Outline

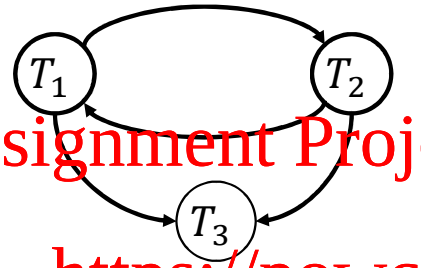
- Q1: Conflict-serializability Vs. Serializability.
- Q2: Schedule feasibility under locking.
- Q3: Isolation levels.

Q1: Check conflict-serializability (a)

- For the given schedule, determine if it is conflict serializable or not.

Transaction T1	Transaction T2	Transaction T3
R(A)		
	W(A)	
W(A)		
		W(A)

A1: Check conflict-serializability (a)



Transaction T1	Transaction T2	Transaction T3
R(A)		
	W(A)	
W(A)		
		W(A)

Q1: Check serializability? (b)

- For the given schedule, determine if it is serializable or not.

Transaction T1	Transaction T2	Transaction T3
R(A)		
	W(A)	
W(A)		
		W(A)

A1: Check serializability? (b)

Given schedule

Transaction T1	Transaction T2	Transaction T3
R(A)		
	W(A)	
W(A)		
		W(A)

A serial schedule

Transaction T1	Transaction T2	Transaction T3
R(A)		
W(A)		
	W(A)	
		W(A)

What is the difference?

- T1 reads the same value of A.
- T2, T3 write the values (no reads).
- After all operations, database is in the same state -> A written by T3.
- Blind write by T3.

Transaction T1	Transaction T2	Transaction T3
R(A)		
	W(A)	
W(A)		
		W(A)

Transaction T1	Transaction T2	Transaction T3
R(A)		
W(A)		
	W(A)	
		W(A)

Both schedules are equivalent – yet not conflict-equivalent.

Serializable !

Q2: Check Strict 2PL feasibility (a)

- For the schedule below, determine if it is possible to execute under strict 2 PL.
- If so: Show a placement of shared locks (S), exclusive locks (X) and lock releases (Rel)

Transaction T1	Transaction T2	Transaction T3
R(A)		
	R(A)	
R(B)		
		W(A)
W(B)		
		R(B)

A2: Check Strict 2PL feasibility (a)

Transaction T1	Transaction T2	Transaction T3
Slock(A) R(A)		
	R(A)	
R(B)		
		W(A)
W(B)		
		R(B)

A2: Check Strict 2PL feasibility (a)

Transaction T1	Transaction T2	Transaction T3
Slock(A) R(A)		
	Slock(A) R(A) Rel(A)	
R(B)		
		W(A)
W(B)		
		R(B)

A2: Check Strict 2PL feasibility (a)

Transaction T1	Transaction T2	Transaction T3
Slock(A) R(A)		
	Slock(A) R(A) Rel(A)	
Slock(B) R(B)		
		W(A)
W(B)		
		R(B)

A2: Check Strict 2PL feasibility (a)

Transaction T1	Transaction T2	Transaction T3
Slock(A) R(A)		
	Slock(A) R(A) Rel(A)	
Slock(B) R(B)		
		Xlock(A)? -> Must happen before W(B) by T1. Lock held by A. W(A)
W(B)		
		R(B)

Q2: Check Strict 2PL feasibility (b)

- For the schedule below, determine if it is possible to execute under strict 2 PL.
- If so: Show a placement of shared locks (S), exclusive locks (X) and lock releases (Rel)

Transaction T1	Transaction T2	Transaction T3
R(A)		
	R(A)	
R(B)		
		R(A)
W(B)		
		R(B)

A2: Check Strict 2PL feasibility (b)

Transaction T1	Transaction T2	Transaction T3
Slock(A)		
R(A)		
	R(A)	
R(B)		
		R(A)
W(B)		
		R(B)

A2: Check Strict 2PL feasibility (b)

Transaction T1	Transaction T2	Transaction T3
Slock(A) R(A)		
	Slock(A) R(A) Rel(A)	
R(B)		
		R(A)
W(B)		
		R(B)

A2: Check Strict 2PL feasibility (b)

Transaction T1	Transaction T2	Transaction T3
Slock(A) R(A)		
	Slock(A) R(A) Rel(A)	
Slock(B) R(B)		
		R(A)
W(B)		
		R(B)

A2: Check Strict 2PL feasibility (b)

Transaction T1	Transaction T2	Transaction T3
Slock(A) R(A)		
	Slock(A) R(A) Rel(A)	
Slock(B) R(B)		
		Slock(A) R(A)
W(B)		
		R(B)

A2: Check Strict 2PL feasibility (1)

Transaction T1	Transaction T2	Transaction T3
Slock(A) R(A)		
	Slock(A) R(A) Rel(A)	
Slock(B) R(B)		
		Slock(A) R(A)
Xlock(B) W(B) Rel(A) Rel(B)		
		R(B)

A2: Check Strict 2PL feasibility (b)

Transaction T1	Transaction T2	Transaction T3
Slock(A) R(A)		
	Slock(A) R(A) Rel(A)	
Slock(B) R(B)		
		Slock(A) R(A)
Xlock(B) W(B) Rel(A) Rel(B)		
		Slock(B) R(B) Rel(A) Rel(B)

Q3: Isolation levels (a)

- For the schedule below, determine the isolation levels under which the given schedule can successfully execute.
- Possible levels: READ UNCOMMITTED, READ COMMITTED, REPEATABLE READ

Transaction T1	Transaction T2	Transaction T3
R(A)		
	R(B)	
		R(C)
W(A)		
	W(B)	
		W(C)

A3: Isolation levels (a)

- The schedule has no dependencies among transactions.
- READ COMMITTED and REPEATABLE READ are possible.

Transaction T1	Transaction T2	Transaction T3
R(A)		
	R(B)	
		R(C)
W(A)		
	W(B)	
		W(C)

Q3: Isolation levels (b)

- For the schedule below, determine the isolation levels under which the given schedule can successfully execute.

Transaction T1	Transaction T2
R(A)	
W(A)	
	R(B)
	W(B)
R(B)	
W(B)	
	R(C)
	W(C)

A3: Isolation levels (b)

- READ UNCOMMITTED -> not possible since both transactions involve reads and writes.

Transaction T1	Transaction T2
R(A)	
W(A)	
	R(B)
	W(B)
R(B)	
W(B)	
	R(C)
	W(C)

A3: Isolation levels (b)

- Check READ COMMITTED.
- Place locks one by one according to the rules.

Transaction T1	Transaction T2
Slock(A) R(A) Rel(A)	
W(A)	
	R(B)
	W(B)
R(B)	
W(B)	
	R(C)
	W(C)

A3: Isolation levels (b)

- Check READ COMMITTED.
- Place locks one by one according to the rules.

Transaction T1	Transaction T2
Slock(A) R(A) Rel(A)	
Xlock(A) W(A)	
	R(B)
	W(B)
R(B)	
W(B)	
	R(C)
	W(C)

A3: Isolation levels (b)

- Check READ COMMITTED.
- Place locks one by one according to the rules.

Transaction T1	Transaction T2
Slock(A) R(A) Rel(A)	
Xlock(A) W(A)	
	Slock(B) R(B) Rel(B)
	W(B)
R(B)	
W(B)	
	R(C)
	W(C)

A3: Isolation levels (b)

- Check READ COMMITTED.
- Place locks one by one according to the rules.

Transaction T1	Transaction T2
Slock(A) R(A) Rel(A)	
Xlock(A) W(A)	
	Slock(B) R(B) Rel(B)
	Xlock(B) W(B)
R(B)	
W(B)	
	R(C)
	W(C)

A3: Isolation levels (b)

- Check READ COMMITTED.
- Slock(B) by T1 is not possible since T2 will not release lock on B till it commits.
- This implies READ COMMITTED and REPEATABLE READ are not possible.
- NOTE: Schedules T1 and T2 are conflict-serializable.

Transaction T1	Transaction T2
Slock(A) R(A) Rel(A)	
Xlock(A) W(A)	
	Slock(B) R(B) Rel(B)
	Xlock(B) W(B)
Slock(B)? – Not possible R(B)	
W(B)	
	R(C)
	W(C)