

## 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  $\text{enq}(x)/\text{void deq}()/x$  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  $\text{enq}(x)/\text{void deq}()/x$  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