as shown on Figure 1: a user/client submits a job by a web-portal; the submission is stored in the "jobs database", and a job-scheduler is activated; after that the processing is executed using different processing nodes (or "grid nodes" – local nodes uses OAR system (Capit et al., 2005)), and the output returns to the database to be shared and/or visualized for the same or other users.

The OurGrid links remote grid-nodes and includes at least three components: (a) *MyGrid*: user interface for job submission; (b) *OurGrid Peer*: executed on the peer machine of each administrative domain from the grid, it provides different grid-nodes for job execution; (c) *User Agent*: a software installed on each local grid-node for executing jobs from the local peer machine/node.

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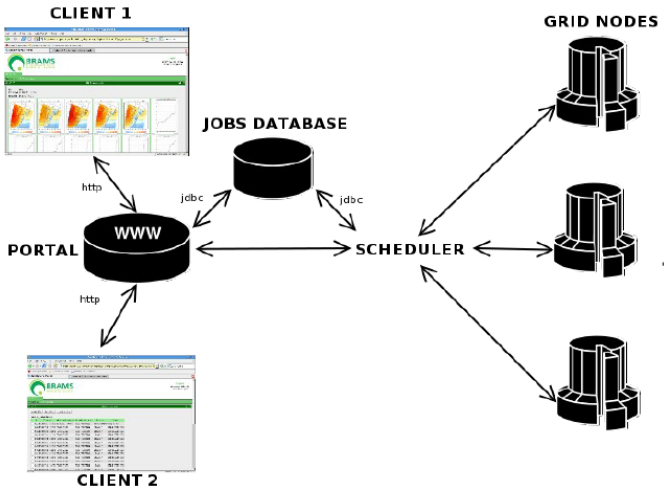


Figure 1: LAG-Clima grid architecture.

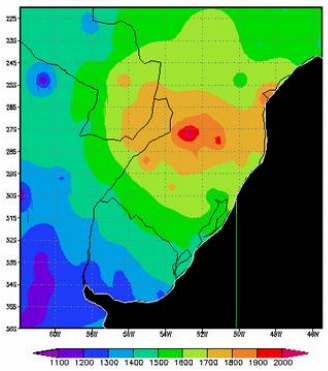
2.1 PROCESSING GRID

For grid, it is relevant to deal with low dependencies for data transfer, because the latency available today does not allow a fast information change using the internet. The ensemble prediction could be classified as a “bag-of-task”. Such demand is appropriate to take advantage of a grid. The grid will be used to address two demands: compute the climatology for the two mentioned regions (initially 10 years), and operation for seasonal climate prediction on mesoscale.

2.2 DATA GRID

The grid environment can also be used to share, transfer, and data analysis. A database for meteorological information is based on PostgreSQL database package (Ruiz, 2103).

(a)



(b)

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Figure 2: Data Grid: (a) database on LAG-Clima web-site, (b) data analysis: Kriging monthly precipitation interpolation (example shown: 1991-2000 period – data from the meteorological services: Argentina, Brazil, Uruguay).

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