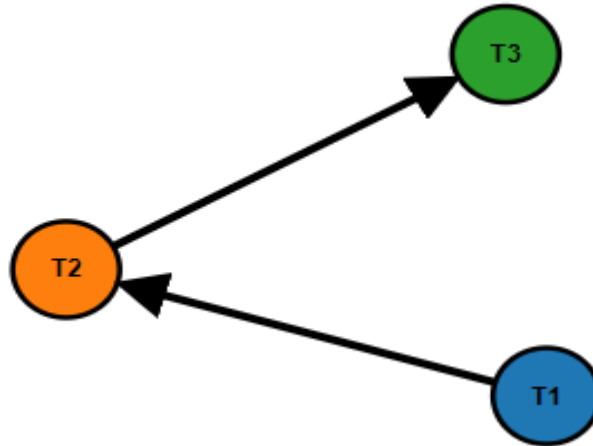


## Transactions

- For each of the following schedules, state whether it is conflict-serializable. If yes, provide all equivalent serial schedules. If no, state why it is not conflict-serializable. ( $r_i(X)$  denotes a read on object X for transaction  $T_i$ .  $w_j(Y)$  denotes a write on object Y for transaction  $T_j$ .) Use precedence graph.

1)  $r_1(X), r_3(Y), r_2(Y), w_3(Y), r_3(X), r_2(Z), w_1(X), w_2(Z), r_1(Z), w_1(Z)$



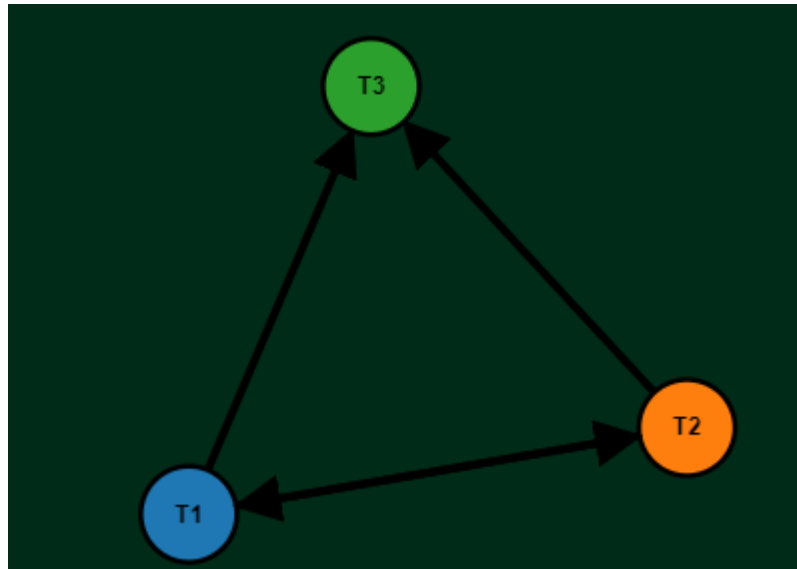
when we group

the transactions by variable

The graph is Acyclic thus is Conflict-Serializable

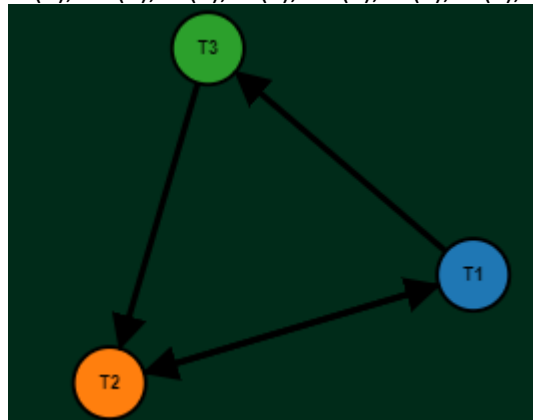
Variable A:  $r_2(A) - w_2(A) - r_3(A) - w_3(A)$   
 Variable B:  $r_1(B) - w_1(B) - r_2(B) - w_2(B)$

- $r_1(X), r_2(Y), r_3(Y), w_3(Y), r_2(Z), w_1(X), r_3(X), r_1(Z), w_2(Z), w_1(Z)$   
precedence graph



The graph is Cyclic thus the schedule is not conflict Serializable

3)  $r1(X), w1(X), r3(Y), r1(Z), w3(Y), r2(Y), r2(Z), r3(X), w1(Z), w2(Z)$



For this graph we have a similar case where this graph is cyclic  
Therefore Not serializable

2. Let  $T1, T2, T3$  be the following transactions:

$T1: r1(D), w1(B), w1(D)$

$T2: r2(C), w2(B)$

$T3: r3(D), w3(D), w3(B)$

For each of the following schedules, state whether it is possible under 2PL protocol?  
Give your reasons not just Yes/No.

- 1)  $r1(D), r2(C), w2(B), w1(B), r3(D), w3(D), w1(D), w3(B)$

**The schedule is not possible under a 2PL PROTOCOL, the schedule is not serializable and has a cyclic precedence which will cause an inconsistent database while executing.**

- 2)  $r2(C), r1(D), w2(B), r3(D), w3(D), w3(B), w1(B), w1(D)$

**C:  $r2(C)$**

**D:  $r1(D) r3(D) w3(D) w1(D)$**

**B:  $w2(B) w3(B) w1(B)$**

With the schedule we have an inconsistent cycle of the transactions therefore the schedule is not possible under 2PL

- 3) Write example of schedule for T1, T2, T3, which is not possible under 2PL protocol.

**$r1(D), r2(C), r3(D), w1(B), w2(B), w1(D), w3(B), w3(D)$**

3. Let Cabana and Old Tavern be two bars. Cabana has local patrons A and remote patrons B, while Old Tavern has local patrons C and remote patrons D. Now a new bar New Tavern is opened in this area. Then Cabana and Old Tavern begin to lose clients. Suppose we have the followings two transactions:

T1: Cabana loses all patrons to Old Tavern. First locals, then the rest

T2: Old Tavern loses all patrons to New Tavern, first locals than the rest

Given the following schedule S:

T2: Insert local patrons of Old Tavern into New Tavern

T1: Insert local patrons of Cabana into Old Tavern

T2: Delete local patrons of Old Tavern

T1: Delete local patrons of Cabana

T2: Insert remote patrons of Old Tavern into New Tavern

T2: Delete remote patrons of Old Tavern

T1: Insert remote patrons of Cabana into Old Tavern

T1: Delete remote patrons of Cabana

What patrons will each bar have after the execution of this schedule (in terms of A, B, C, D or empty)? Is the schedule serializable (result equivalent to a serial schedule)?

**Let A be patrons in cabana**

**Let B be patrons in old tavern**

**Let C be patrons in new tavern**

**Cabana- Empty,**

**old tavern- A**

**new tavern- B and C**

**The schedule is serializable since the schedule does not have any cyclic precedence**