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Geospatial Applications on Different Parallel and Distributed Systems in enviroGRIDS Project

D. Rodila, V. Bacu, and D. Gorgan

Technical University Cluj-Napoca, Computer Science, Cluj-Napoca, Romania (denisa.rodila@cs.utcluj.ro, victor.bacu@cs.utcluj.ro, dorian.gorgan@cs.utcluj.ro)

The execution of Earth Science applications and services on parallel and distributed systems has become a necessity especially due to the large amounts of Geospatial data these applications require and the large geographical areas they cover. The parallelization of these applications comes to solve important performance issues and can spread from task parallelism to data parallelism as well. Parallel and distributed architectures such as Grid, Cloud, Multicore, etc. seem to offer the necessary functionalities to solve important problems in the Earth Science domain: storing, distribution, management, processing and security of Geospatial data, execution of complex processing through task and data parallelism, etc.

A main goal of the FP7-funded project enviroGRIDS (Black Sea Catchment Observation and Assessment System supporting Sustainable Development) [1] is the development of a Spatial Data Infrastructure targeting this catchment region but also the development of standardized and specialized tools for storing, analyzing, processing and visualizing the Geospatial data concerning this area. For achieving these objectives, the enviroGRIDS deals with the execution of different Earth Science applications, such as hydrological models, Geospatial Web services standardized by the Open Geospatial Consortium (OGC) and others, on parallel and distributed architecture to maximize the obtained performance.

This presentation analysis the integration and execution of Geospatial applications on different parallel and distributed architectures and the possibility of choosing among these architectures based on application characteristics and user requirements through a specialized component. Versions of the proposed platform have been used in enviroGRIDS project on different use cases such as: the execution of Geospatial Web services both on Web and Grid infrastructures [2] and the execution of SWAT hydrological models both on Grid and Multicore architectures [3]. The current focus is to integrate in the proposed platform the Cloud infrastructure, which is still a paradigm with critical problems to be solved despite the great efforts and investments.

Cloud computing comes as a new way of delivering resources while using a large set of old as well as new technologies and tools for providing the necessary functionalities. The main challenges in the Cloud computing, most of them identified also in the Open Cloud Manifesto 2009, address resource management and monitoring, data and application interoperability and portability, security, scalability, software licensing, etc.

We propose a platform able to execute different Geospatial applications on different parallel and distributed architectures such as Grid, Cloud, Multicore, etc. with the possibility of choosing among these architectures based on application characteristics and complexity, user requirements, necessary performances, cost support, etc. The execution redirection on a selected architecture is realized through a specialized component and has the purpose of offering a flexible way in achieving the best performances considering the existing restrictions.

References:
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