Database Technology

Topic 9:
Database Recovery

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Fundamental Concepts

Write-Ahead Logging and the Commit Point

Quiz

Which of these statements is *not* correct?

1) There may be cases in which all the log records for all operations of a transaction are written to disk together.

2) During the process of writing log records for one transaction to disk, log records for other transactions may be written as well.

3) If the DBMS decides to abort a transaction, log records related to the transaction may have been written to disk already.

4) After a transaction has reached its commit point, the DBMS may still decide to abort the transaction.

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Update Strategies and the Corresponding Recovery Algorithms

Exercise

start-transaction T1
write-item T1, D, 10, 20
commit T1
start-transaction T2
write-item T2, B, 20, 15
start-transaction T3
write-item T3, B, 10, 20
write-item T3, A, 5, 10
commit T3
start-transaction T4
write-item T4, A, 10, 30
write-item T2, D, 20, 25
CRASH

Considering the given database log, which transactions have to be undone / redone by systems that use the listed update strategies?

Transactions that need to be: Update strategy:	undone	redone
Deferred Update	?	?
Immediate Update I	?	?
Immediate Update II	?	?

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Solution

start-transaction T1
write-item T1, D, 10, 20
commit T1
start-transaction T2
write-item T2, B, 20, 15
start-transaction T3
write-item T3, B, 10, 20
write-item T3, A, 5, 10
commit T3
start-transaction T4
write-item T4, A, 10, 30
write-item T2, D, 20, 25
CRASH

Considering the given database log, which transactions have to be undone / redone by systems that use the listed update strategies?

Transactions that need to be: Update strategy:	undone	redone
Deferred Update	--	T1, T3
Immediate Update I	T2, T4	--
Immediate Update II	T2, T4	T1, T3

Recovery Steps

start-transaction T1
write-item T1, D, 10, 20
commit T1
start-transaction T2
write-item T2, B, 20, 15
start-transaction T3
write-item T3, B, 10, 20
write-item T3, A, 5, 10
commit T3
start-transaction T4
write-item T4, A, 10, 30
write-item T2, D, 20, 25
CRASH

write-item T2, D, 25, 20 ⎤
write-item T4, A, 30, 10 ⎬ undo phase
write-item T2, B, 15, 20 ⎦

write-item T1, D, 10, 20 ⎤
write-item T3, B, 10, 20 ⎬ redo phase
write-item T3, A, 5, 10 ⎦

Immediate Update II	T2, T4	T1, T3

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Exercise (cont'd)

start-transaction T1
write-item T1, D, 10, 20
commit T1
start-transaction T2
write-item T2, B, 20, 15
start-transaction T3
write-item T3, B, 10, 20
checkpoint
write-item T3, A, 5, 10
commit T3
start-transaction T4
write-item T4, A, 10, 30
write-item T2, D, 20, 25
CRASH

Considering the given database log, which transactions have to be undone / redone by systems that use the listed update strategies?

Transactions that need to be: Update strategy:	undone	redone
Deferred Update	?	?
Immediate Update I	?	?
Immediate Update II	?	?

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Solution

start-transaction T1
write-item T1, D, 10, 20
commit T1
start-transaction T2
write-item T2, B, 20, 15
start-transaction T3
write-item T3, B, 10, 20
checkpoint
write-item T3, A, 5, 10
commit T3
start-transaction T4
write-item T4, A, 10, 30
write-item T2, D, 20, 25
CRASH

Considering the given database log, which transactions have to be undone / redone by systems that use the listed update strategies?

Transactions that need to be:	undone	redone
Update strategy:		
Deferred Update	--	T3
Immediate Update I	T2, T4	--
Immediate Update II	T2, T4	T3

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