

CMSC 724, Spring 2015: Homework 5

Due Friday April 17, 2015, 11:59pm.

The homework is to be done by yourself. You are free to make reasonable assumptions about the problem if something is not fully specified – make sure to state any assumptions. Try to be concise in your answers. You can turn in a hard copy if you'd like before the deadline (slide under my office door if I am not there). Total weight = 5%.

1. Explain the P4C phenomenon described in the “Critique of ANSI SQL Isolation Levels”, how it differs from the standard P4, and how they both relate to CURSOR STABILITY isolation level.
2. In a majority quorum system, if an object has N replicas, then updating a majority (i.e., $\lfloor N/2 + 1 \rfloor$ replicas) is enough. So eager replication strategy discussed in the “Dangers of Replication” paper can be modified to require eagerly updating only those many replicas, and lazily updating the rest. How would the conclusions of say Section 3 change under that setting? You don't have to rederive the equations – thoughts on how they might change and why, would be enough.
3. (ARIES) Concisely and clearly explain why “System R paradigm of undo preceding redo is incorrect with WAL and fine-granularity locking” (Section 10.1).
4. In the basic 2-Phase Commit protocol, explain why the coordinator must force-write COMMIT record before sending COMMIT messages to the subordinates (i.e., what could go wrong if the coordinator did not do this).
5. Briefly explain for what the authors of the PBS paper (Bailis et al.; CACM 2014) use Monte Carlo simulations, and how they use it.