



**Exercises**  
**Distributed Systemes: Part 2**  
**Summer Term 2014**  
30.6.2015

## 4. Exercise sheet: Recovery and Commit Coordination

### Exercise 1

Judge whether the following statements about recovery are true or false. In your assessment, give clear reasons:

- A. Recovery techniques are employed by DBMSs to guarantee the isolation and durability transactional properties.
- B. The write-ahead logging principle (WAL) states that all log records for a given updated page should be written to stable storage before the page itself is written and that a transaction is only considered to be committed after all its log records have been written to stable storage.
- B. Using an operating system or disks with an active write(-back) cache is safe for both log and data storage
- D. When a no-force and no-steal strategy is used, one must implement schemes both for the redo of operations from committed transactions whose changes have not yet been written to the database and for the undo of operations from uncommitted transactions that have already updated the database.
- E. Physical logging implies that only actions, not images, processed by the system are written to the log.

### Exercise 2

Characterize centralized 2PC and linear 2PC with respect to

- (1) message and time complexity,
- (2) possibilities of processes to become uncertain.

### Exercise 3

Consider the following scenario. The server at a travel agency initiated a distributed transaction involving four other participants – an international airline company (P1), a domestic airlines (P2), a hotel chain (P3) and a car rental agency (P4). The travel agency acts as the coordinator (C) in this transaction and can communicate directly with all other participants. Assume that all parties agree to the transaction and are willing to commit.

- A. Assuming that there are no failures, describe the sequence of messages exchanged and the log entries written at each site when using the 2PC protocol to carry out this transaction.
- B. Now, suppose that participant P2 crashes just after sending the “vote-commit” message (i.e. this message is successfully received by the coordinator) and there are no further failures. Repeat the previous question for this modified scenario and show the final state of each participant including the coordinator. Are any of the participants blocked?
- C. If you use the 3PC protocol instead of 2PC for the scenario in part [B] above, what would be the sequence of messages and log entries? What would be the final state of each participant?