ABSTRACT

Fault Tolerance in COPAR

Sharda Beharry

Today, distributed computing systems are used extensively to solve various types of problems. One approach for increasing performance and availability in a distributed system is to replicate data items at different sites. However, with replication, the consistency of data across the sites may become compromised. COPAR is a distributed service that integrates optimistic processing and pessimistic processing for managing updates to counter like replicas at a predetermined penalty. It trades consistency for availability and the variable, *system cost bound*, captures the level of inconsistency the system can tolerate.

The service runs over the Internet and there are different classes of failure that may affect the servers and communication links involved and modest attention has been given to these failure types in the context of the combination concurrency control technique. Another problem with the technique developed thus far is that the formula used for calculating a new system cost bound at the end of permanent processing may overstate the number of resources available for allocation by temporary processing.

This thesis recommends methods for detecting failure and prescribes in detail the actions that should be taken by servers in the context of the role being performed during processing. The research undertaken seeks to propose and evaluate a new cost bound formula that more accurately reflects the number of resources available for temporary allocation. A system that implements these recommendations has been built and performance of the system is evaluated in this report.

The results indicate that almost all transactions submitted to the system are committed despite the occurrence of failure. In addition, clients enjoy a quicker response, facilitated by temporary processing, than they would have under traditional pessimistic schemes. Also, the formula introduced in this thesis, albeit simplistic, avoids violations experienced under the old cost bound formula.

Keywords: Distributed System; Replication; Consistency; Availability; Pessimism; Optimism; Fault Tolerance.