Institut de Recherche
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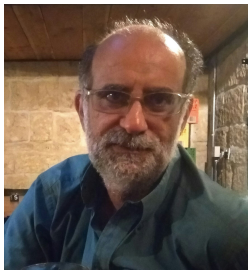
Séminaire



Mercredi 6 Février 2019
14h00 – 16h00
UT3 Paul Sabatier, IRIT, Salle des Thèses

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Scaling OLTP throughput over data centres

Mots-clés : Distributed Databases, Transactions, Causal Consistency, Middleware, Actor Model

Résumé : Adopting levels of availability, consistency and partitioning for data resident over multiple data stores is known to be overloaded with trade-offs that affect an OLTP's reliability, scalability and maintainability. If scalability is earmarked as the driving force in a cloud system's elasticity then one has very few data consistency models to choose from.

In this presentation, causal consistency, described as a schedule in which causally-related data access appear in the same sequences to all data processes, is selected as the data consistency model. Furthermore, casual consistency is the strongest type of consistency that can be achieved when data is stored in multiple data stores, and fault tolerance is desired. This study considers the effects of various loads applied to an OLTP database with various set-up options have on correctness, performance and scalability operations have on the database undergoing job scheduling through causal consistency. One OLTP adopted in this study is based on the well-known YCSB data set and its workload schedules.

To implement and study data consistency options over OLTP operations, a middleware system, called Thespis, is being developed that uses the Actor model to leverage and implement causal consistency over a DBMS, whilst abstracting complexities for application developers behind a REST open-protocol interface. With this evaluation harness, empirical experiments on selected data sets show promising correctness, performance and scalability results within a causal consistency scheduling framework. Furthermore these results are used as baseline data to compare with additional functionality stacked onto future versions of Thespis.

With the adoption of causal data consistency a number of data integrity issues appear and these need to be addressed. One of these is the Time-To-Check-Time-To-Use (TOCTOU) race conditions and our Thespis middleware offers read-only transaction capabilities to allow data processes to read a causally-consistent version of multiple data entities. Another issue is the enforcement of integrity constraints. We show that for a subset of constraints, i.e. of Linear Arithmetic Inequality constraint types, Thespis preserves these constraints in a causally-consistent and distributed database, whilst minimising latency in the user's critical path. Any mechanism introduced in Thespis to counter act these issues entails the re-valuation of the empirical tests and comparison to our initial baseline results.

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