Grid computing, a transactional approach

Extended Abstract

In the computing reality of this first decade of the XXI century, such as in about all other aspects of reality, the defining word is globalization, which in computational terms translates the traditional in-house supercomputer clusters of yesteryear into grids of computers scattered all over the world. Moreover, these grids are usually inter-organizational and heterogeneous entities equipped with multi-purposed software layers that enable them to execute different and unrelated computations and/or services ordered by multiple independent clients of varying nature and backgrounds. Furthermore, some of these services spawn and must develop other services or computations in the same or other grids.

The emergence of grid computing in vital sectors such as biomedical research, meteorology, business and economic projections, etc. demand that the operation of these systems is conducted in a trustful way, and thus the need of adapting transactions in a way that ensures the scalability nature of the grid model and, at the same time, reflects, with the obvious and essential loosening and decoupling inherent to grid systems, an ACID[1]-like integrity.

In this paper, the discussion is centered into the different approaches that have been proposed for providing a transactional process model for grid computing entities. Concretely, the argumentation will revolve around the convenience of adapting current transaction solutions[2], incorporating control principles of other technologies with the same distributed background Grid has[3] and devising ad-hoc methods for transaction-like control.

To properly achieve the objective of comparing and evaluating the different current methods available for handling transactions in grid computing solutions, the paper will be articulated on an introduction of several key components that determine the goodness of such a system, a proper comparison of the methodologies, an insight section on which some changes or new proposals on the previous aspects will be made, and the final outline and conclusion.

The scrutiny about the convenience of the different proposed approaches will be a thoroughly aspect by aspect revision and side by side comparison of the strengths and weaknesses of each of the aforementioned solutions. In particular, some of the aspects that will be reviewed are the differences with which they affront the typical ACID[4] principles, especially the consistency and whether they settle for a complete rollback approach, or a partial rollback for compensation. Grid computing, though, needs extra checks and adaptations and thus, part of the paper will discuss the nature of the transaction control, whether it is handled by a server, partially distributed through a group of servers or completely distributed among all the workstations. The handling of errors in composed transactions is also a matter

1 ACID is an acronym that stands for Atomicity, Consistency, Isolation and Durability.

2 Qi, Z. and X. Xie, B. Zhang, and J.You, (2004). Integrating x/open dtp into grid services for grid transaction processing. In FTDCS, pages 128-134. IEEE Computer Society.

3 Türker, C. and K. haller, C. Schuler, and H.J.Schek, (2005). How can we support grid transactions? Towards peer-to-peer transaction processing. In CIDR, pages 174-185.

4 See footnote 1.

of study and some focus will be put on the locking avoiding mechanisms such as the ones present in the third footnote paper. Another meaningful subject to this paper is the handling methodology for dealing with allocating and distributing the services and transactions through the grid, particularly the disjunctive between higher load room versus proximity in cases of dependent transactions, which could be a factor in highly parallelized and/or short term transactions.

Posteriorly the argumentation will move on to the the insight section on which the author will try to merge some of the debated proposals strong points in an ideally feasible implementation of transactions for Grid computing. Additionally, some not directly related principles such as those found in filesharing systems, concurrent programming and, more generally, distributed systems, will be tried and/or studied for applicability in the grid transactions field.

Finally, the outline and conclusion section will try to give some recommended guidelines for deploying grid computing systems supporting one of the analyzed transaction systems or one of the ideally proposed ones, stating the benefits and concordance of several typical grid applications and their suggested transactional model. To conclude this section and the paper, some topics which the author believes should be object of further research will be given.