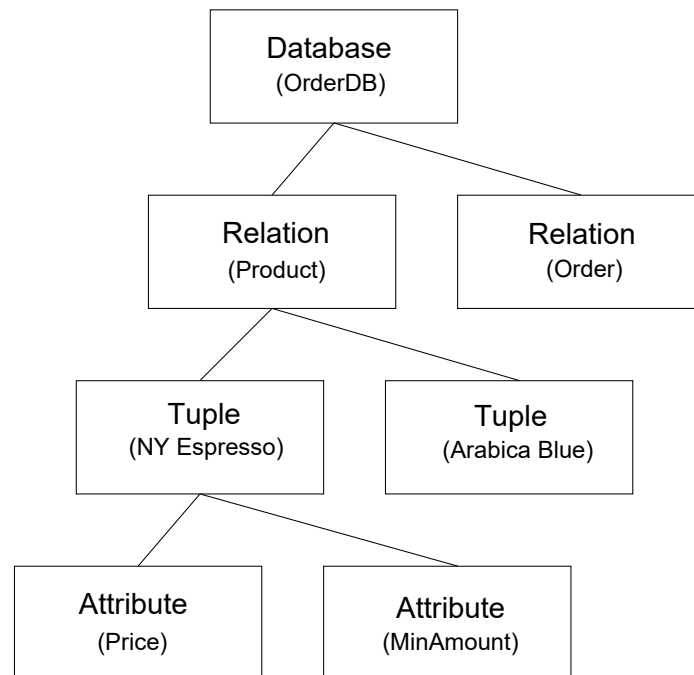


Transaction Processing

Exercise 5

Assignment 1: Explain the term lock granularity. Which granularity hierarchies do you know? Why are these lock granularities used?

Assignment 2: Explain the hierarchical locking on the following example:



Given are two transactions. Which of the following lock combinations are valid?

1. T_1 : rl(Product); T_2 : wl(MinAmount)
2. T_1 : rl(Product); T_2 : rl(MinAmount)
3. T_1 : rl(Product); T_2 : wl(Order)
4. T_1 : rl(Price); T_2 : wl(MinAmount)
5. T_1 : rl(Product) and wl(NY Espresso); T_2 : rl(Arabica Blue)
6. T_1 : rl(Product) and wl(NY Espresso); T_2 : wl(Arabica Blue)
7. T_1 : wl(NY Espresso); T_2 : wl(Arabica Blue)
8. T_1 : rl(Price); T_2 : rl(OrderDB)

Assignment 3: Based on the hierarchy of the previous assignment, explain the difference between hierarchical locking and the tree protocol. How would the locks be used in the tree protocol to increase the price of all products?

Assignment 4: Based on the following schedules, explain the timestamp-ordering protocol:

s_1			s_2		
T_1	T_2	T_3	T_1	T_2	T_3
$ts = 200$	$ts = 150$	$ts = 175$	$ts = 200$	$ts = 180$	$ts = 175$
read B	read A	read C	read B	read A	read C
write B			write B		
write A	write C		write A	write C	

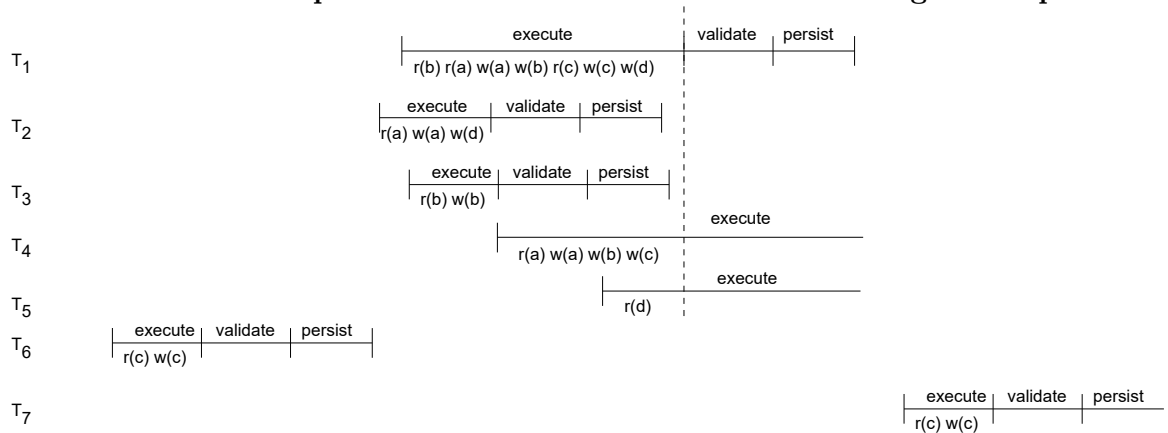
s_3			s_4		
T_1	T_2	T_3	T_1	T_2	T_3
$ts = 200$	$ts = 220$	$ts = 175$	$ts = 200$	$ts = 150$	$ts = 175$
read B	read A	read C	read B	read A	read B
write B			write B		
write A	write C		write A	write C	

Which of these schedules are valid? How can the timestamp-ordering protocol be improved? Consider hereby the problems of the timestamp-ordering protocol (e.g., live locks)!

Assignment 5: What is the basic concept of the SGT? Explain the functional principle based on the following example.

	T_1	T_2	T_3
1	$r_1(x)$		
2		$r_2(y)$	
3	$w_1(x)$		
4			$r_3(z)$
5		$r_2(x)$	
6			$r_3(x)$
7			$w_3(z)$
8		$w_2(z)$	
9	commit		
10		commit	
11			commit

Assignment 6: Explain the concepts of forward and backward validation in the context of optimistic scheduler on the following example:



Which operations need to be compared for the forward and backward validation of transaction T₁?