

Database Technology

Topic 11: 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.

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: | undone | redone |
|-------------------------------|--------|--------|
| Update strategy: | | |
| Deferred Update | ? | ? |
| Immediate Update I | ? | ? |
| Immediate Update II | ? | ? |

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: | undone | redone |
|-------------------------------|--------|--------|
| Update strategy: | | |
| 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
write-item T2, B, 15, 20
write-item T1, D, 10, 20
write-item T3, B, 10, 20
write-item T3, A, 5, 10

} undo phase
redo phase

Immediate Update II

T2, T4

T1, T3

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

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| Update strategy: | | |
| Deferred Update | ? | ? |
| Immediate Update I | ? | ? |
| Immediate Update II | ? | ? |

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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