DEADLINE- 6 TRANSACTIONS

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Concurrent Database Transactions

Assuming the application is hosted on a public server, multiple users can access and use it simultaneously. Hence, there may arise cases where multiple users access the database (through transactions) in a way that creates conflicts and inconsistency.

Non-Conflicting Transactions

Transaction Pair 1

Consider the case of two Admins updating the LowInventoryAlert and Quantity simultaneously. The following table of transactions sums up the reads and writes to the database needed to complete the required actions.

Here, Q represents the reading of the Product Table . Similarly, $L1$ represent the old value of LowInventoryAlert read by Admin 1 and $L1'$ represents the LowInventoryAlert updated by Admin 1 and $L2$ represent the old value of LowInventoryAlert read by Admin 2 and $L2'$ represents the LowInventoryAlert updated by Admin 2 , whereas changes saved in Product table accessed by Admin 1 is represented as $P1$ and $P2$.

Transaction-1 (T1)	Transaction-2 (T2)
Read(product 1 quantity)	Read(product 1 quantity)
$Q := Q - q1$	$Q := Q - q2$
Write(product 1 quantity)	Write(product 1 quantity)
Read(LowInventoryAlert by Admin 1)	Read(LowInventoryAlert by Admin 1)
Write(Updated LowInventoryAlert by Admin 1)	Write(Updated LowInventoryAlert by Admin 1)
Commit	Commit

Transaction-1 (T1)	Transaction-2 (T2)
	Read(Q)
	$Q := Q - q2$
	Write(Q)
	Read(L2)
	Write(L′2)
Read(Q)	
$Q := Q - q1$	
Write(Q)	
	Write(Product P2)
Read(L1)	
Write(L′1)	
Write(Product P1)	

Transaction Pair 2

Consider the case of two Admins updating the Status of the Vendors simultaneously. The following table of transactions sums up the reads and writes to the database needed to complete the required actions.

Here, Q represents the reading of the Vendor Table . Let the $S1$ represent the Pending Status of the Vendor 1 read by Admin 1 and $S'1$ represent the Approved Status updated by Admin 1 of the Vendor 1 whereas $S2$ represent the Pending Status of the Vendor 2 read by Admin 2 and $S'2$ represent the Approved Status updated by Admin 2 of the Vendor 2 .

Transaction-1 (T1)	Transaction-2 (T2)
Read(Vendor Table)	Read(Vendor Table)
Read(Vendor 1 Status)	Read(Vendor 2 Status)
Write(Vendor 1 Updated Status)	Write(Vendor 2 Updated Status)
Commit	Commit

Transaction-1 (T1)	**Transaction-2 (T2)**
Read(Q)	
	Read(Q)
	Read(S2)
	Write(S′2)
	Write(Vendor V1)
Read(S1)	
Write(S′1)	
Write(Vendor V1)	

Transaction Pair 3

Consider the case where the two Admins updates the Product ID and Quantity Sold of the Sales table simultaneously . The following table of transactions

sums up the reads and writes to the database needed to complete the required actions.

Here, Q represents the reading of the Sales Table . Let the $P1$ represent the Product ID of Product 1 read by Admin 1 and $P'1$ represent the updated value of Product ID by Admin 1 whereas $P2$ represent the Product ID of Product 2 read by Admin 2 and $S'2$ represent the updated value of Product ID by Admin 2 . Whereas the $Q1$ represent the Quantity Sold of Product 1 read by Admin 1 and $Q'1$ represent the updated value of Quantity Sold by Admin 1 whereas $Q2$ represent the Quantity Sold of Product 2 read by Admin 2 and $Q'2$ represent the updated value of Quantity Sold by Admin 2

Transaction-1 (T1)	Transaction-2 (T2)
Read(Sales Table)	Read(Sales Table)
Read(Product ID of Product 1)	Read(Product ID of Product 2)
Read(Quantity of Product 1)	Read(Quantity of Product 2)
Write(Updated Product ID of Product 1)	Write(Updated Product ID of Product 2)
Write(Updated Quantity of Product 1)	Write(Updated Quantity of Product 2)
Commit	Commit

Transaction-1 (T1)	**Transaction-2 (T2)**
	Read(Q)
	Read(Q2)
	Write(Q'2)
Read(Q)	
Read(Q1)	
Write(Q'1)	
Read(P1)	
Write(P'1)	
	Read(P2)
	Write(P′2)

Transaction Pair 4

Consider the case where the two Admins updates the Report Type and Report Data of the Sales table simultaneously . The following table of transactions sums up the reads and writes to the database needed to complete the required actions.

Here, Q represents the reading of the Analytics Table . Let the $R1$ represent the ReportType of Analytics Entry 1 read by Admin 1 and $R'1$ represent the updated value of ReportType of Analytics Entry 1 whereas $R2$ represent the ReportType of Analytics Entry 2 read by Admin 2 and $S'2$ represent the updated value of ReportType of Analytics Entry by Admin 2 . Whereas the $RD1$ represent the ReportData of Analytics Entry 1 read by Admin 1 and $RD'1$ represent the updated value of ReportData of Analytics Entry 1 by Admin 1 whereas $RD2$ represent the ReportData of Analytics Entry 2 read by Admin 2

and $RD'2$ represent the updated value of ReportData of Analytics Entry 2 by Admin 2

Transaction-1 (T1)	Transaction-2 (T2)
Read(Analytics Table)	Read(Analytics Table)
Read(Report Type of Analytics Entry 1)	Read(Report Type of Analytics Entry 2)
Read(Report data of Analytics Entry 1)	Read(Report data of Analytics Entry 2)
Write(Updated Report Type of Analytics Entry 1)	Write(Updated Report Type of Analytics Entry 2)
Write(Updated Report data of Analytics Entry 1)	Write(Updated Report data of Analytics Entry 2)
Commit	Commit

Transaction-1 (T1)	**Transaction-2 (T2)**
Read(Q)	
Read(R1)	
Write(R'1)	
	Read(Q)
	Read(R2)
	Write(R'2)
Read(RD1)	
Write(RD′1)	
	Read(RD2)
	Write(RD′2)

Conflicting Transactions

Transaction Pair 1

Consider the case where two Admins access the Inventory Table simultaneously in which one Admin Delete the Product and another Admin tries to update the same Product. The following table of transactions sums up the reads and writes to the database needed to complete the required actions.

Here, Q represents the reading of the Inventory Table . Let the P represent the Product ID of Product 1 read by Admin 1 and Admin 2 accessed at same time and Write operation in them represent Updation and Deletion.

Transaction-1 (T1)	Transaction-2 (T2)
Read(Inventory Table)	Read(Inventory Table)
Read(Product ID of Product 1)	Read(Product ID of Product 1)
Write(Delete Product)	Write(Update Same Product)

Transaction-1 (T1)	Transaction-2 (T2)
	Read(Q)
Read(Q)	
Read(P)	
Write(P)	
	Read(P)
	Write(P)

Conflict Serializable Schedule With Locks:

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Transaction-1 (T1)	Transaction-2 (T2)
	Lock-X(Q)
	Read(Q)
	Unlock(Q)
Lock-X(Q)	
Read(Q)	
Unlock(Q)	
Lock-X(P)	
Write(P)	
Unlock(P)	
	Lock-X(P)
	Read(P)
	Write(P)
	Unlock(P)

Transaction Pair 2

Consider the case where two Admins access the Analytics Table simultaneously in which one Admin Delete the Analytics Entry and another Admin tries to update the same Analytics Entry. The following table of transactions sums up the reads and writes to the database needed to complete the required actions.

Here, Q represents the reading of the Analytics Table . Let the P represent the Analytics ID of Analytics Entry 1 read by Admin 1 and Admin 2 accessed at same time and Write operation in them represent Updation and Deletion.

Transaction-1 (T1)	Transaction-2 (T2)
Read(Analytics Table)	Read(Analytics Table)
Read(Analytics ID of Analytics Entry 1)	Read(Analytics ID of Analytics Entry 1)
Write(Delete Analytics Entry)	Write(Update Analytics Entry)

Transaction-1 (T1)	Transaction-2 (T2)
	Read(Q)
Read(Q)	
Read(P)	
	Read(P)
Write(P)	
	Write(P)

Conflict Serializable Schedule With Locks:

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Transaction-1 (T1)	Transaction-2 (T2)
	Lock-X(Q)
	Read(Q)
	Unlock(Q)
Lock-X(Q)	
Read(Q)	
Unlock(Q)	
	Lock-X(P)
	Read(P)
	Write(P)
	Unlock(P)
Lock-X(P)	
Write(P)	
Unlock(P)	