Design of Parallel and High Performance Computing
HS 2016
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Homework 4

Sequential Consistency vs. Linearizability

Please explain the differences between Sequential Consistency and Linearizability.

Linearizability

Definitions

For the following history of a shared register with the operations write(x)/void and read()/x answer the questions below.

B: r.write(1)
A: r.read()
C: r.write(2)
A: r:1
B: r:void
C: r:void
B: r.read()
B: r:1
A: q.write(3)
C: r.read()
A: q:void

- What is $H|B$?
- What is $H|r$?
- Turn H into a complete subhistory H'.
- Is H' sequential?
- Is H' well-formed?
- Is H' linearizable? If yes, prove it!
- If the first two events are swapped, is the resulting history equivalent to H?

Overlap

In the following history, do the marked method executions overlap?

A: q.enq(x)
B: q.enq(y)
B: q:void
B: q.deq()
A: q:void
A: q.deq()
B: q:x

Linearizability, FIFO I

Is the following history of a FIFO queue with the operations enq(x)/void deq()/x linearizable? If yes, prove it! Is it sequentially consistent?

A: r.enq(x)
A: r:void
B: r.enq(y)
A: r.deq()
B: r:void
A: r:y

Linearizability, FIFO II

Is the following history of a fifo queue with the operations enq(x)/void deq()/x linearizable? If yes, prove it!

A: q.enq(x)
B: q.enq(y)
A: q:void
B: q:void
A: q.deq()
C: q.deq()
A: q:y
C: q:y