Weekly exercises IN3020 and IN4020
Week 12

April 22, 2022

1 Review

1. What do we mean with recovery?
2. Why would we want to recover?
3. Discuss at least two types of failures?
4. What is do we mean by a catastrophic failure? How can we recover from catastrophic failures?
5. How is the system log stored? What is it used for?
6. In the system log, we have several different common entry types. Which?
7. What do we mean with the cache when speaking about recovery?
8. Why do we say that the cache complicates things?
9. In the cache, what is:
   (a) Dirty bit
   (b) Pin bit (hot bit)
10. What flushing strategies have we seen for the cache?
11. What is and why do we need write-ahead logging (give an example)?
12. What do we mean by checkpoints for recovery? Why is this important?
13. What is the difference between a basic (rigid) checkpoint and fuzzy checkpoints?
14. Describe the idea of the shadow recovery protocol. Discuss advantages/disadvantages with this protocol.

15. Describe the deferred-update recovery protocol. Discuss advantages/disadvantages with this protocol.

16. Describe the immediate-update recovery protocol. Discuss advantages/disadvantages with this protocol.

17. What is the ARIES recovery protocol? Discuss advantages/disadvantages with this protocol.

2 Recovery protocols

1. The following is a sequence of an immediate-update log written by two transactions T and U:

$[Checkpoint]$
$[START, U]$
$[write_item, U, A, 10, 11]$
$[START, T]$
$[write_item, T, B, 20, 21]$
$[write_item, U, C, 30, 31]$
$[write_item, T, D, 40, 41]$
$[commit, T]$
$[write_item, U, E, 50, 51]$
$[commit, U]$

   Describe the action of the recovery manager if there is a crash and the last log record to appear on the disk is:

   (a) $[START, T]$

   (b) $[commit, T]$

   (c) $[commit, U]$

2. For each of the following recovery protocols, discuss how the log must look like and discuss what the system would have to do to recover after the system crash in the schedule in Table 1 using:

   (a) A deferred-update recovery protocol

   (b) An immediate-update UNDO/REDO recovery protocol

3. Assume a single-user environment and a shadowing recovery protocol. Describe how the log should be like and how this system can recover from a system crash.

4. Let us consider the ARIES recovery protocol. When do we not have to do a redo?

Table 1: Schedule

T_1	T_2	T_3	T_4
s_1			
$r_1(A)$			
$w_1(A)$			
	s_2		
	$r_2(B)$		
	$r_2(C)$		
	$w_2(B)$		
c_1			
Checkpoint t_1			
		s_3	
		$r_3(D)$	
			s_4
			$r_4(E)$
			$w_4(F)$
	c_2		
		c_3	
System crash t_2			