

CSE 444: Homework 3

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1 Concurrency Control with Locking

1. (a) $R_2(X), R_2(Y), \underline{W_2(Y)}, \underline{R_1(X)}, \underline{R_1(Y)}, \underline{W_1(X)}, C_1, \dots$ (the rest of Transaction 2)
 (b) $\underline{R_1(X)}, \underline{R_1(Y)}, \underline{W_1(X)}, \underline{R_2(X)}, R_2(Y), W_2(Y), C_1, \dots$ (the rest of Transaction 2)
 (c) $R_1(X), R_1(Y), \underline{W_1(X)}, R_2(X), R_2(Y), W_2(Y), R_2(X), R_2(Y), \underline{W_2(X)}, \underline{C_1}, \dots$ (the rest of Transaction 2)
2. No. $R_0(A)$ is before $R_2(A)$ so Transaction T_0 needs to precede T_2 . $R_2(B)$ is before $W_0(B)$ so Transaction T_2 needs to precede T_0 , forming a cycle in the precedence graph.
3. See the following schedule

| Transaction T_0 | Transaction T_1 | Transaction T_2 |
|-------------------|--------------------------|--------------------------|
| $L_0(A), L_0(B)$ | | |
| $R_0(A)$ | | |
| $W_0(A), U_0(A)$ | $L_1(A) - \text{DENIED}$ | $L_2(A), R_2(A)$ |
| | $L_1(A) - \text{DENIED}$ | $W_2(A)$ |
| $R_0(B)$ | | $L_2(B) - \text{DENIED}$ |
| $W_0(B), U_0(B)$ | | $L_2(B), R_2(B), U_2(A)$ |
| | $L_1(A), R_1(A)$ | $W_2(B), U_2(B)$ |
| | $L_2(B), R_1(B)$ | |
| | $U_1(A), U_1(B)$ | |

4. By only releasing all locks when the transaction is completed, we have both conflict-serializable and recoverable schedules. Also we can avoid cascading aborts.

2 Optimistic Concurrency Control

1. See below

| T_1 | T_2 | T_3 | T_4 | X | Y |
|-------------------|----------|-------------------|----------|------------------------------|------------------------------|
| 1 | 2 | 3 | 4 | RT = 0 WT = 0 C = true | RT = 0 WT = 0 C = true |
| | $R_2(X)$ | | | RT = 2 | |
| $R_1(X)$ | | | | RT = 2 | |
| | $W_2(X)$ | | | WT = 2 C = false | |
| | | | $W_4(X)$ | WT = 4 | |
| $W_1(X)$ ABORT | | | | | |
| | | $W_3(X)$ DELAY | | | |
| | | | ABORT | | |
| | $R_2(Y)$ | $W_3(X)$ | | WT = 3 | RT = 2 |
| | $W_2(Y)$ | | | | WT = 2 C = false |
| | | $R_3(Y)$ DELAY | | | |
| | C_2 | $R_3(Y)$ | | RT = 2 WT = 3 C = true | RT = 3 |
| | | $W_3(Y)$ | | | WT = 3 |
| | | C_3 | | | RT = 3 WT = 3 C = true |

2. See below

| T_1 | T_2 | T_3 | T_4 | X_0 | X_3 | X_4 |
|----------|-------------------|----------|----------|--------|--------|--------|
| 1 | 2 | 3 | 4 | | | |
| $R_1(X)$ | | | | RT = 1 | | |
| | | $R_3(X)$ | | RT = 3 | | |
| | | $W_3(X)$ | | | CREATE | |
| | $R_2(X)$ | | | RT = 3 | | |
| | | | $R_4(X)$ | | RT = 4 | |
| | $W_2(X)$ ABORT | | | | | |
| | | | $W_4(X)$ | | | CREATE |