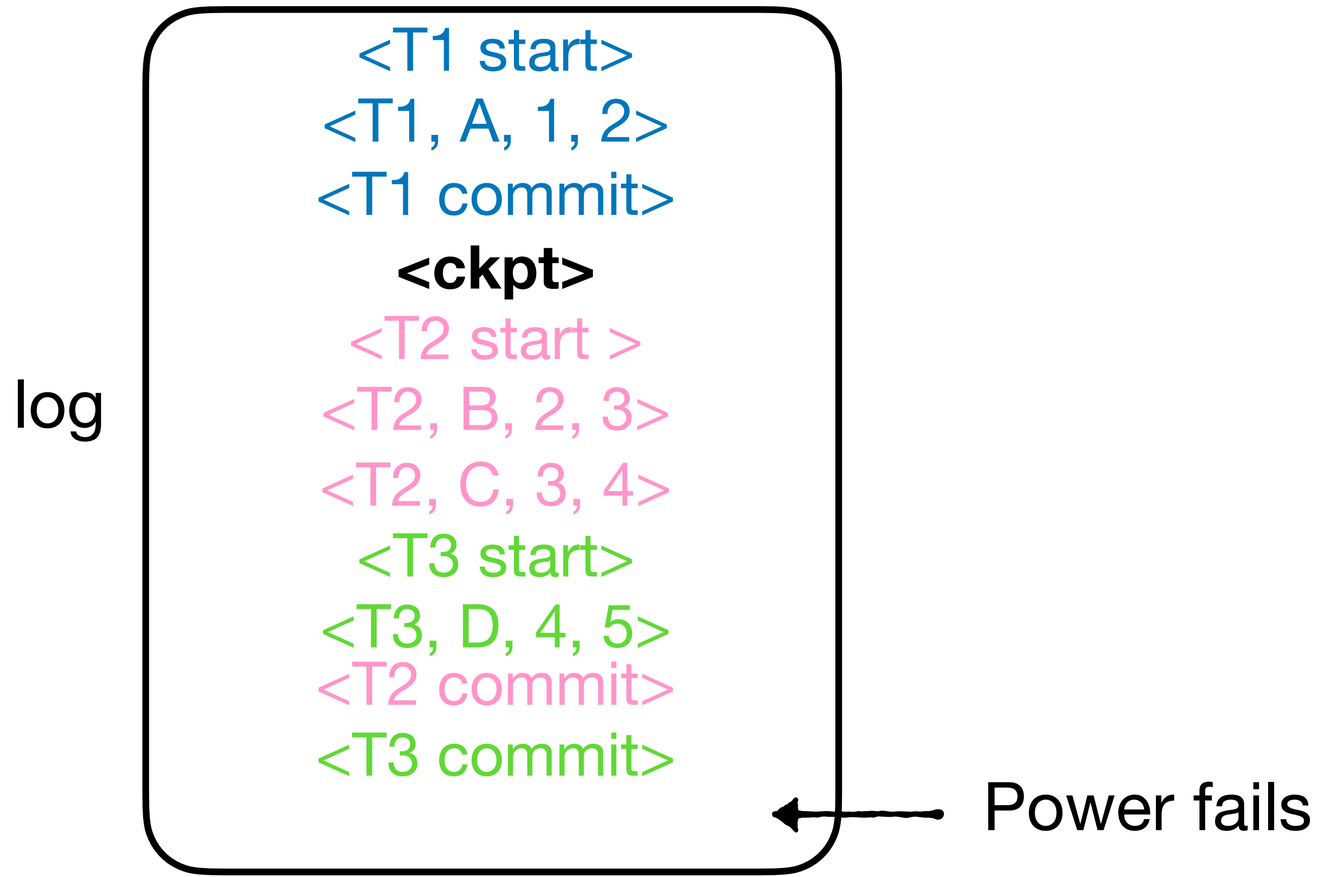
Recovery Tutorial

CSC443H1 Database System Technology

Niv Dayan

Question 1

Consider the following log, and note how records for different transactions are interleaved. Suppose power fails at different points. What would you need undo or redo?



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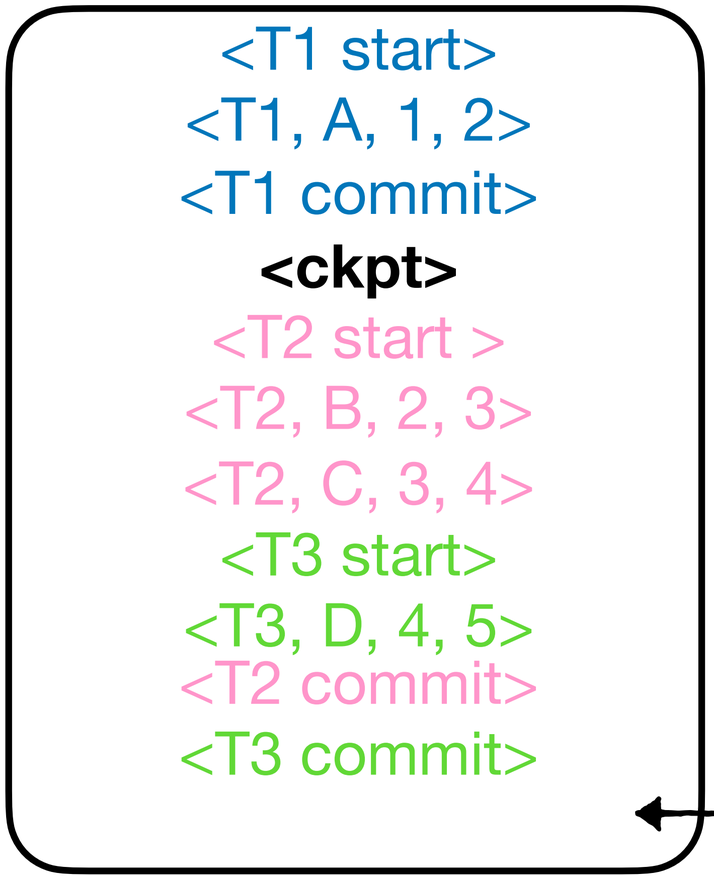

Nothing to undo

Redo T2 and T3 since checkpoint

Power fails

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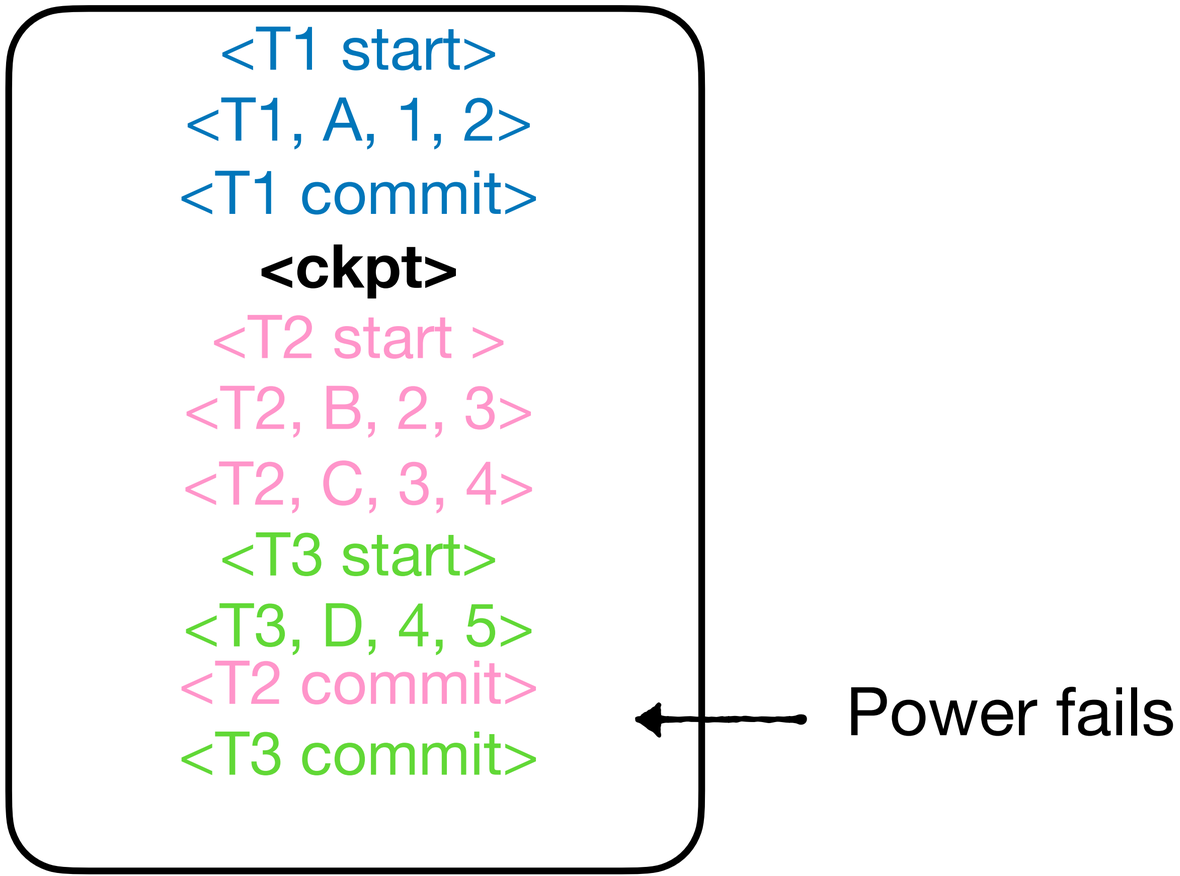

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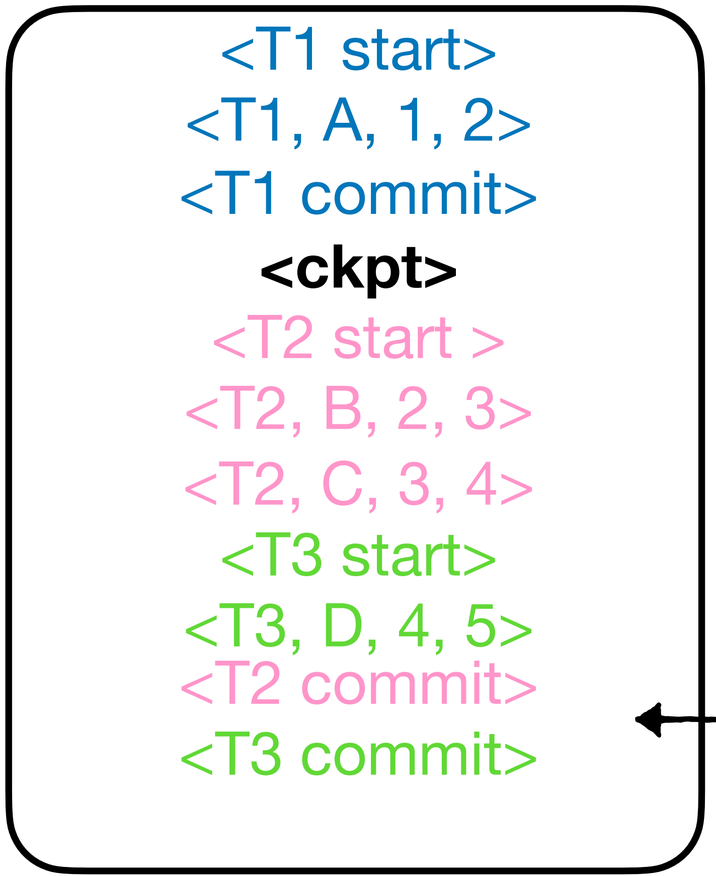

Undo T3

Redo T2

Power fails

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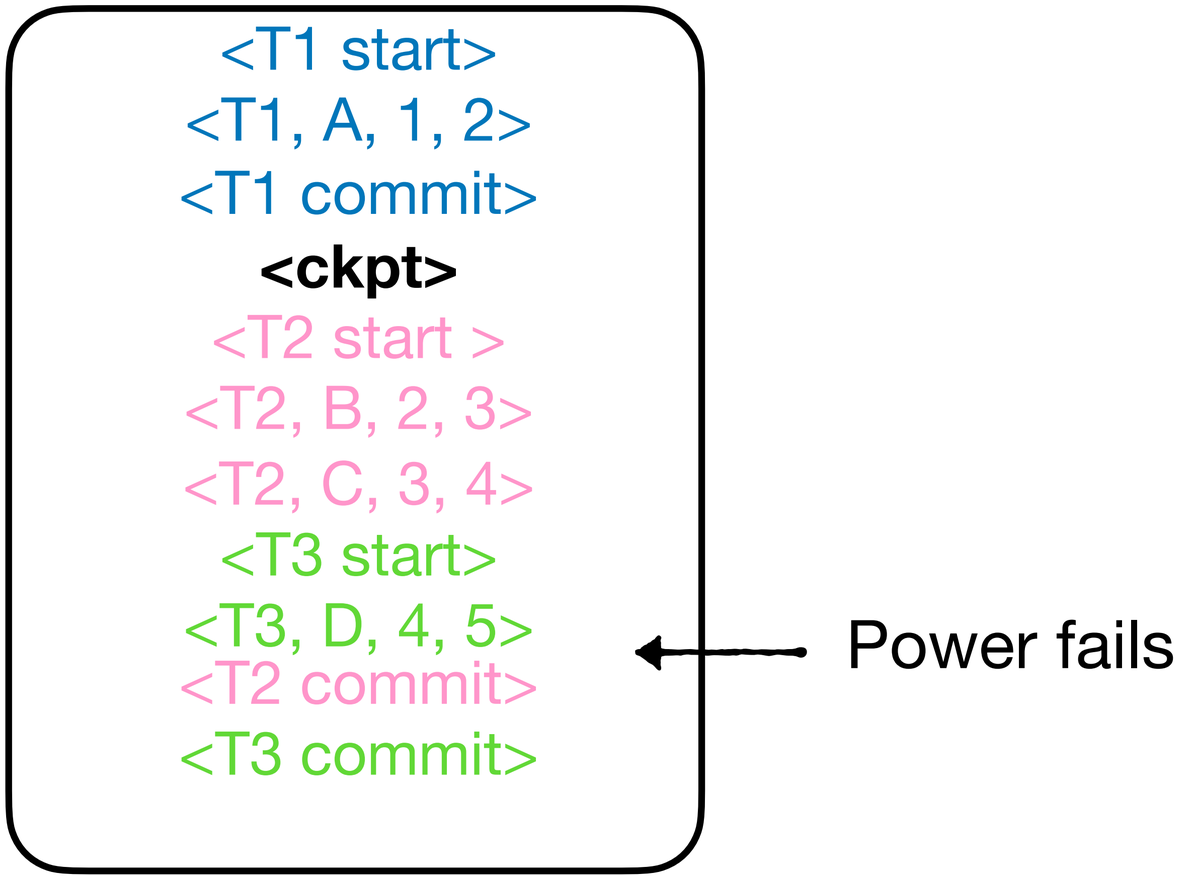

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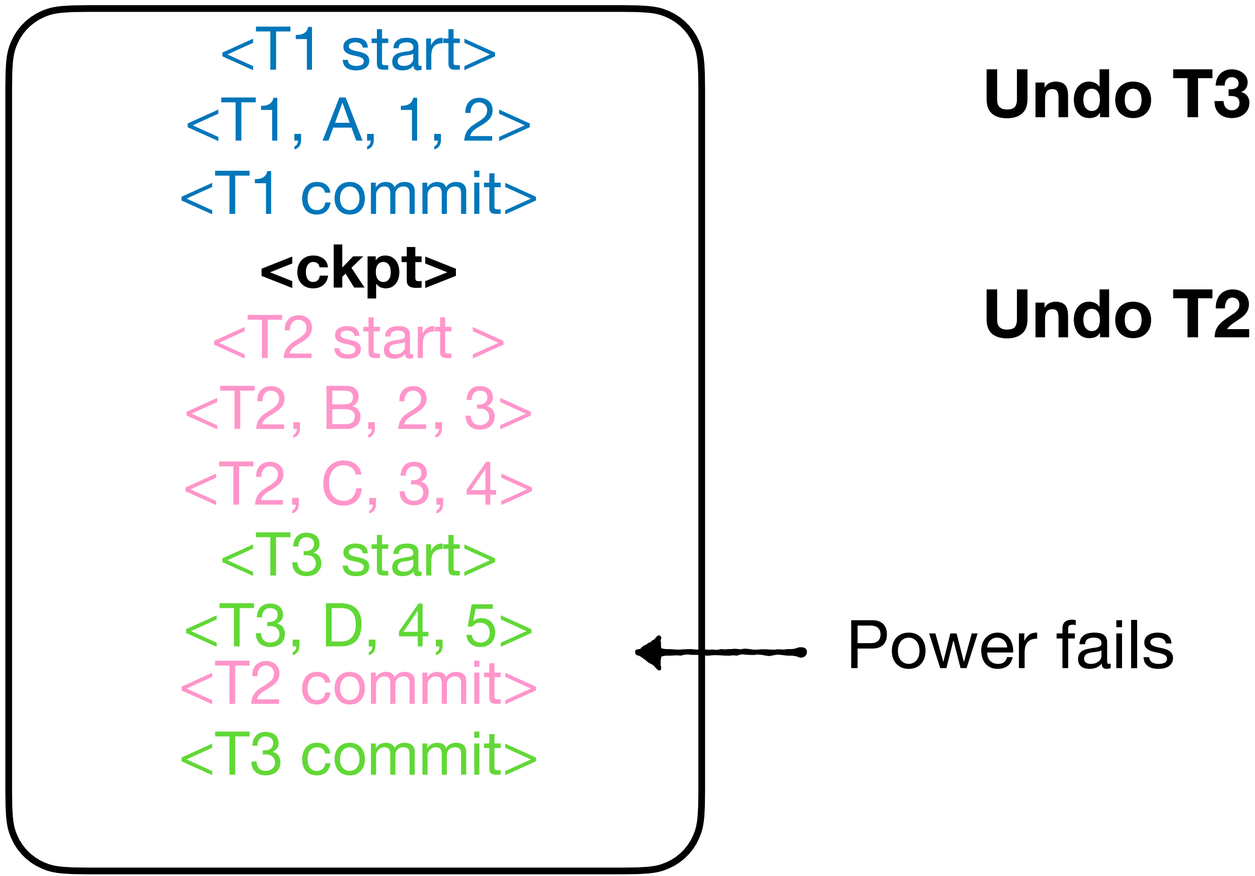

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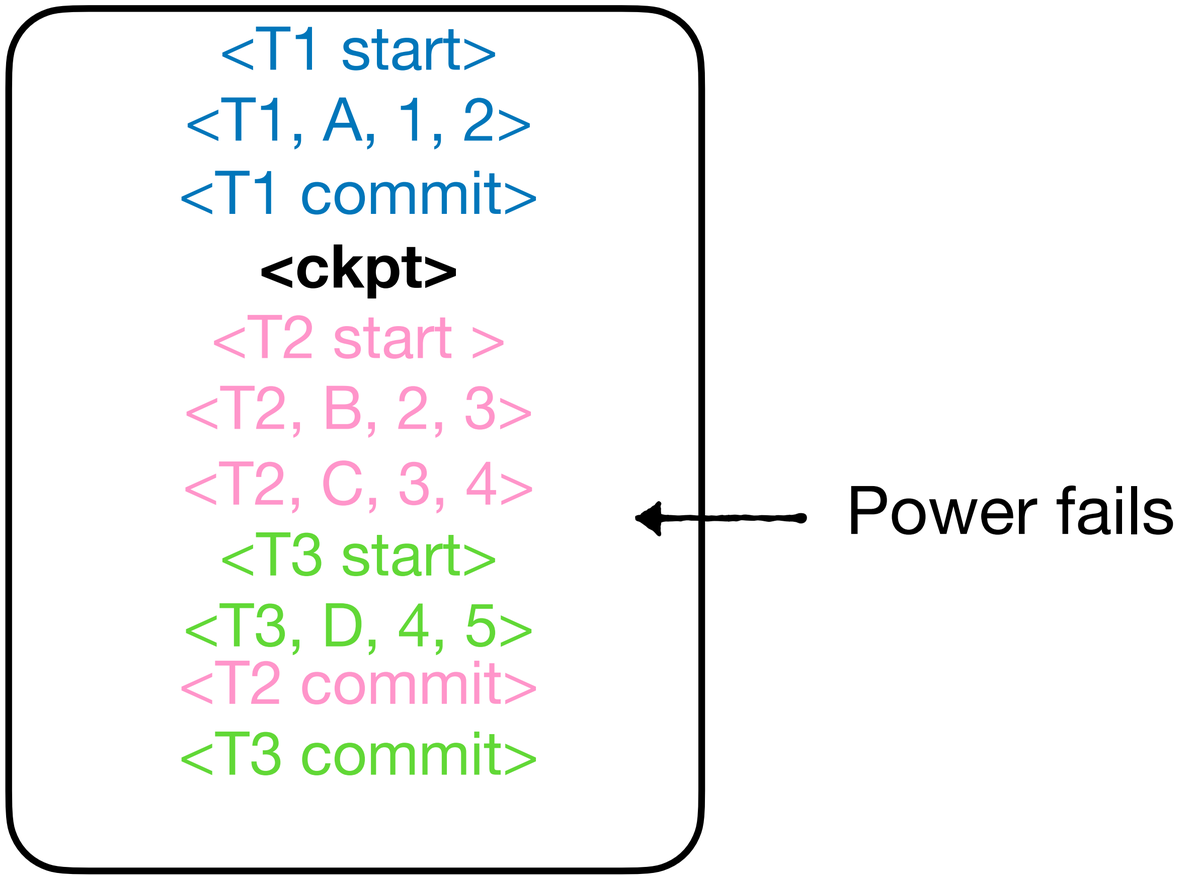

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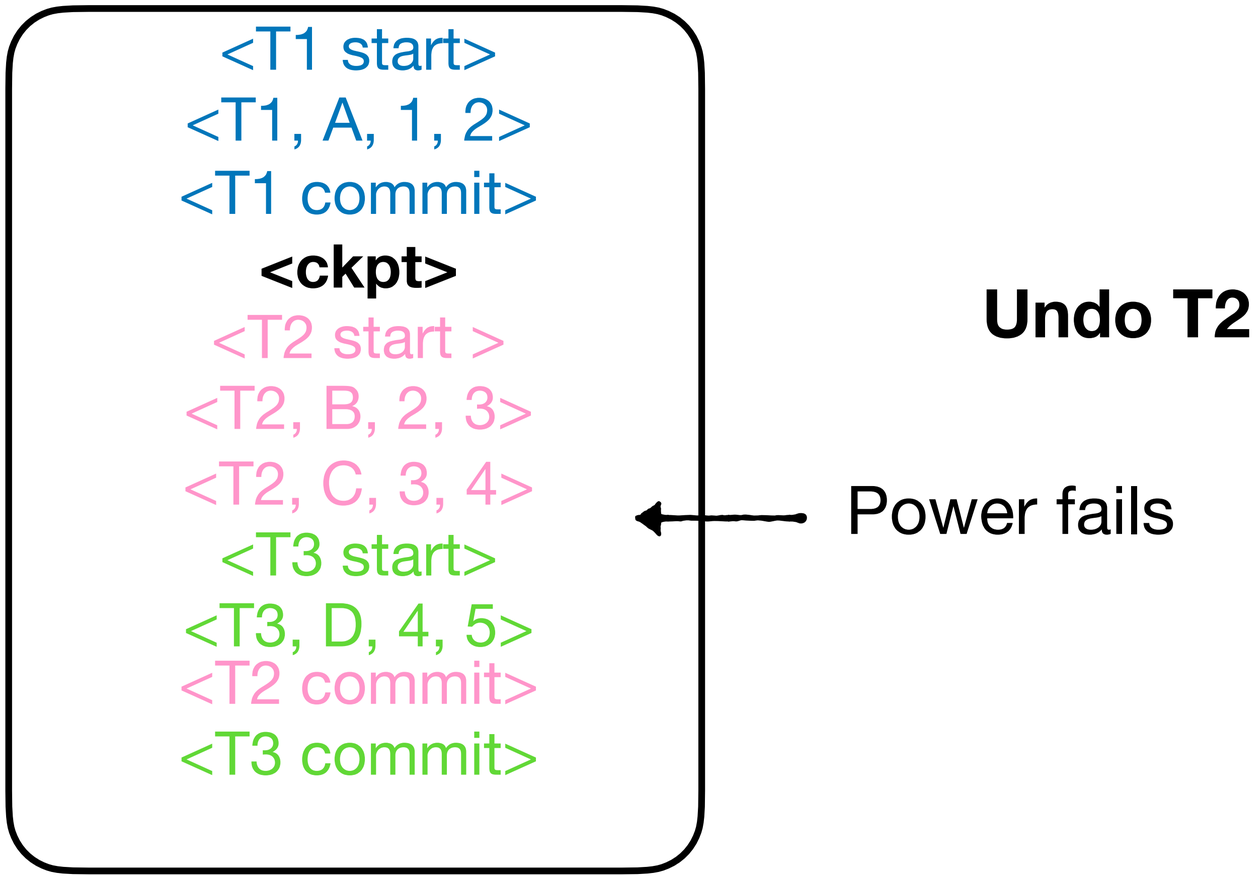

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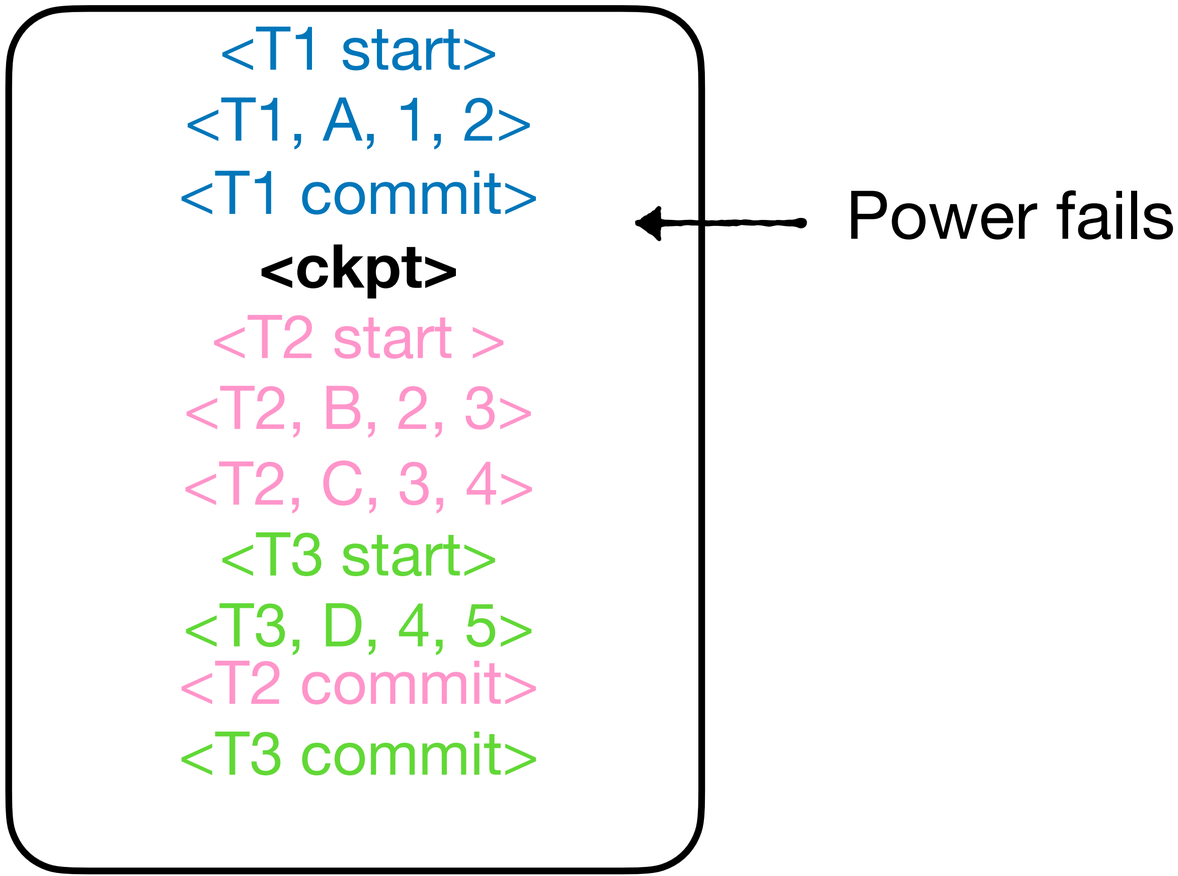

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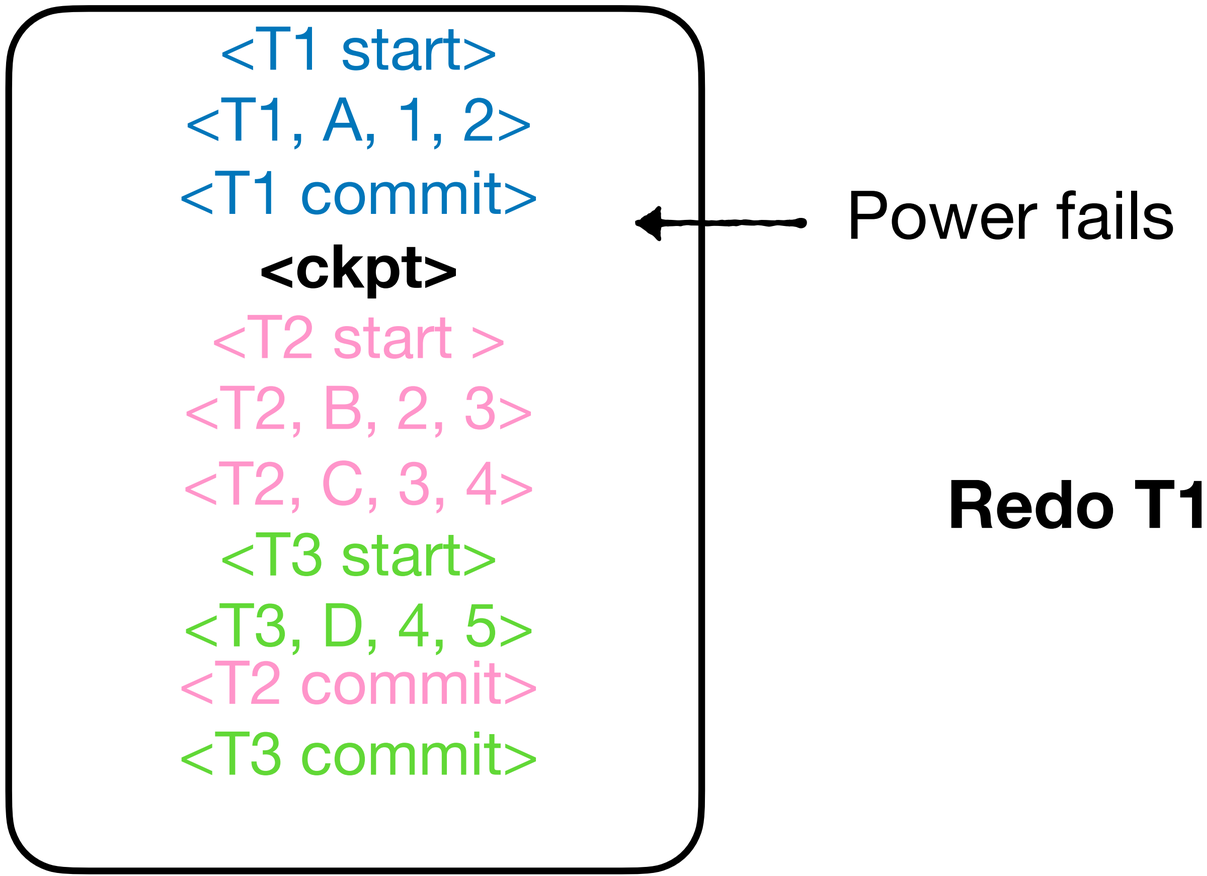

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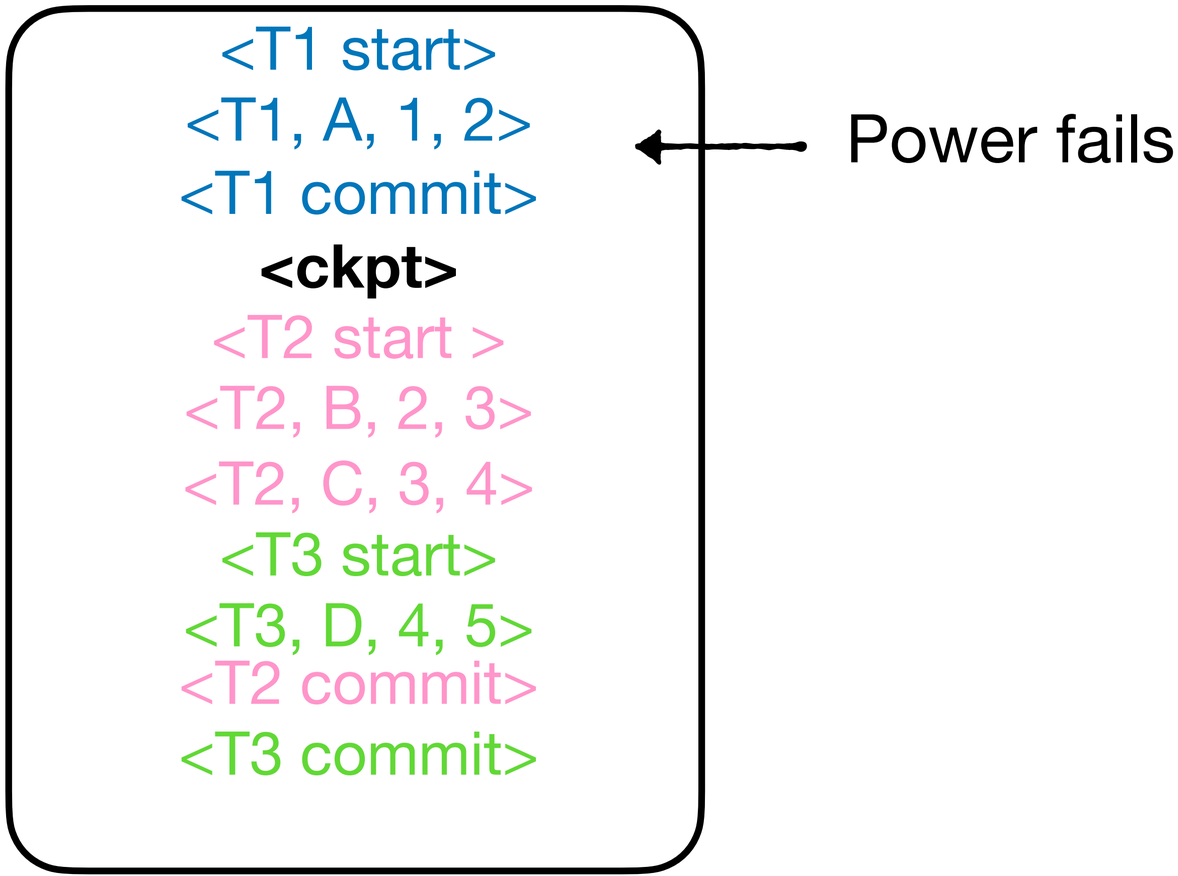

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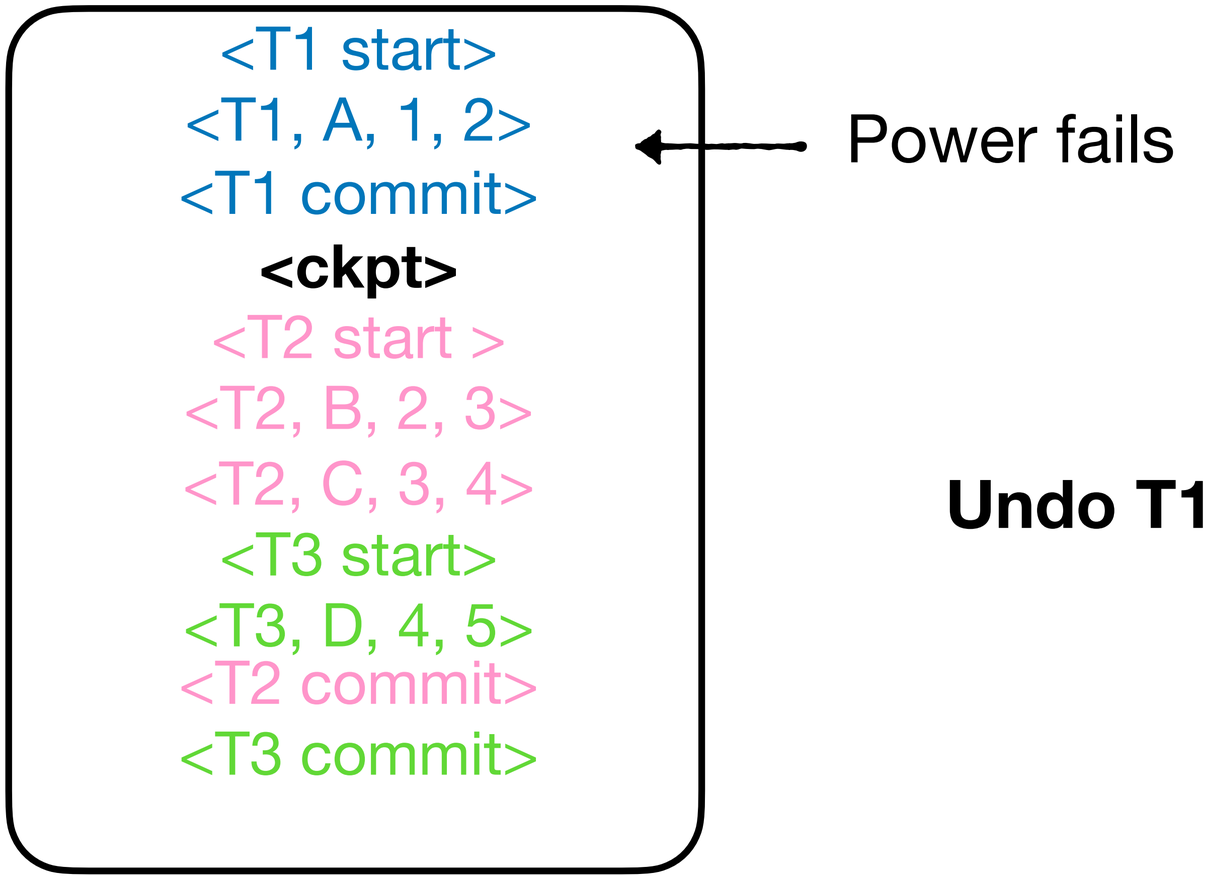
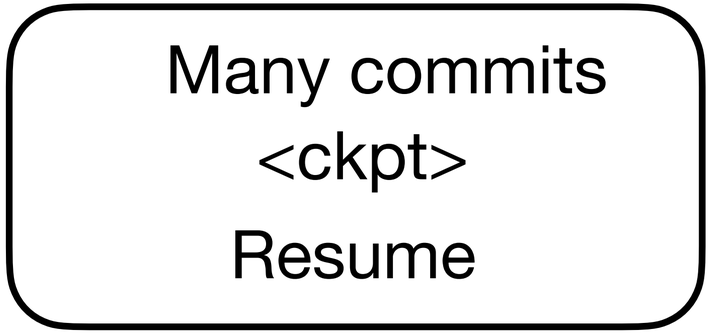


Question 2

The checkpointing mechanism we have seen requires all current transactions to commit, but this could lead to rejecting user transactions for a long while. How would you design a checkpoint mechanism that does not require all existing transactions to finish?

Buffer pool

Database



log

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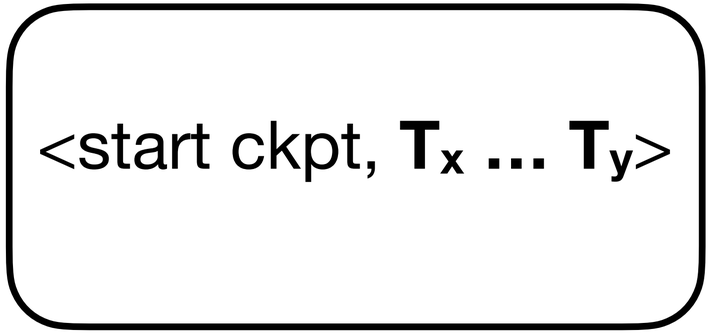
Buffer pool

Add all ongoing transaction names in checkpoint start record

Database



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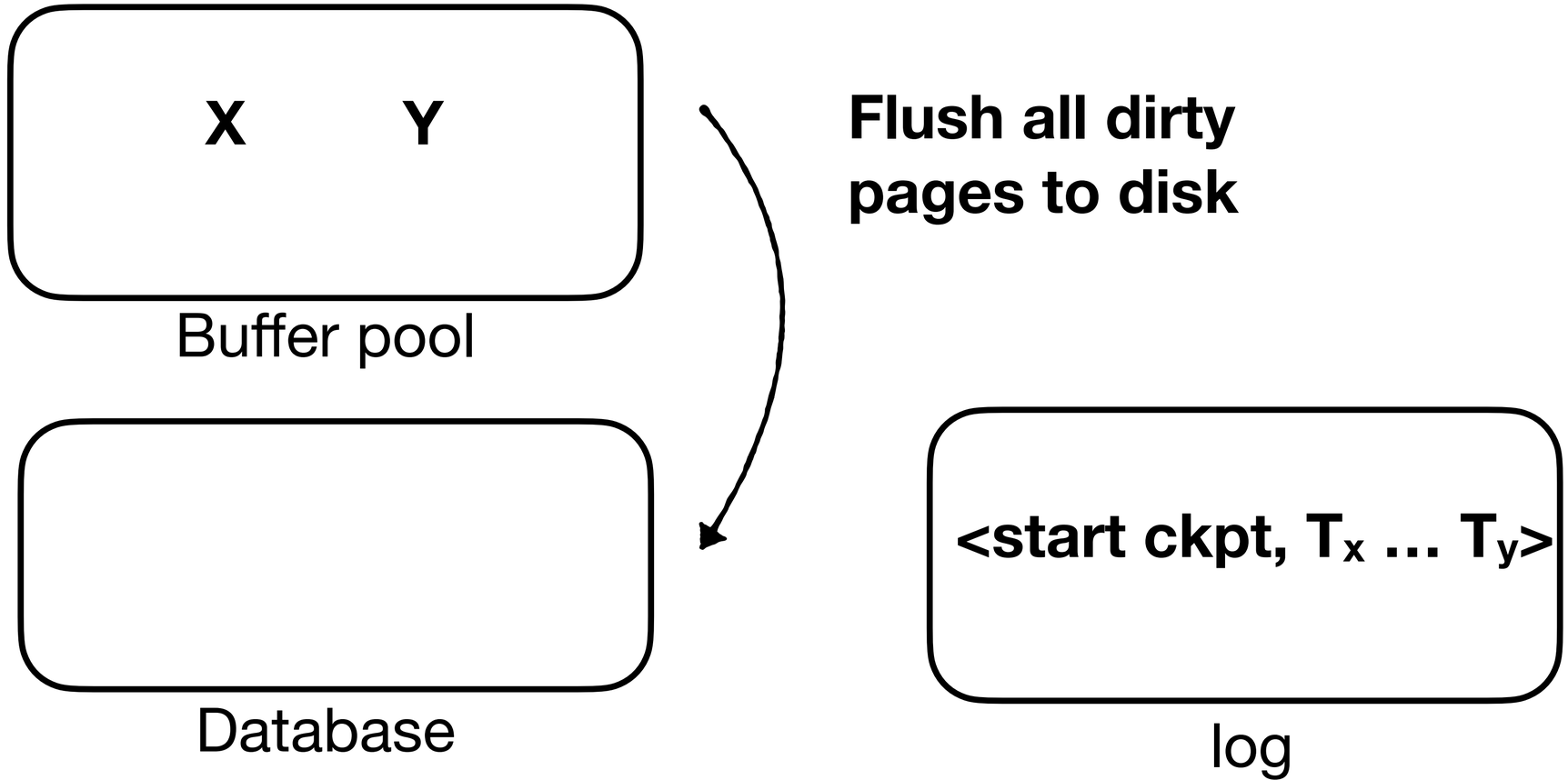

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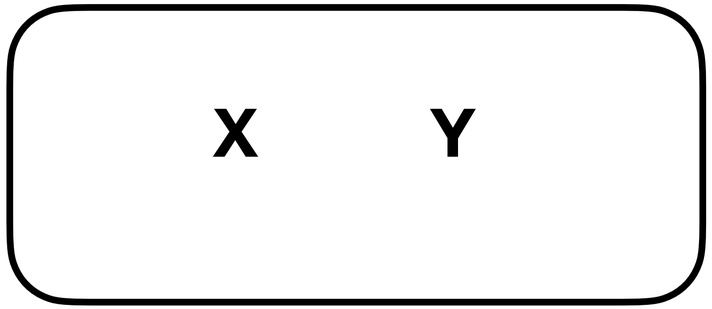
Flush end checkpoint record



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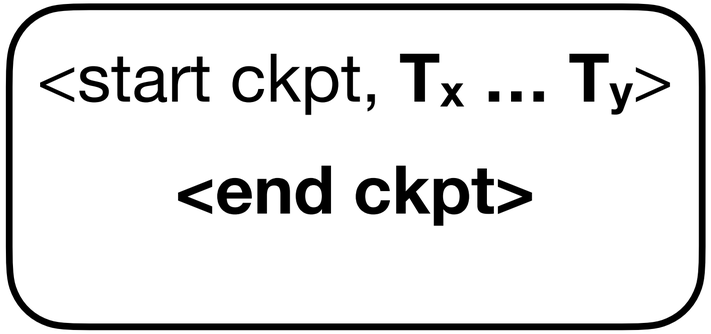

log

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how to recover?

log

<T1 start>
<T1, A, 1, 2>
<T2 start >
<T1 commit>
<T2, B, 2, 3>
<ckpt start T2>
<T2, C, 3, 4>
<T3 start>
<T3, D, 4, 5>
<ckpt end>
<T2 commit>
<T3 commit>

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Find checkpoint start & identify committed & uncommitted transactions

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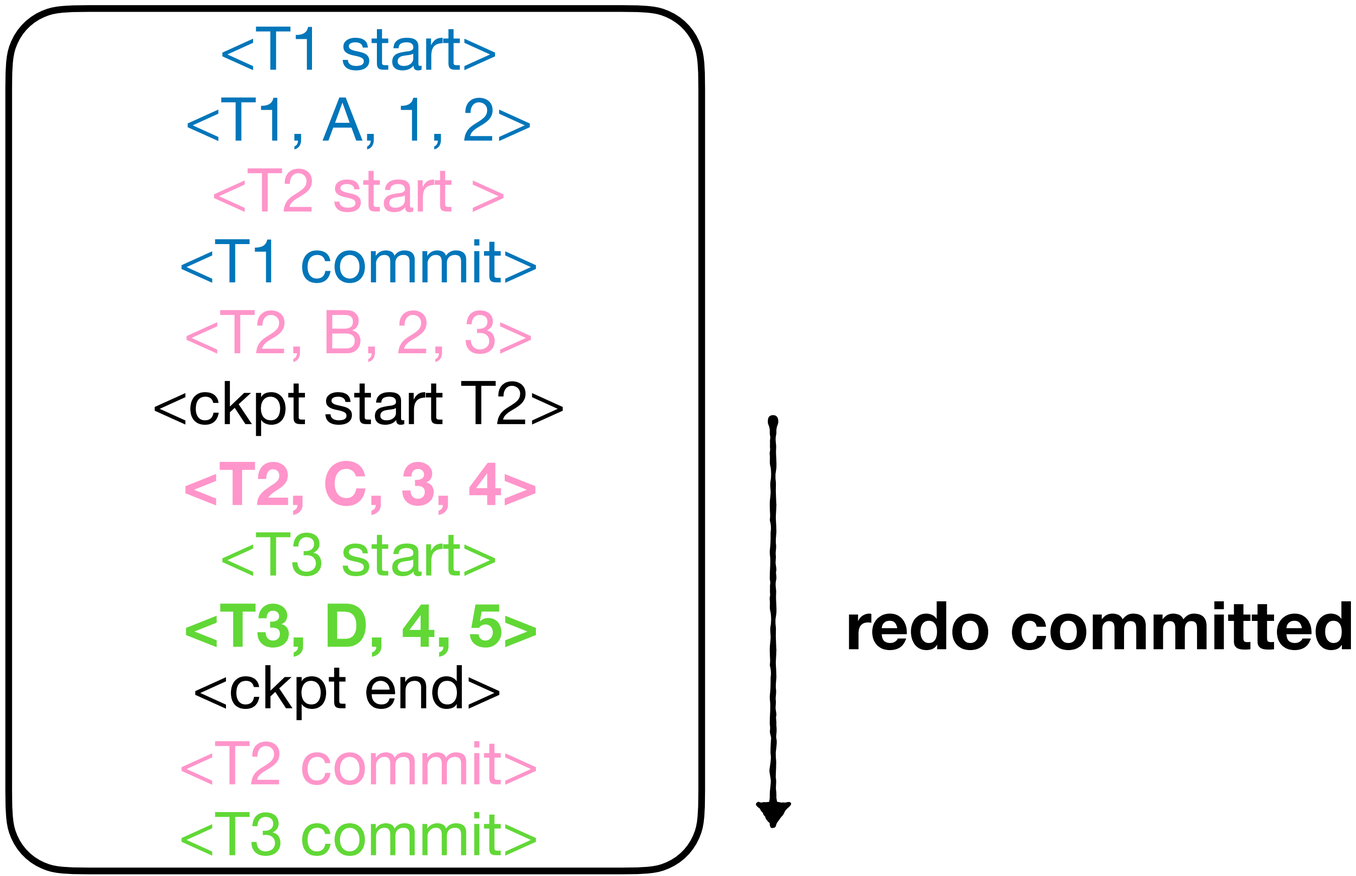

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redo committed

Go from back to front so we keep latest copy of each value

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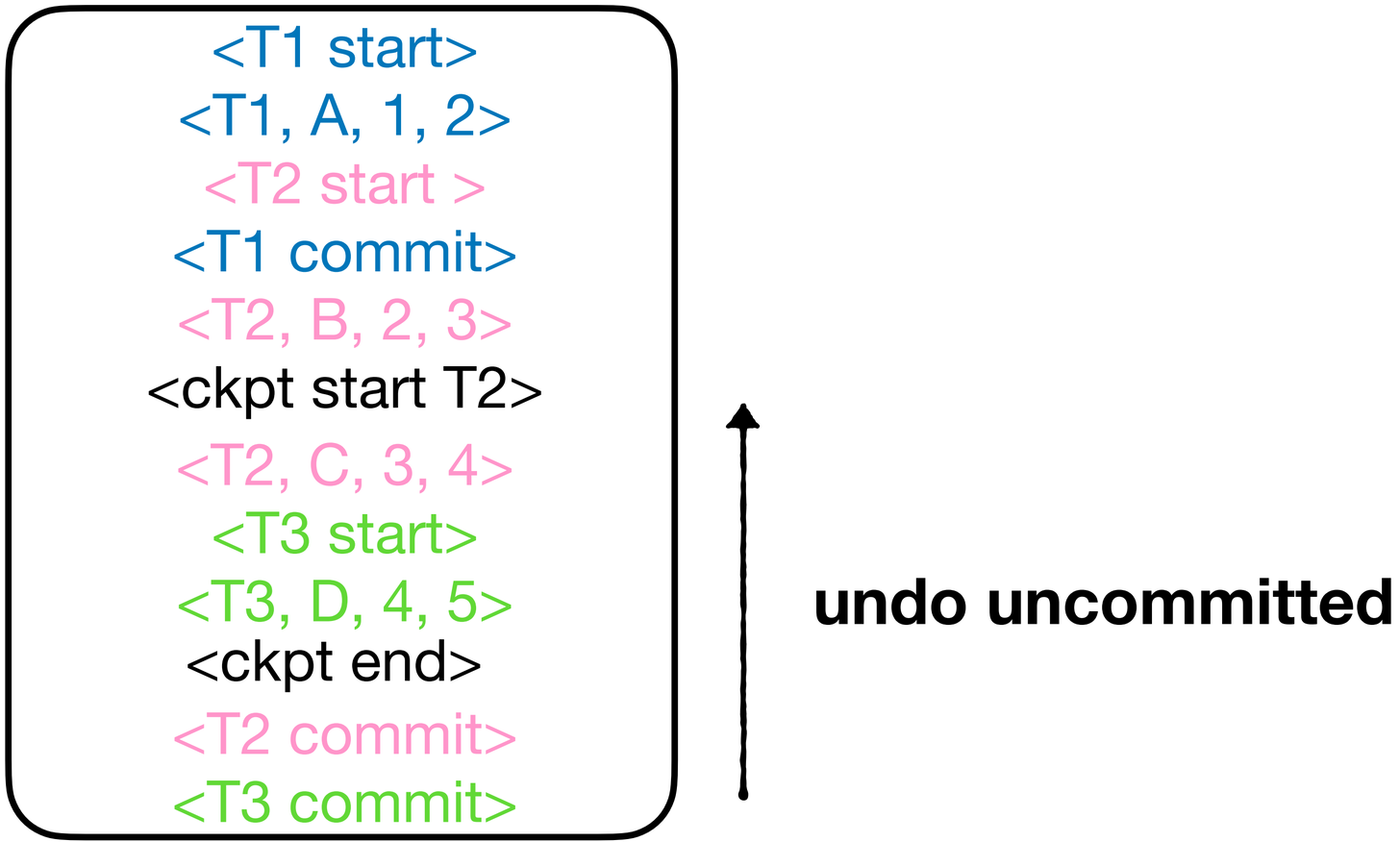

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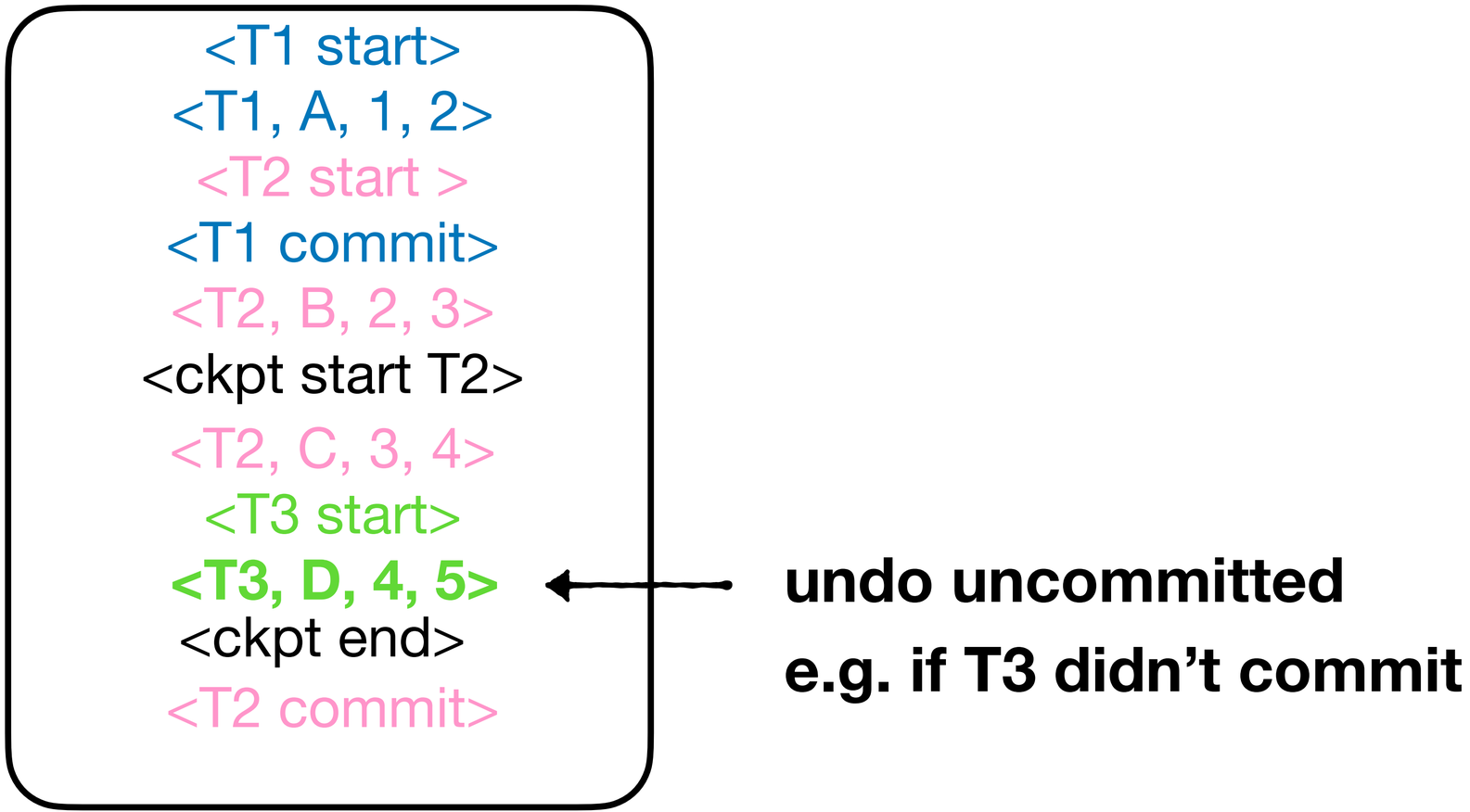

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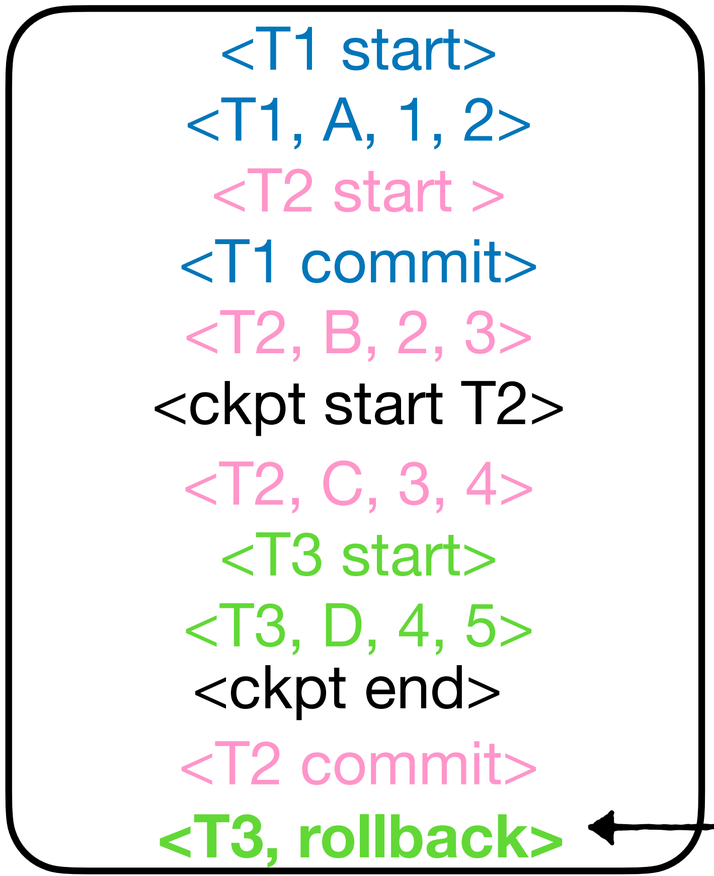

undo uncommitted

e.g. if T3 didn't commit

Add rollback

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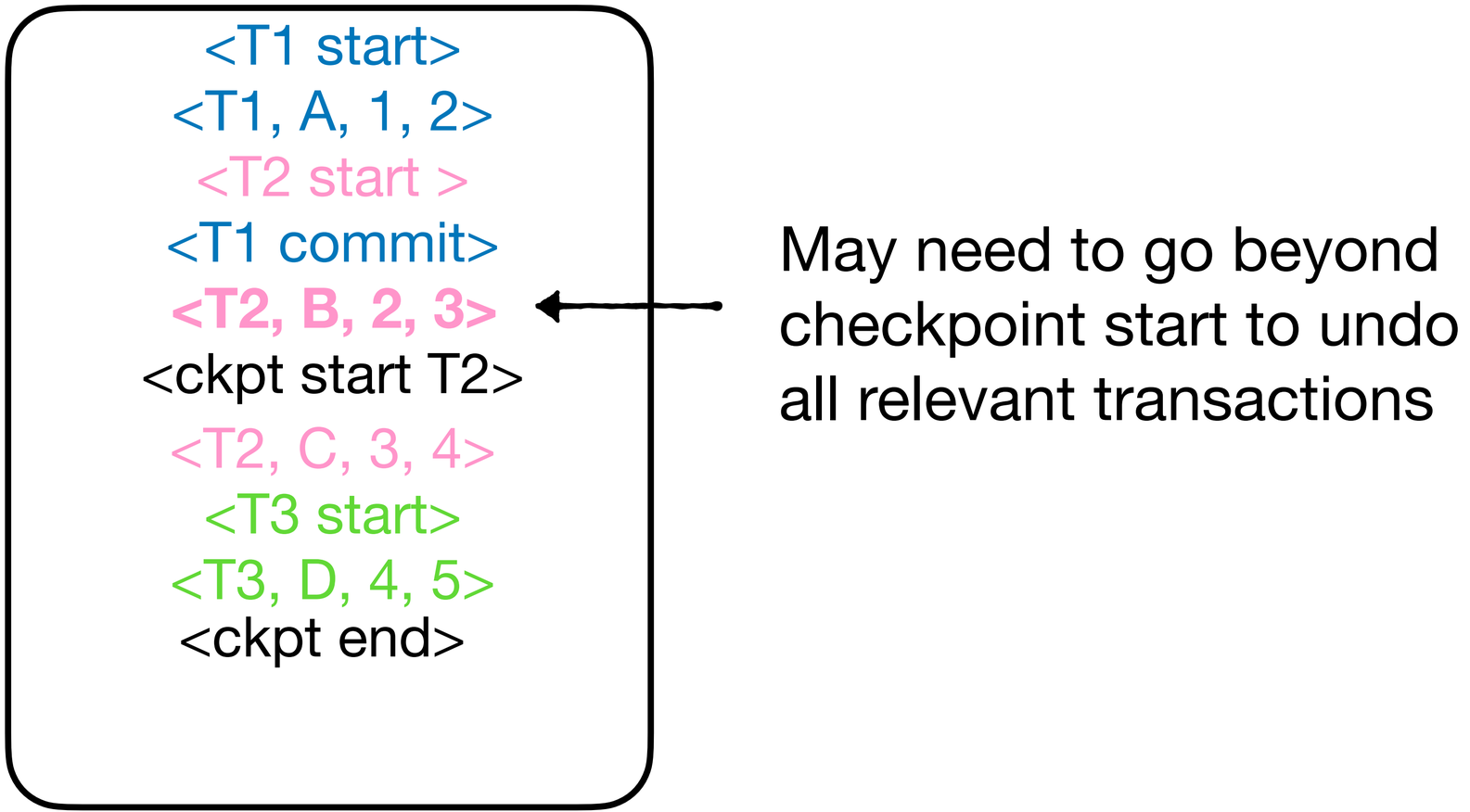

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Put log on a separate disk

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Put DB on one or more SSDs or disks, maybe using RAID