

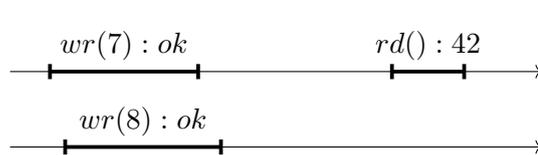
Exercise 4: Programming Distributed Systems (SS 2018)

- Prepare this sheet for the exercise on Thursday, May 24th.

1 Registers

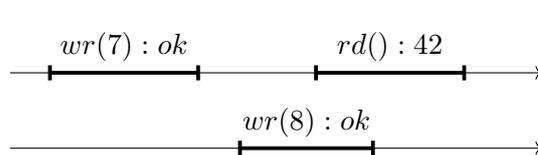
To better understand the differences between the registers discussed in the lecture, try to find example executions that show the differences:

- a) Give an execution that is not allowed for a safe register.



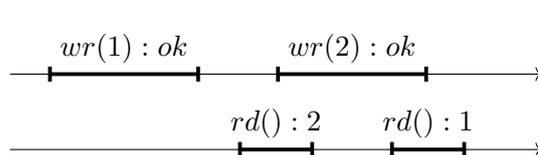
Not safe, since a read that doesn't overlap with a write returns the value of a preceding write, so it should either return 7 or 8 in this example.

- b) Give an execution that is allowed for a safe register but not for a regular register.



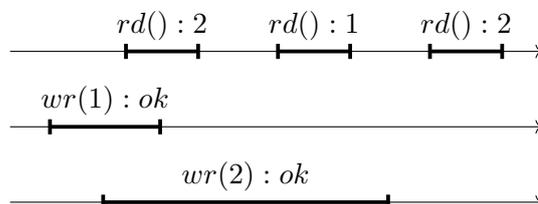
Would be safe, since for reads that overlap with writes safe register do not restrict the outcome. It is not regular, since a regular register must either return the value from one of the concurrent writes or a preceding write, so either 7 or 8 in this example.

- c) Give an execution that is allowed for a regular register but not for an atomic register.



Would be regular, but not atomic. Since we first read 2 and then 1, the write of 1 must not be before the write of 2.

A different example for the case of multiple writers: For (N,N) atomic registers the following execution would not be allowed:



2 Raft

Answer questions 3, 4, 5, and 6 of the Raft quiz at <https://ramcloud.stanford.edu/~ongaro/userstudy/quizzes.html>.

To learn about the details of the Raft algorithm, read the Raft paper “In Search of an Understandable Consensus Algorithm (Extended Version)” by Diego Ongaro and John Ousterhout (<https://ramcloud.stanford.edu/raft.pdf>). You can also watch the video at <https://youtu.be/YbZ3zDzDnrw>.

The answers are available on the same Raft page: <https://ramcloud.stanford.edu/~ongaro/userstudy/rubric.pdf>