Fundamentals of Database Systems
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Lecture - 31
Recovery Systems: Immediate Database Modification

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Let us now move on to another database modification scheme, recovery scheme, which is called a immediate database modification as supposed to the default that we saw earlier. So, these allows on committed rights, so previously all rights were committed, so these allows on committed rights. So, that means even if the transaction has not committed, the right of it can go to the database. And the right record reads both the old value and the new value; both of them are needed, otherwise this is wrong.

Now, once more remember that log is written before the actual thing is being; that is the log is written before the actual operation. So, this is very important and we will see why this is important. So, first the log is written, then the actual right operation is if needed is done to the database. So, just like the same thing data transaction crashes, so again the log is searched and everything for this committee is searched. All the records, all the transaction with committee is been searched.

And if committee is also these two cases if found, so this committee record is searched, if it is not found, but the transaction is started, so that means, there is some start T somewhere, the transaction has started, but it has not committed. So, that means, that what may happen is that, there may be some rights in between which has gone to the database, but the transaction has not been committed, so there may be some errors in this.

So, what the transaction is do is to undo, what does undo essentially do is that, the transaction, this is the fail transaction, but it has, may have already written some values to the database, assuming it is going to be correct, now it is not correct. So, it must be undone. So, what is the example, if we see the banking example where and failure transaction may be that A as many as been debited, but before B has been credited; it has failed.

Now; that means, the committee is missing. So, that debit operation from A's account must be undone; that means, A is must be restored to the previous value. Now, for undoing of course, you did the old values, this is undone. If on the other hand, the committee record is found, then what may happen is that, not all the records, not all the rights in that may have actually traverse to the database. This means traverse to the database, not all of them actually gone to the database. So, this needs to be redone.

So, all the transaction needs to be redone. So, now, the point is the same as the previous scheme is that the transaction is set it as committed; that means, that is successfully completed all the operations, but all these operations may not gone to the database. So, the database values may not have been updated and there is no guarantee, it does been updated, it is only been the committee is only being return to the log; that is the log is being checked. So, it is needs to be redone.

So, it is just to ensure that if the transaction said it has successfully completed all it is operations are actually being done on the database. So, that is why both undo and redo is needed. So, this is why, these scheme is also sometimes called an undo, redo recovery scheme, because both undo and redoing is needed. One important thing is that, both of these as I said earlier, it is redo and undo both are identical operations, because there may be multiple crashes etcetera and undoing and redoing may be needed to be done again and again and again.

So, this must be an idempotent operation, more importantly how is this undoing and redoing done it that is the order in which this thing being done, so this is the way. So, undoing must been done in the order of the reverse of the log. So, undoing is done in the order reverse of the log and redoing is in the follow at order of the log. So, undoing is in the reverse order of log records, which is situate and easy to understand while the redoing is in the forward order of log records.

But, even then on more important question come is that, suppose our transactions, one transaction needs to be undone and other needs to be redone, which one should be done earlier? Should the undo be done first and then, the redone or should the redone be done first and then the undo. The answer is the undoing must been done before the redoing, first everything that I feel that the field transaction must been undone and then, the transaction that has correctly completed will be redone.

The reason is suppose consider a particular data, it is x, now suppose transaction 0 and x as fail while transaction 1 and x as passed now the that means, the right values of x should be reflected as whatever has been return by T 1. So, if T 1 the redoing of T 1 is done first and then, undoing of T 0 is done, T 2, T 0 may then roll back to the value toward T 1 has been return.

So, as what T 1 has returned, so that is not the correct thing. So, first T 0 should undo the value whatever it is return to x and then, T 1 is redoing. So, that because T 1 is correct has finished correctly.

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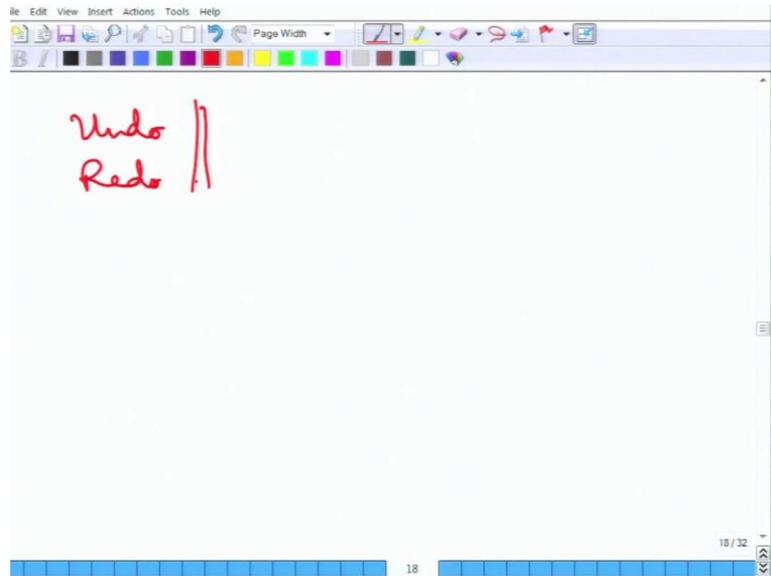
So, the value that after T 1 has done is now reflected in to the database. So, this is the very, very important point, where undoing must been done before redoing. So, undo and then, to redo, this is very, very important. Now, let us see an example to understand this completely.

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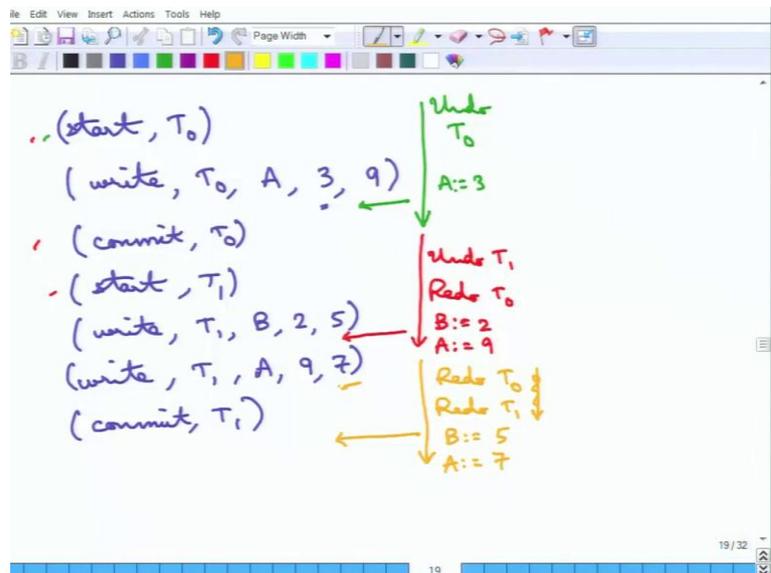
So, here is the example, so start T 0 and this is the same example as we solve earlier, but with one important difference is that the old values are now recorded. So, the three is the old value, the last time we did not require the old value, it was not there. By the way one

important thing is that, the about segment is required here, because the transaction may just say, I mean this is which has failed and it will write their about T.

Anyway coming back to the examples, so there are two transactions is T 0 and T 1, T 0 it is returns the value of a just change it from T 2 and 9 and T 1 is changing B from 2 to 5 and then T 1 also changing the value of a from 9 to 7 and then, there is the commit T 1. So, now, suppose the crush happens after this statement the right T 0 statement, now this is being searched, the log is being searched, what is found is that transaction T 0 has started, but it has not committed.

So, what is being done is that T 0 is undone. So, undo T 0, because T 0 has started, but has not no committing. So, T 0 may have already retain this value of A to 9, which is wrong, because this T 0 wrong, it should roll back the value to 3. So, undoing of T 0 is done. So, the value is now take back to 3, now suppose there is the crash after the right to T 1, but on the after the B statement, this is the thing.

So, again this log is being searched etcetera and what is being done is that T 1 has started, but not finished. So, T 1 is being undone and T 0 has started and finished to T 0 needs to be redone and the order must be the undoing of T 1 is first and redo of T 0 is then. So, essentially undo once one undo T 1 will be done earlier than redo of T 0. So, then, this will undo of T 1 will restore the value of B back to 2 and redo of T 0 will restore the value of A to 9, because this is the is the correct new value; that is needs to be it.

And finally, suppose there is the crash after the committee, so again everything is being searched and then, both T 1 and T 0 needs to be redone and again the redoing operation should be done in the order in which they have committed. So, redo T 0 and then, redo T 1, because otherwise you see the value of A will be wrong. So, then after this is being done B is the new value of B is return and A is the new value which is the 7, these value.

If this is not done in the order, then they will be wrong is that like the previous scheme. So, that is the point of this two recovery management system that differed database modification scheme and the immediate database modification. Just we summaries the differ meaning, the right the differ, it is coming and immediate meaning, the rights can go immediately, after it has been retain on the log, but the log record must been retain first.