



Non-Confidential Description  
**Portfolio of Technologies Related to Database Concurrency Control**

Technology Case: RFT-79\_99

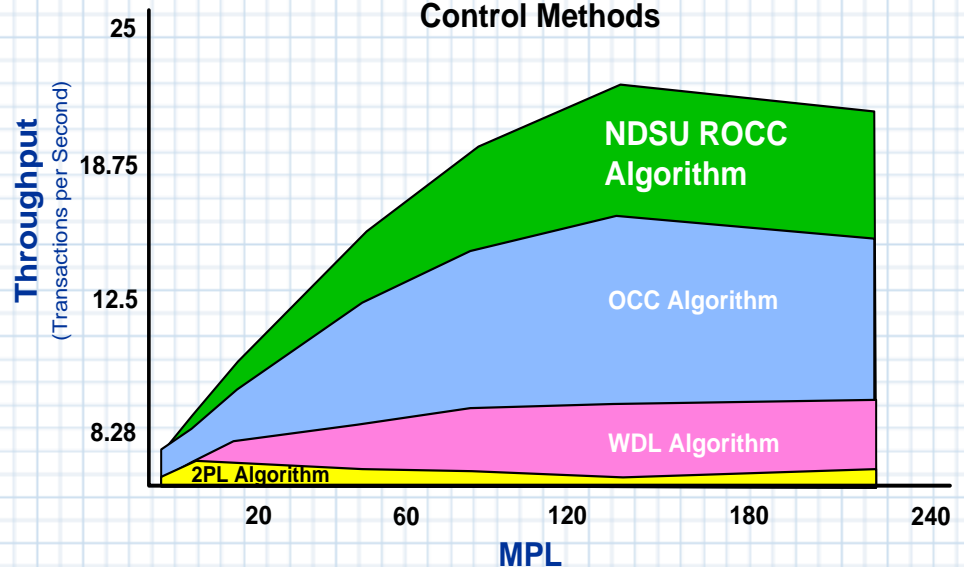
### Invention Summary

This invention is a Read-commit Order Concurrency Control (ROCC) method for centralized database systems.

“Concurrency control” refers to a means of making sure there are no conflicts between one system reading a database and another system writing to the database at the exact same time, causing data read errors.

This technology can be used to prevent data corruption due to competing systems trying to write and read data from the same location in a database. This technology offers a significant improvement in speed and efficiency over existing concurrency control methods. When analyzed against other leading concurrency control methods, the NDSU ROCC technology provides higher throughput in number of transactions per second. The top line of the graph shown on the right represents the throughput of the NDSU ROCC method, and the three lines below the ROCC line, from highest to lowest, represent the throughputs of the optimistic concurrency control (OCC), weight depth limit (WDL), and two-phase locking (2PL) methods, respectively.

**Comparison of Transaction Throughput Rates of ROCC versus Leading Concurrency Control Methods**



### Benefits

- Data throughput increase ranging from **150% to 240%** compared to existing methods.
- Unlike existing, lower-throughput methods of concurrency control, ROCC is able to meet the increasing needs of high performance in today's Internet-based business, such as online shopping, stock trading, movie rental, and search engines.
- Can be used in database management systems with high throughput and **real-time access** requirements.
- The multi-version ROCC method solves the “write skew” problems inherent in the Snapshot multi-version concurrency control (MVCC) algorithms used by industry leader Oracle and the open-source PostgreSQL standard.

## Invention Premise

This invention comprises a Read-commit Order Concurrency Control method for centralized database systems (ROCC). ROCC is a deadlock-free concurrency control method based on optimistic mechanisms. It maintains a Read-Commit queue (RC-queue) that records the access order of transactions. Along with the RC-queue, an intervening validation method is developed and used for execution validation. In addition to traditional operation conflict, the new concept of element conflict is introduced and used. Through the intervening element conflict check, the transaction restarts and validation complexity are reduced.

## Patents

This invention is protected by an issued US Patent No. 7,051,028, which is immediately available for licensing.

## The Lead Inventor



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Dr. William Perrizo is North Dakota State University Distinguished Professor and Fargo-Moorhead Chamber of Commerce Distinguished Professor of Computer Science at North Dakota State University. He received his Ph.D. from the University of Minnesota, Minneapolis, in 1972, his M.S. from the University of Wisconsin, Madison, in 1967 and bachelor's degree from St. John's University in 1965. Dr. Perrizo has over 200 refereed publications including over 50 journal papers. He has been a Research Scientist at IBM ABS in Rochester, MN, a Research Scientist at the U.S. Air Force Electronic Systems Division at Hanscom Air Force Base, MA, a Visiting Professor at the University of Minnesota, and a Visiting Assistant Professor at Oregon State University. Dr. Perrizo's expertise is in Database Systems, Data Mining, Knowledge Discovery, Distributed Database Systems, High Performance Computer Systems, Communications Networks, Precision Agriculture, Bio-informatics, and Remotely Sensed Imagery Analysis.

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