

## INF3100: Databasesystemer – Oppgaver logging

**Oppgave 17.2.7:** Consider the following sequence of UNDO log records:  $\langle \text{START S} \rangle$ ;  $\langle \text{S, A, 60} \rangle$ ;  $\langle \text{COMMIT S} \rangle$ ;  $\langle \text{START T} \rangle$ ;  $\langle \text{T, A, 10} \rangle$ ;  $\langle \text{START U} \rangle$ ;  $\langle \text{U, B, 20} \rangle$ ;  $\langle \text{T, C, 30} \rangle$ ;  $\langle \text{START V} \rangle$ ;  $\langle \text{U, D, 40} \rangle$ ;  $\langle \text{V, F, 70} \rangle$ ;  $\langle \text{COMMIT U} \rangle$ ;  $\langle \text{T, E, 50} \rangle$ ;  $\langle \text{COMMIT T} \rangle$ ;  $\langle \text{V, B, 80} \rangle$ ;  $\langle \text{COMMIT V} \rangle$ . Suppose that we begin a nonquiescent checkpoint immediately after one of the following log records has been written (to memory):

- a)  $\langle \text{S, A, 60} \rangle$
- d)  $\langle \text{U, D, 40} \rangle$

For each, tell:

- i. When the  $\langle \text{END CKPT} \rangle$  record is written, and
- ii. For each possible point at which a crash could occur, how far back in the log we must look to find all possible incomplete transactions (both when the  $\langle \text{END CKPT} \rangle$  record was written, and when it was not).

**Oppgave 17.3.2:** Repeat Oppgave 17.2.7 for REDO logging.

**Oppgave 17.4.1:** For each of the sequences of log records representing the actions of one transaction T, tell all the sequences of events that are legal according to the rules of undo/redo logging, where the events of interest are the writing to disk of the blocks containing database elements, and the blocks of the log containing the update and commit records. You may assume that log records are written to disk in the order shown; i.e., it is not possible to write one log record to disk while a previous record is not written to disk.

- a)  $\langle \text{START T} \rangle$ ;  $\langle \text{T,A,10,11} \rangle$ ;  $\langle \text{T, B, 20,21} \rangle$ ;  $\langle \text{COMMIT T} \rangle$ ;
- b)  $\langle \text{START T} \rangle$ ;  $\langle \text{T,A, 10,21} \rangle$ ;  $\langle \text{T, B, 20,21} \rangle$ ;  $\langle \text{T, C, 30,31} \rangle$ ;  $\langle \text{COMMIT T} \rangle$ ;

**Oppgave 17.4.2:** The following is a sequence of undo/redo-log records written by two transactions T and U:  $\langle \text{START U} \rangle$ ;  $\langle \text{U, A, 10, 11} \rangle$ ;  $\langle \text{START T} \rangle$ ;  $\langle \text{T, B, 20, 21} \rangle$ ;  $\langle \text{U, C, 30, 31} \rangle$ ;  $\langle \text{T, D, 40,41} \rangle$ ;  $\langle \text{COMMIT T} \rangle$ ;  $\langle \text{U, E, 50,51} \rangle$ ;  $\langle \text{COMMIT U} \rangle$ . Describe the action of the recovery manager, including changes to both disk and the log, if there is a crash and the last log record to appear on disk is:

- a)  $\langle \text{START T} \rangle$ , b)  $\langle \text{COMMIT T} \rangle$ , d)  $\langle \text{COMMIT U} \rangle$