01_HW_08

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1 Distributed Systems (LTAT.06.007)

1.0.1 Seminar 8: Sequential Consistency

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1.1 Task

Assuming that all variables are initially set to 0, for the below executions:

- Please indicate whether they are sequentially consistent.
- If an execution is not sequentially consistent, then show the right execution that makes it sequentially consistent (simply explain how you achieved that)

4. **P1**: W(x) 1; R(x) 2
   P2: R(x) 1; R(x) 2
   P3: R(x) 1; W(x) 2
   P4: R(x) 1; R(x) 2

   Solution : They are sequentially consistent. They can be executed as follows:
   P1: W(x) 1 -> **P2**: R(x) 1 -> **P3**: R(x) 1 -> **P4**: R(x) 1 -> **P3**: W(x) 2 -> **P1**: R(x) 2 -> **P2**: R(x) 2 -> **P4**: R(x) 2

5. **P1**: W(x) 1
   P2: W(x) 2
   P3: R(x) 2; R(x) 1
   P4: R(x) 1; R(x) 2

   Solution : Not sequentially consistent, Right consistent as follows:
   P1: W(x) 1
   P2: W(x) 2
   P3: R(x) 1; R(x) 2
   P4: R(x) 1; R(x) 2

   Can be executed as follows:
   P1: W(x) 1 -> **P2**: W(x) 2 -> **P3**: R(x) 1 -> **P4**: R(x) 1 -> **P3**: R(x) 2 -> **P3**: R(x) 2

6. **P1**: W(x) 1; R(x) 1; R(y) 0
   P2: W(y) 1; R(y) 1; R(x) 1

P3: R(x) 1; R(y) 0
P4: R(y) 0; R(x) 0

Solution : Not sequentially consistent, Right consistent as follows:
P1: R(y) 0; W(x) 1; R(x) 1
P2: W(y) 1; R(y) 1; R(x) 1
P3: R(y) 0; R(x) 1
P4: R(y) 0; R(x) 0

Can be executed as follows:
P4: R(y) 3 -> **P4**: R(y) -> 0 **P1**: R(y) -> 0 **P2**: W(y) -> 1 **P4**: R(x) -> 0 **P1**: W(x) -> 1 **P3**: W(x) -> 1 **P2**: R(y) -> 1 **P1**: R(x) -> 1 **P2**: R(x) 1

7. **P1**: W(x) 1; R(x) 1; R(y) 1
   P2: W(y) 1; R(y) 1; R(x) 1
   P3: R(x) 0; R(y) 1

   Solution : They are sequentially consistent. They can be executed as follows:
   P3: R(x) -> 0 **P1**: W(x) -> 1 **P2**: W(y) -> 1 **P3**: R(x) -> 0; R(y) -> 1 **P2**: R(x) -> 0; R(y) -> 1 **P1**: R(x) -> 1 **P2**: R(x) -> 1 **P1**: R(y) 1