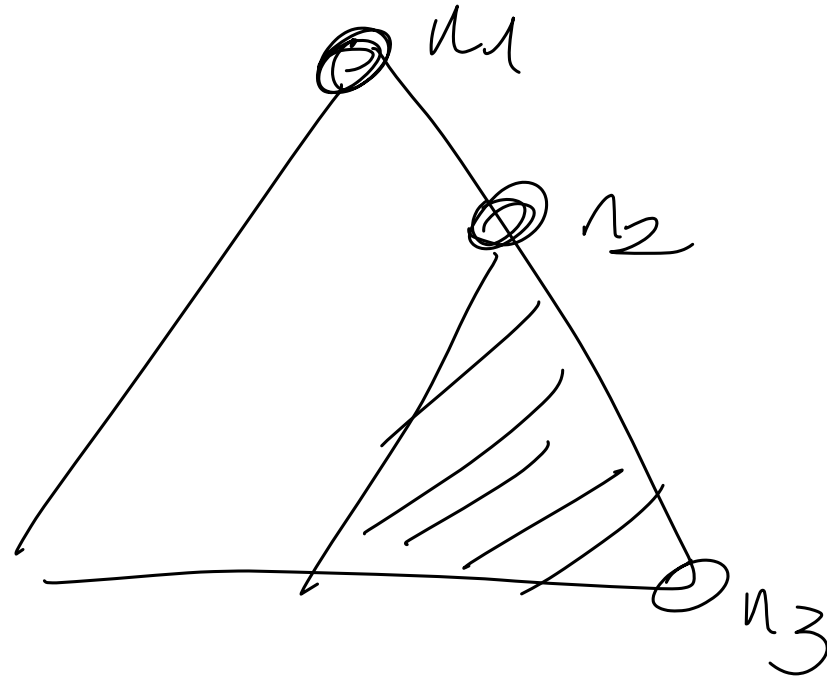


Multi-level locking using B-trees (or other hierarchies)

table
|
page
|
tuple

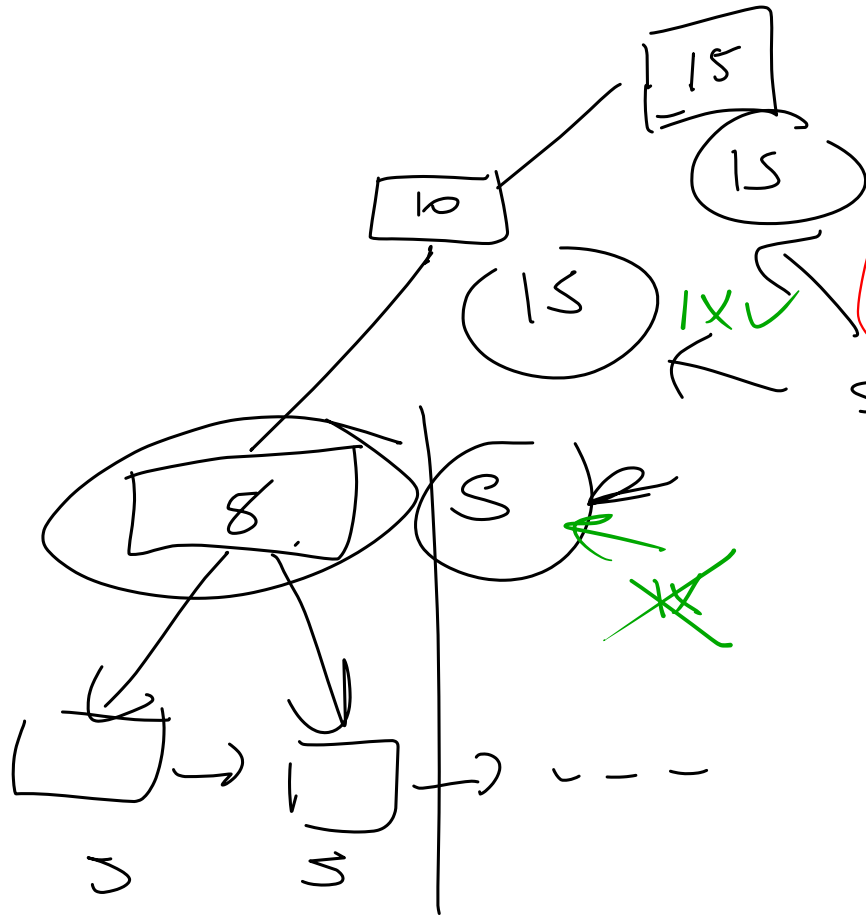


lock hierarchically

Requested
Lock

		Existing Lock			
		IS	IX	S	X
IS	✓	✓	✓	✓	X
IX	✓	✓	✓	X	X
S	✓	✓	X	✓	X
X	X	X	X	X	X

index on
 $R(A)$



~~IX ✓~~
~~IX ✓~~
select count(*)
from R
where A=5;

insert into $R(A)$
values (5);

insert into $R(A)$
values (20);

LOG ← log sequence no

<u>LSN</u>	<u>OP</u>	<u>PREV LSN</u>
100	T ₁ update	
	PX A B	

w₁(x)

w₂(y)

commit T₁

w₃(z)

w₃(w)

w₂(x)

abort T₂

MEMORY

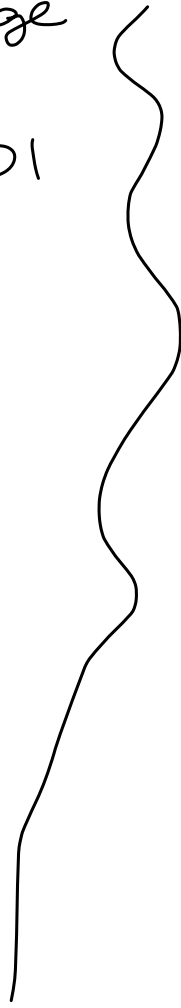
(volatile)

DBK (non-volatile)

LOG
101 T₁ update P_x

Data page

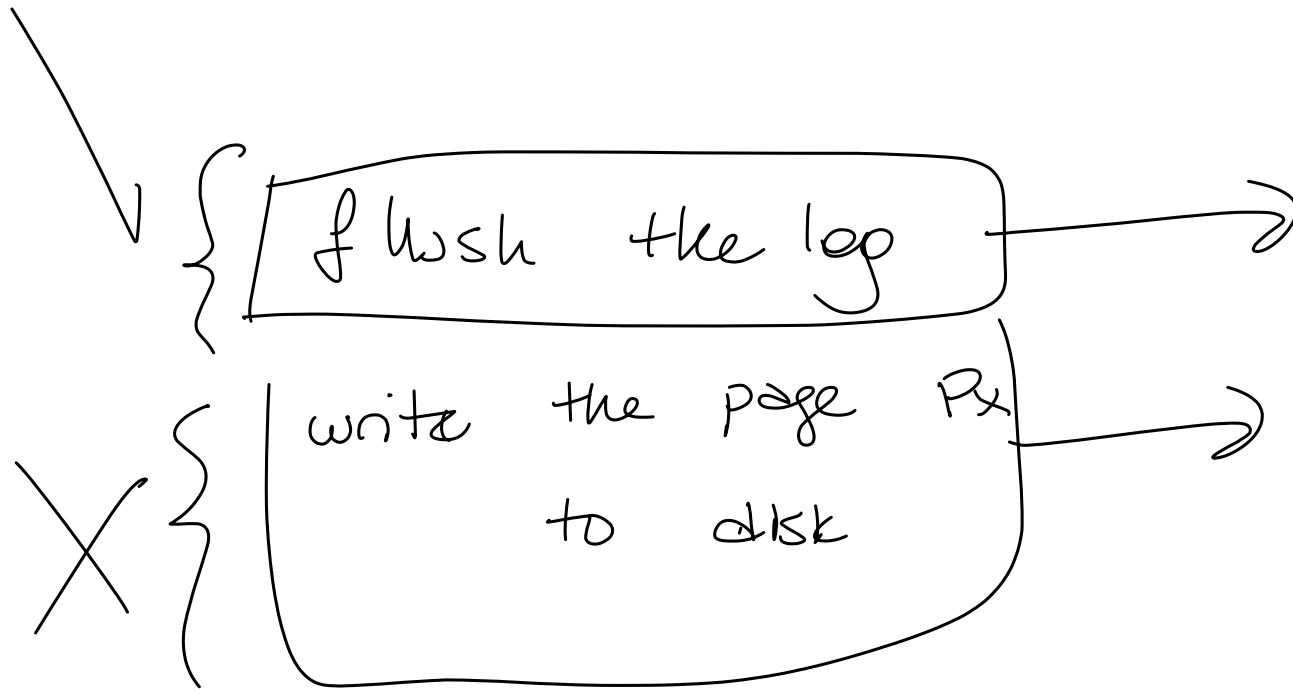
P_x 101



Data pages

P_x 101

write a page P_x to disk



DISK

101 T₁ update

Px A B

102 T₁ commit

~~DATA~~

Px 101