

Schedules : lists of operations

- operations can be interleaved

- ops from same transaction must be in same order in sched. as transaction

$r_i(x)$: transaction i reads item X
 $w_i(x)$: " " writes " "
 c_i : " " commits
 a_i : " " aborts

Withdraw : $T_1 : r_1(x) w_1(x) c_1$

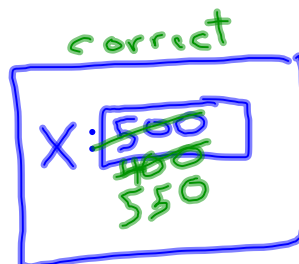
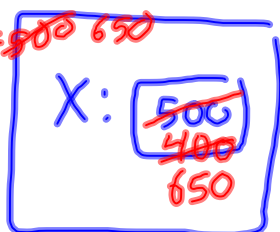
Transfer : $T_2 : r_2(y) w_2(y) r_2(x) w_2(x) c_2$

$S_a : r_2(y) w_2(y) r_1(x) w_1(x) r_2(x) w_2(x)$
 c_1, c_2

$S_b : r_2(y) w_2(y) r_1(x) r_2(x) w_1(x) w_2(x)$
 c_1, c_2

$T_1 : x = 500$

$T_2 : x = 500, 650$



$T_1 : \text{w/d } 100$
 $T_2 : \text{trans. } 150$

Conflicting operations

Two ops conflict

1. the ops are in different transactions
2. they access the same item X.
3. at least 1 op is a write

Schedule is recoverable

if no transaction T commits

until all transactions T'

that write some value that T
later reads have committed.

T' ... $w_{T'}(x)$...

T . . . $r_T(x)$

S : $w_{T'}(x)$... $r_T(x)$ c_T $a_{T'}$

S : ... $w_{T'}(x)$... $r_T(x)$ ~~c_T $c_{T'}$~~

$a_{T'}$
cascade rollback
rollback T' causes
rollback T

cascade less

- every transaction reads only
items from transactions
that have committed.