Optimistic Synchronization and the Natural Degree of Parallelism of Concurrent Applications

Jörg Schenker
joerg.b.schenker@gmail.com

24. Oktober 2011

Zusammenfassung

Kapitel 1

Work Done

- gnuplotscript additional functionality (standard deviation) and nicer viewdoc
- changed stamp to run with a random amount of thread instead of only to run with powerOfTwo threads. It was that we added a new keyword to stamp and use the ßimulatedmode where threads are managed. This then uses pthread and not the internal bintree as barrier.
- run on velox and on ubelix
- learn about stamp and tinySTM
- run many different kind of experiments on velox.
- found segFaults with yada and reparied several bugs. There are still bugs in it, but much less. It crashes much less often. Bugs were of the form TM_SHARED_READ_P not used arround pointer redings. tried to fix yada over a long time.
- there was a (minor?) bug in stats.pl, found and fixed it.
- run special tests with all benchmarks. Found ETLmodular to be much slower on some benchmarks than ETLsuicide
- found that memmory-problems only exist with yada and only under ETLmodular (tried to localize and repair the bug)
- fixed not compiling kmeans (under seq) (added fix in my stamp version)

Kapitel 2

STAMP STATUS

2.1 yada

2.1.1 ETL-modular

here we have our memory usage problems. On velox it crashes (used more than 60 GB of ram) allready with 14 threads. On my notebook it still works up to 40 threads, but halts the hole system with 50 threads. Yada has no bugs with ETL. (no bug that might lead to a segFault) When the critically amount of threads is used, it suddenly (like one out of five times) starts to allocate memory in a very very constant speed. I think it stops executing useful things, just allocating mem, more than 10 times as much as it uses on other runs... Used NO_DUPLICATES_IN_RW_SETS flag, but it didn't change anything.

2.1.2 CTL

Yada used to crash always with CTL. After several fixes it only crashes every 10th or twentiest time. There is a special yada version with lots of (particulary maybe usless) fixes that crashes even i think less often. the memmory bug happens also with CTL.

2.2 ETL-MODULAR

while running several benchmarks with etl modular, we found several benchmarks having a much lower speed. While some benchmarks (like labyrinth) did not show any differences between etl-modular, etl-suicide and ctl-suicide, there were others like genome, which went really down upon changing to the modular flag.

seq results under some kmeans: file not found. did it compile? no it didn't. fixed it. was a problem in stamp-0.9.10/lib/tm.h

Kapitel 3

References

1. TinySTM, Version 1.0.0; (2010)
   http://tmware.org/
2. STAMP, Version 0.9.10; (2008)
   http://stamp.stanford.edu/
3. Rick Merritt, EETimes; IBM plants transactional memory in CPU (2011)
   http://www.eetimes.com/electronics-news/4218914/IBM-plants-transactional-memory-in-CPU
4. Pascal Felber, Christof Fetzer, and Torvald Riegel, Proceedings of the 13th ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming (PPoPP); Dynamic Performance Tuning of Word-Based Software Transactional Memory (2008)
   http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.141.7646&rep=rep1&type=pdf
5. Nir Shavit, Dan Touitou; Software Transactional Memory (1995)
   http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.81.8510&rep=rep1&type=pdf
6. Bratin Saha, Ali-Reza Adl-Tabatabai, Richard L. Hudson, Chi Cao Minh, Benjamin Hertzberg; McRT-STM: A High Performance Software Transactional Memory System for a Multi-Core Runtime (2006)
   http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.96.6412&rep=rep1&type=pdf
7. Chi Cao Minh, Martin Trautmann, JaeWoong Chung, Austen McDonald, Nathan Bronson, Jared Casper, Christos Kozyrakis, Kunle Olukotun; An Effective Hybrid Transactional Memory System with Strong Isolation Guarantees (2007)
   http://tcc.stanford.edu/publications/tcc_isca2007.pdf
8. Cilk, Version 5.4.6, The Cilk Project (1998)
   http://supertech.csail.mit.edu/cilk/
   Cilk Manual (1998)
   http://supertech.csail.mit.edu/cilk/manual-5.4.6.pdf
9. Milind Kulkarni, Martin Burtscher, Rajasekhar Inkulu, Keshav Pingali, Calin Cascaval; How Much Parallelism is There in Irregular Applications? (PPoPP 2009)
   http://users.ices.utexas.edu/~burtscher/papers/ppopp09b.pdf
10. Calin Cascaval, Colin Blundell, Maged Michael, Harold W. Cain, Peng Wu, Stefanie Chiras, Siddhartha Chatterjee; Software Transactional Memory: Why Is It Only a Research Toy? (2008)
    http://queue.acm.org/detail.cfm?id=1454466
    Lonestar (2011)
    http://iss.ices.utexas.edu/?p=projects/galois/lonestar
11. Pascal Felber, Christof Fetzer, Ulrich Müller, Torvald Riegel, Martin Süßkraut, Heiko Sturzrehm; Transactifying Applications using an Open Compiler Framework (2007)
    www.cs.rochester.edu/meetings/TRANSACT07/papers/felber.pdf
12. Gokcen Kestor, Roberto Gioiosa, Tim Harris, Osman S. Unsal, Adrian Cristal, Ibrahim Hur, Mateo Valero; STM^2: A Parallel STM for High Performance Simultaneous Multithreading Systems
    http://www.bscmsrc.eu/sites/default/files/pact11.pdf