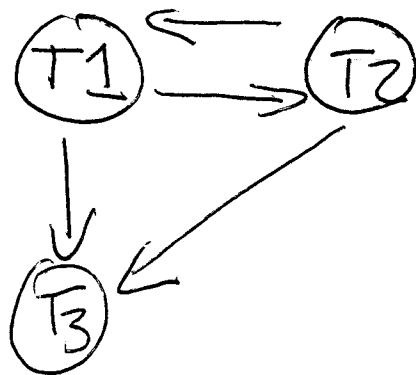


Serializability Graph

Vertices - committed transactions

Edges $T_i \rightarrow T_j$ if an op of T_i conflicts w/
 T_j and occurs first in T_i .

EX



corresponds to previous example.

Fact: A schedule is conflict serializable iff its precedence graph is acyclic.

2PL - (relaxation of strict 2PL) where a transaction cannot request additional locks once it releases any lock.

Fact: 2PL guarantees conflict serializability.

Then what does strict 2PL get you?

A schedule is strict if a value written by T is not read or written by any T' until T either commits or aborts.

More Serializability

Two schedules are view equivalent if:

- ① If T_i reads initial values of A in S_1 , it does as well in S_2 .
- ② Similarly for last write of A in the two schedules
- ③ If T_i in S_1 reads value written by T_j then it does in S_2 .

A schedule is view serializable if it is view equivalent to a serial schedule.

~~How are locks stored
in a lock table~~

Dealing w/ Deadlocks

Lock manager controls who has locks to what
Maintains a waits-for graph to detect deadlock cycles.

- There is an edge $T_i \rightarrow T_j$ in this graph if T_i is waiting for a lock held by T_j

~~edges added to graph~~
 Ex)

| | |
|--------|--------|
| T1 | T2 |
| r-l(A) | w-l(A) |
| r(A) | |

 \rightarrow T2 \rightarrow T1
 in wait-for graph

cycle in graph means
dead lock.

About some transaction in this case
Also might use time out

Deadlock Prevention

One solution: assign a time stamp to a transaction it starts. (Earlier means higher priority)

If T_i requests a lock of T_j but T_j holds conflicting lock

Wait die: If T_i has higher priority ^{than T_j} , allow it to wait otherwise abort it (restart w/ same timestamp)

Wound-wait: If T_i has higher priority abort T_j otherwise T_i waits. (restart same timestamp).

Another way to prevent: require transaction to get all locks before any operations, then use 2PL. Called conservative 2PL.

Avoiding Phantoms

If file does not have an index. Then prevent new pages from being added to file as well as lock all existing pages.

If file has an index can obtain a lock on the index pages for the given values values being searched over. Ex) Rating = 1. Can't insert or delete now since to do so would require lock on index page. Called index locking.