

Concurrency  
control:  
assume that all  
individual actions  
are correct



When we swap  
read/write/commit  
operations in schedules

- we will never permit  
swaps that change the  
order of operations  
within an individual  
transaction in the schedule



A pair of R/W operations  
is a conflicting pair if:

(1) these operations are on the  
same data item

AND

(2) they are by different  
transactions

AND

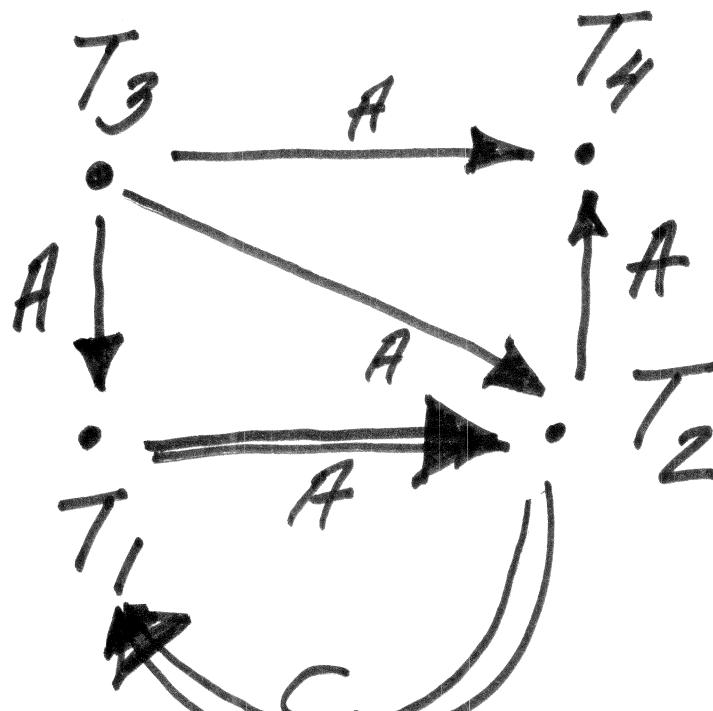
(3) At least one of the operations  
is a write



Schedule S of slide 18:

$$S = \frac{W_3(A) \ W_2(C) \ R_1(A) \ W_1(B) \ R_1(C)}{W_2(A) \ R_4(A) \ W_4(D)}$$

- ✓ A:  $\frac{W_3(A) \ R_1(A)}{W_2(A) \ R_4(A)}$
- ✓ B:  $W_1(B)$
- ✓ C:  $W_2(C) \ R_1(C)$
- ✓ D:  $W_4(D)$

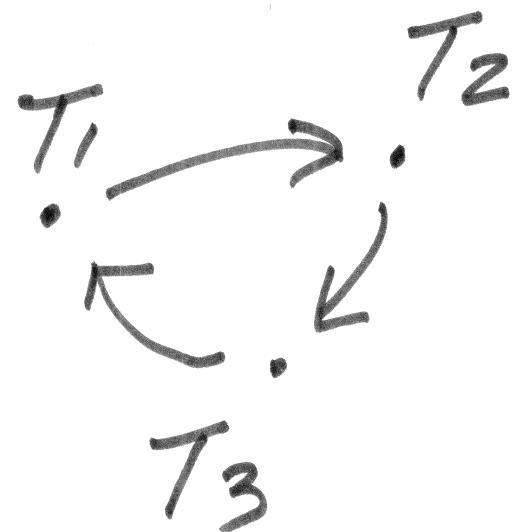


Assignment for extra credit  
due end of day  
Saturday April 18

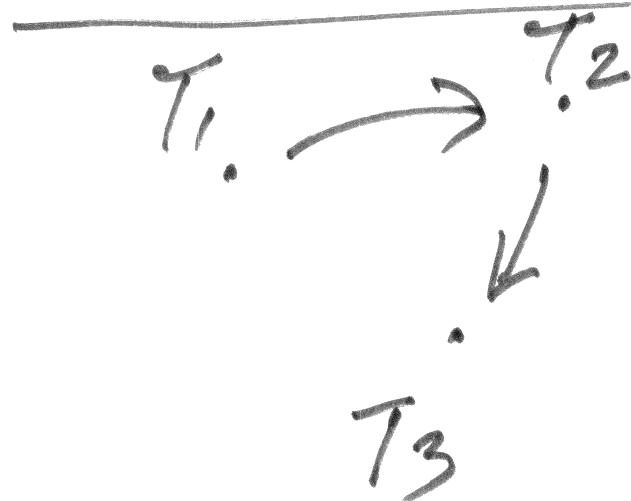
S:  $R_1(A)$   $R_2(A)$   $R_3(B)$   $w_1(A)$   
 $R_2(C)$   $R_2(B)$   $w_2(B)$   $w_1(C)$

- submit the precedence graph for
- is conflict serializable?
- what are all the conflict-equivalent serial schedules?

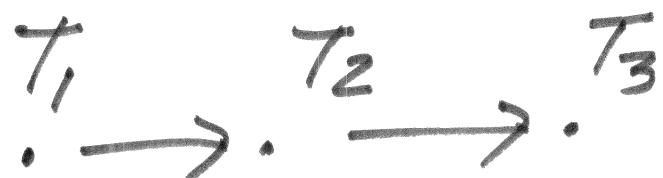




cycle  $\Rightarrow$   
 $\emptyset$  conflict  
 equivalent  
 serial schedules



no cycle  $\Rightarrow$



$\Rightarrow T_1, T_2, T_3$  is  
 the only confl -  
 equiv serial schedule

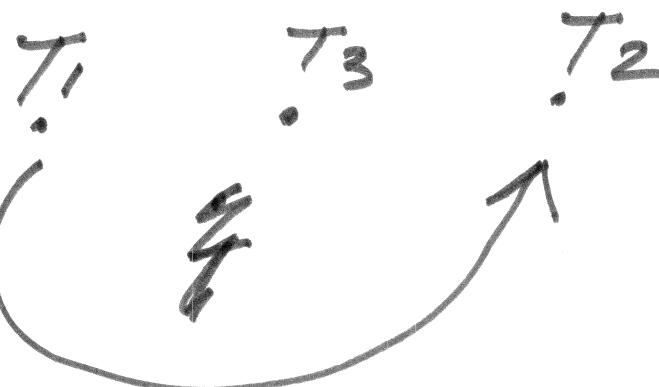


$T_1 \xrightarrow{\cdot} T_2$

$T_3$

no cycles  $\Rightarrow$

$T_1 \xrightarrow{\cdot} T_2 \xrightarrow{\cdot} T_3$



$T_1 \xrightarrow{\cdot} T_2 \xrightarrow{\cdot} T_3$

$T_3 \xrightarrow{\cdot} T_1 \xrightarrow{\cdot} T_2$

$T_1 \xrightarrow{\cdot} T_2 \xrightarrow{\cdot} T_3$

$T_1 \xrightarrow{\cdot} T_3 \xrightarrow{\cdot} T_2$

$T_3 \xrightarrow{\cdot} T_1 \xrightarrow{\cdot} T_2$

