

Quiz Sheet No. 4 for Architecture and Implementation of Database Systems
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Exercises for Chapter 5.2.4: Cache/Safe Method

1. Reconsider schedule H2 of Exercise 2c) of Quiz Sheet No. 3:

t_1	t_2	t_3	
r(u)			1
	r(z)		2
r(y)			3
	r(u)		4
	r(y)		5
w(y)			6
	w(z)		7
	ct		8
r(z)			9
w(z)			10
		r(z)	11
		r(y)	12
w(u)			13
ct			14
		r(u)	15
		w(u)	16
		ct	17

↓

timeline

- a) Determine the different states of the database, the cache and the safe along the timeline from timestamp 1 to 13 using the following schema. For each step fill in the appropriate objects. Indicate R- and A-locks on objects u, y, z using this notation: $obj(C)_A^R$, where
- obj is the respective object,
 - C is an *ordered* list of all transactions (use indices 1, 2, 3 for t_1, t_2, t_3) that have changed the object in the past (on commit),
 - R is a list of all transactions that hold an R-lock on the object, and
 - A is a list of all transactions that hold an A-lock on it

Example: $z(3,1)_3^{1,2}$ indicates, on the one hand, that object z has been altered first by transaction t_3 and then by t_1 , and on the other hand, that currently transactions t_1 and t_2 hold R-locks on z, while t_3 holds an A-lock. Assume that old versions of objects are removed from the cache when a committing transaction writes their new versions into the database.

Schema:

	DB	Cache	Safe
0	u, y, z		
1	u, y, z	u^1	
2
...			
13			

- b) Show that in timestamps 14 to 17 a deadlock occurs between transactions t_1 and t_3 .
- c) Complete the Cache/Safe listing of exercise 1a) assuming that t_3 does *not* set R-locks on objects z and y (at timestamps 11 and 12).