

# The Latency Spin Bit

## draft-trammell-quic-spin-01

Brian Trammell, ETH

MAMI Plenary Cambridge, 30 January 2018



measurement and architecture for a middleboxed internet

measurement

architecture

experimentation



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# Introducing the Spin Bit

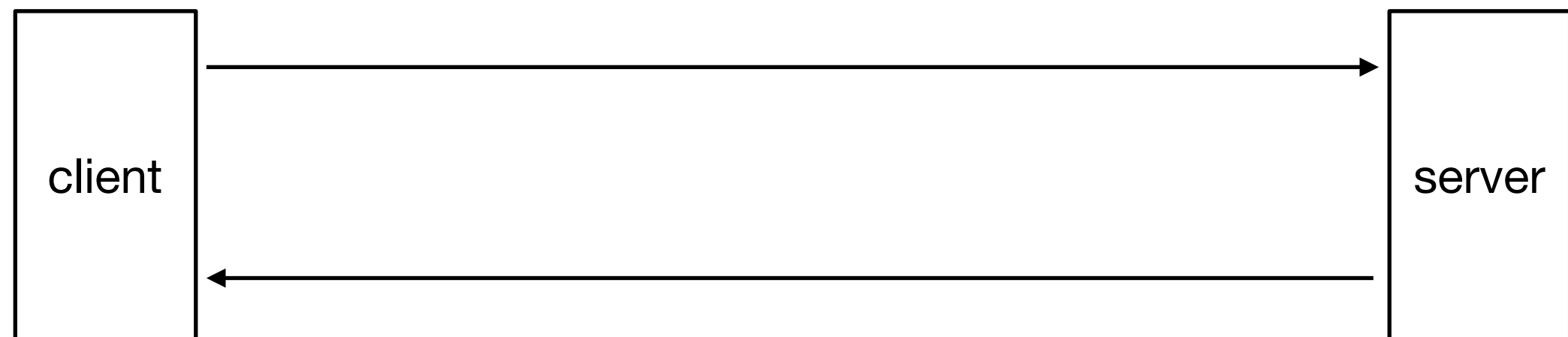
- Goal of QUIC: encrypt all the bits.
  - The path will see anything not encrypted.
  - The path will change anything not integrity protected.
- Goal of MAMI: explicit middlebox cooperation
  - Per [1], design signals expressly for path consumption
- Spin bit: add passive RTT to QUIC for one bit per packet

[1] Allman, Beverly, Trammell "Principles for Measurability in Protocol Design", ACM CCR April '17



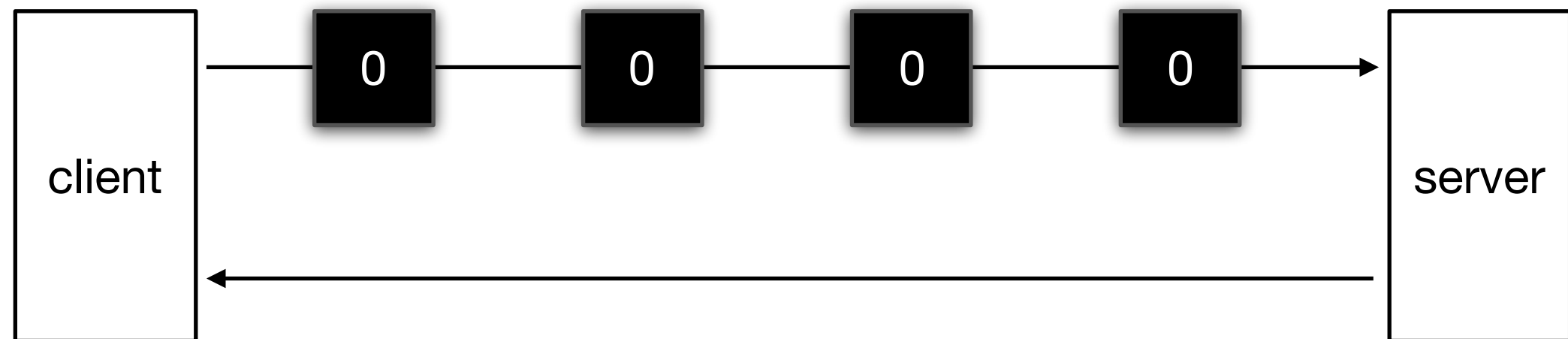


# How does it work?



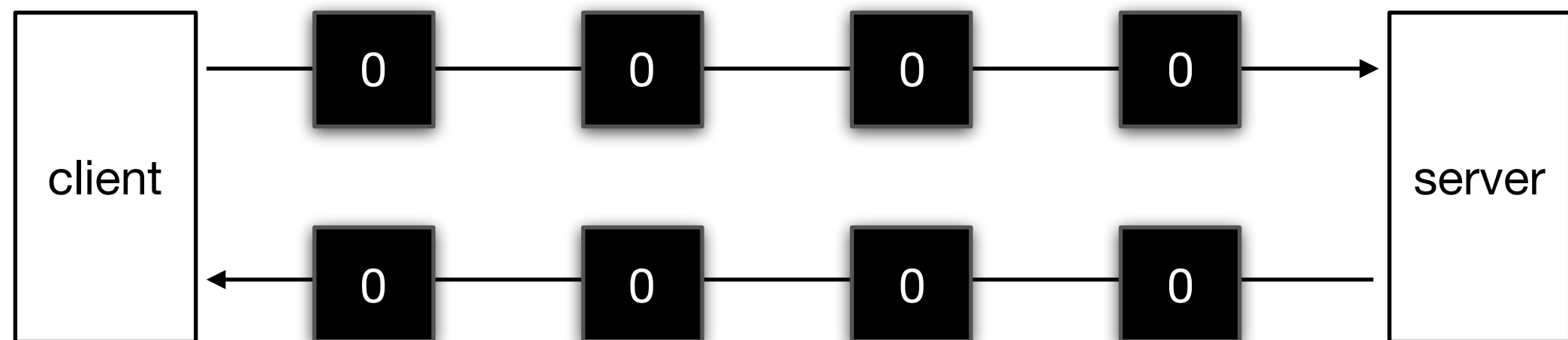


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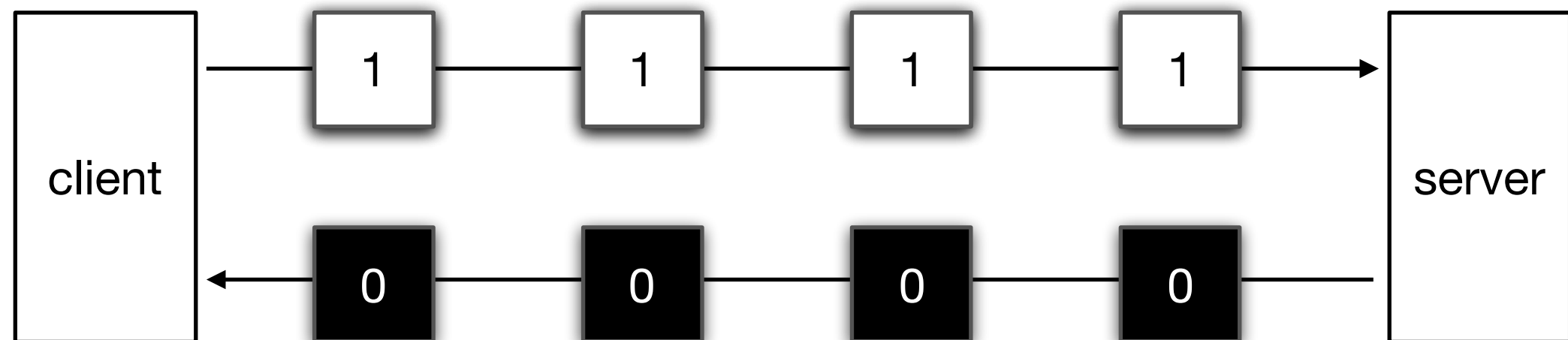


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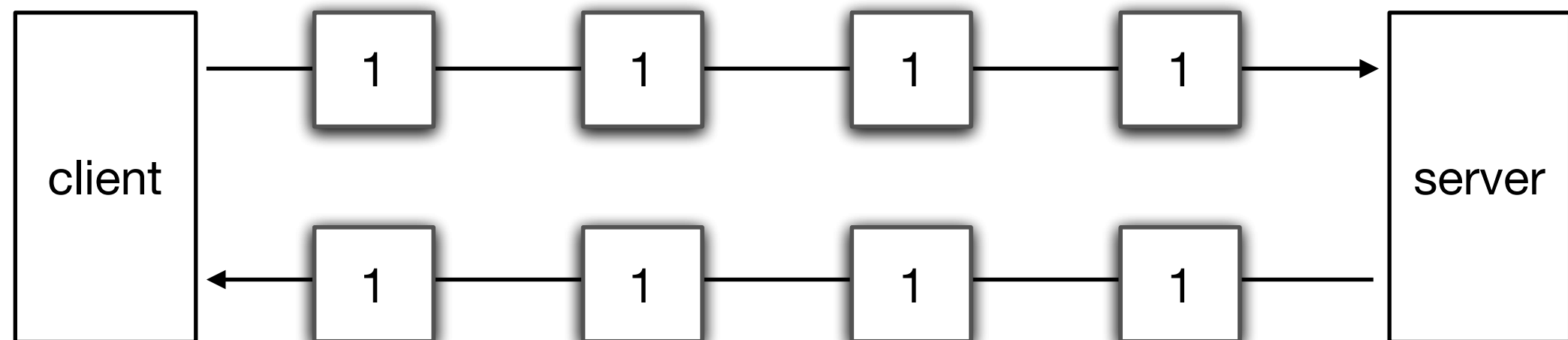


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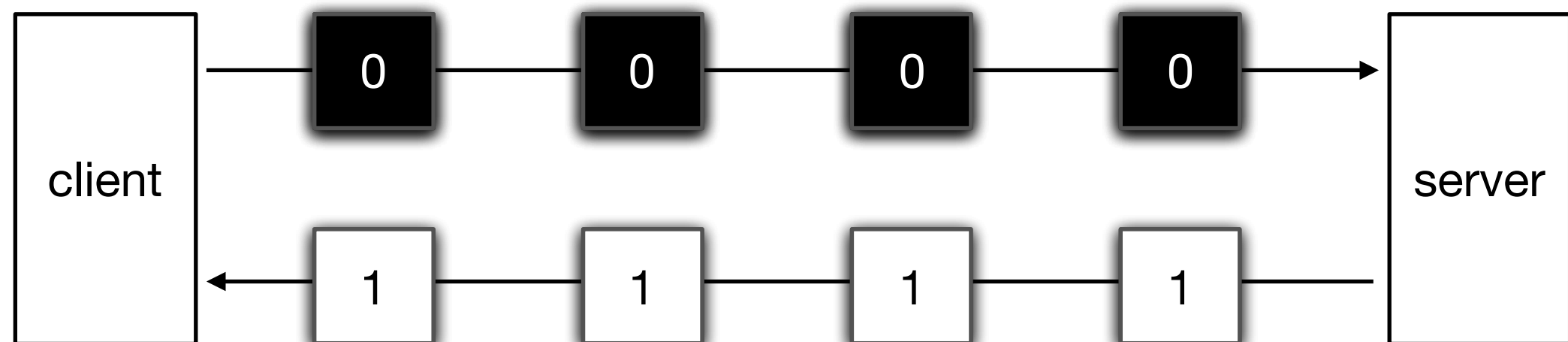
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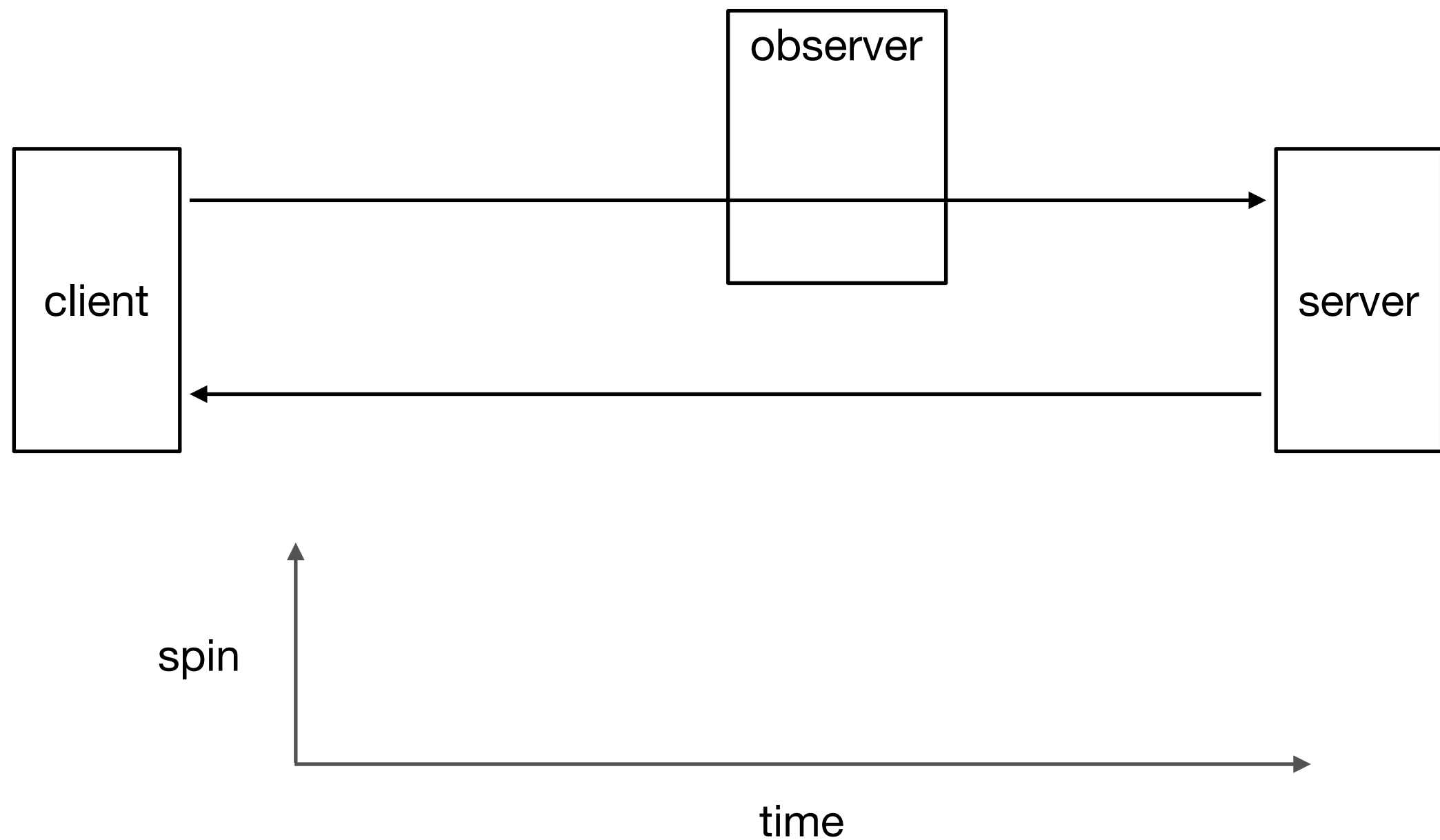


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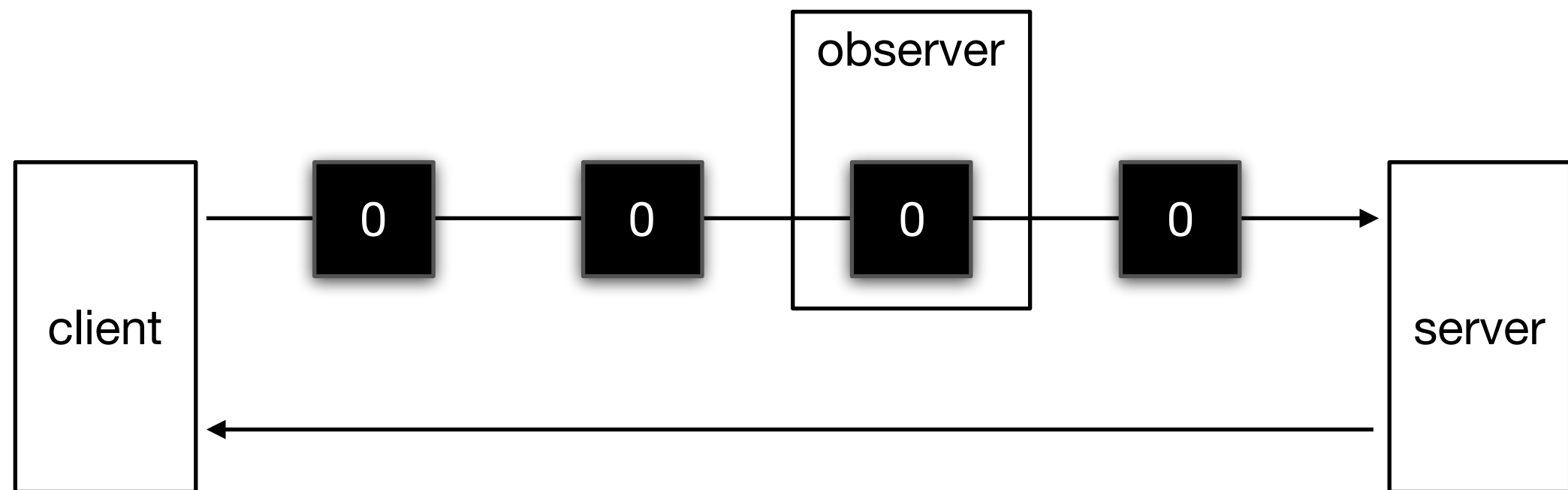


# Unidirectional one-point measurement



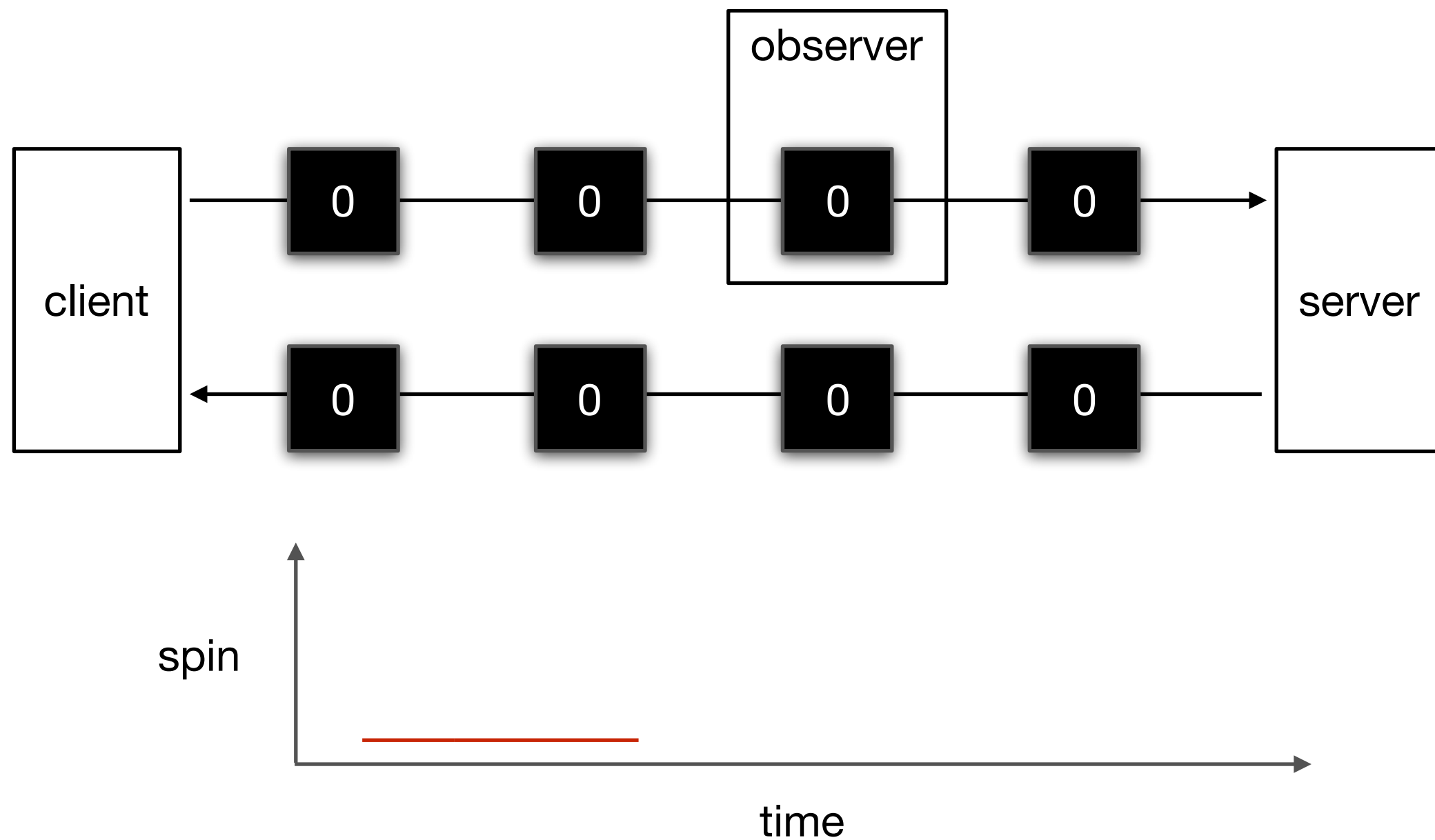


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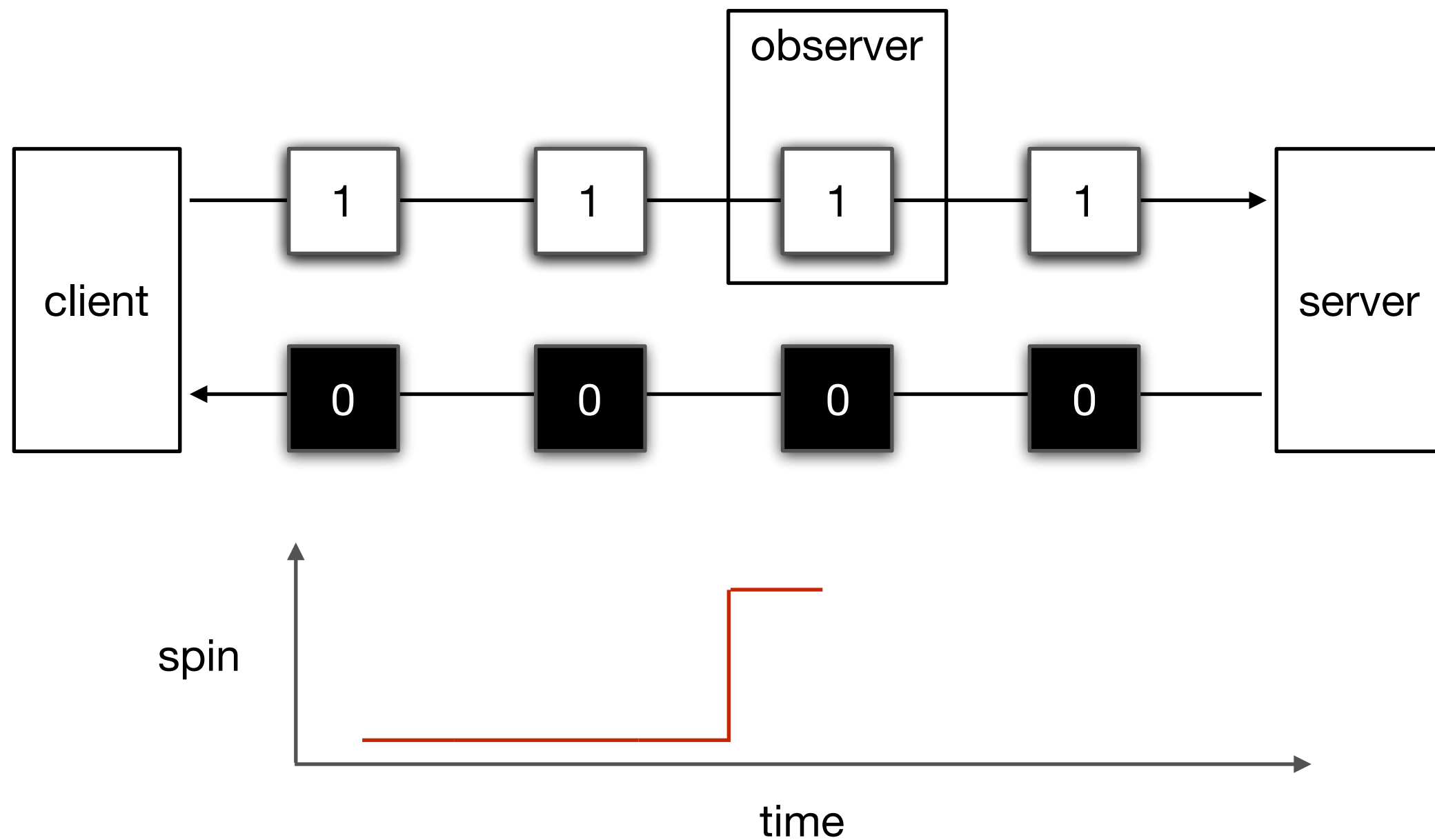


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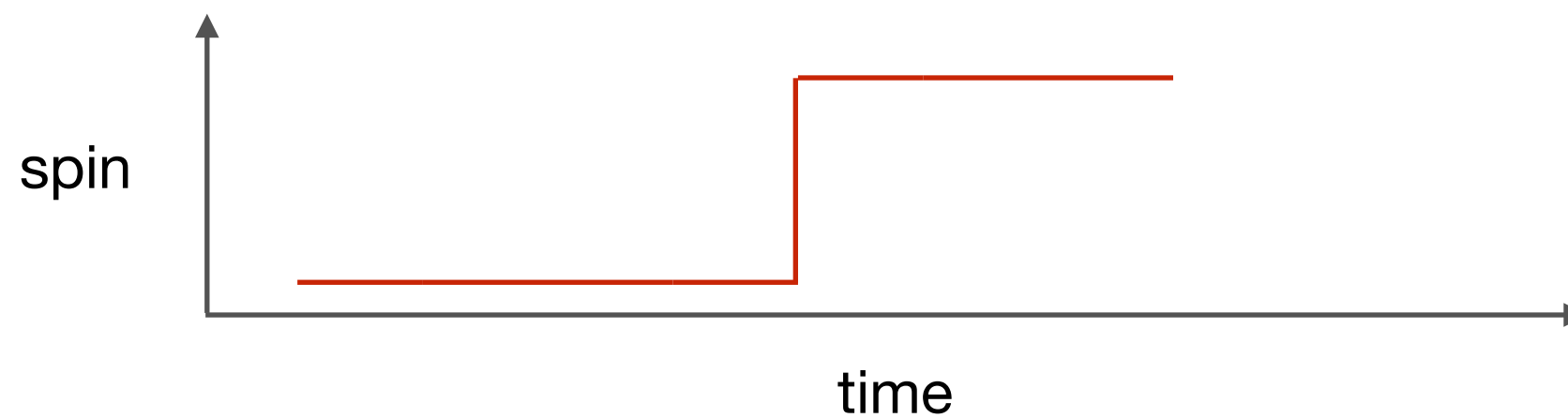
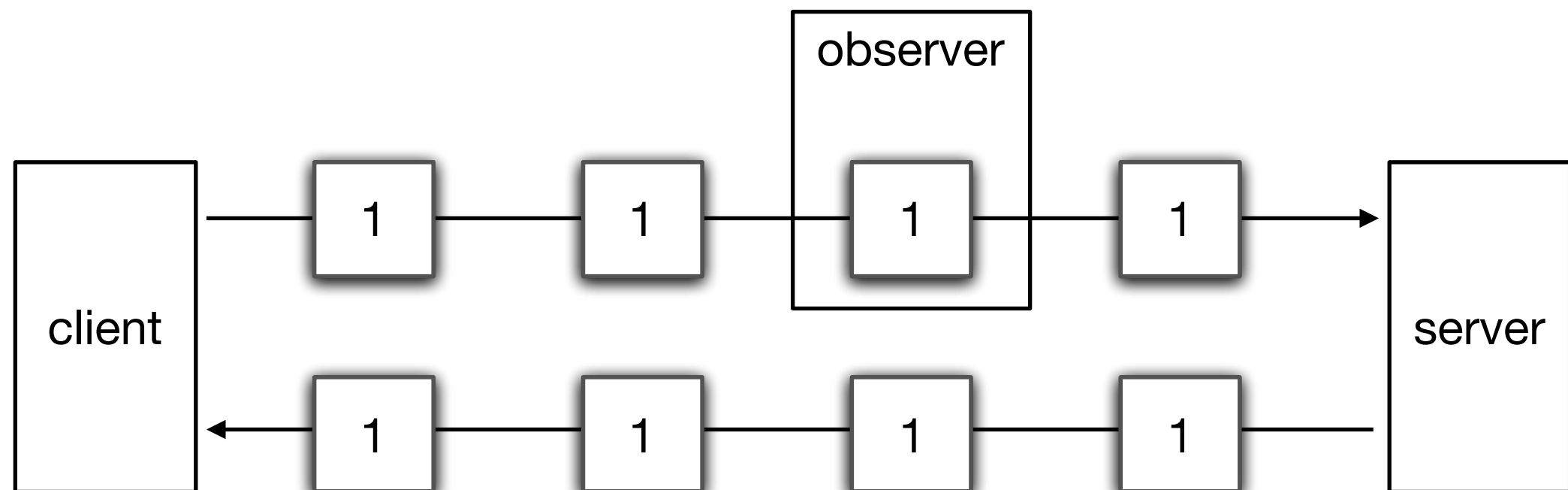


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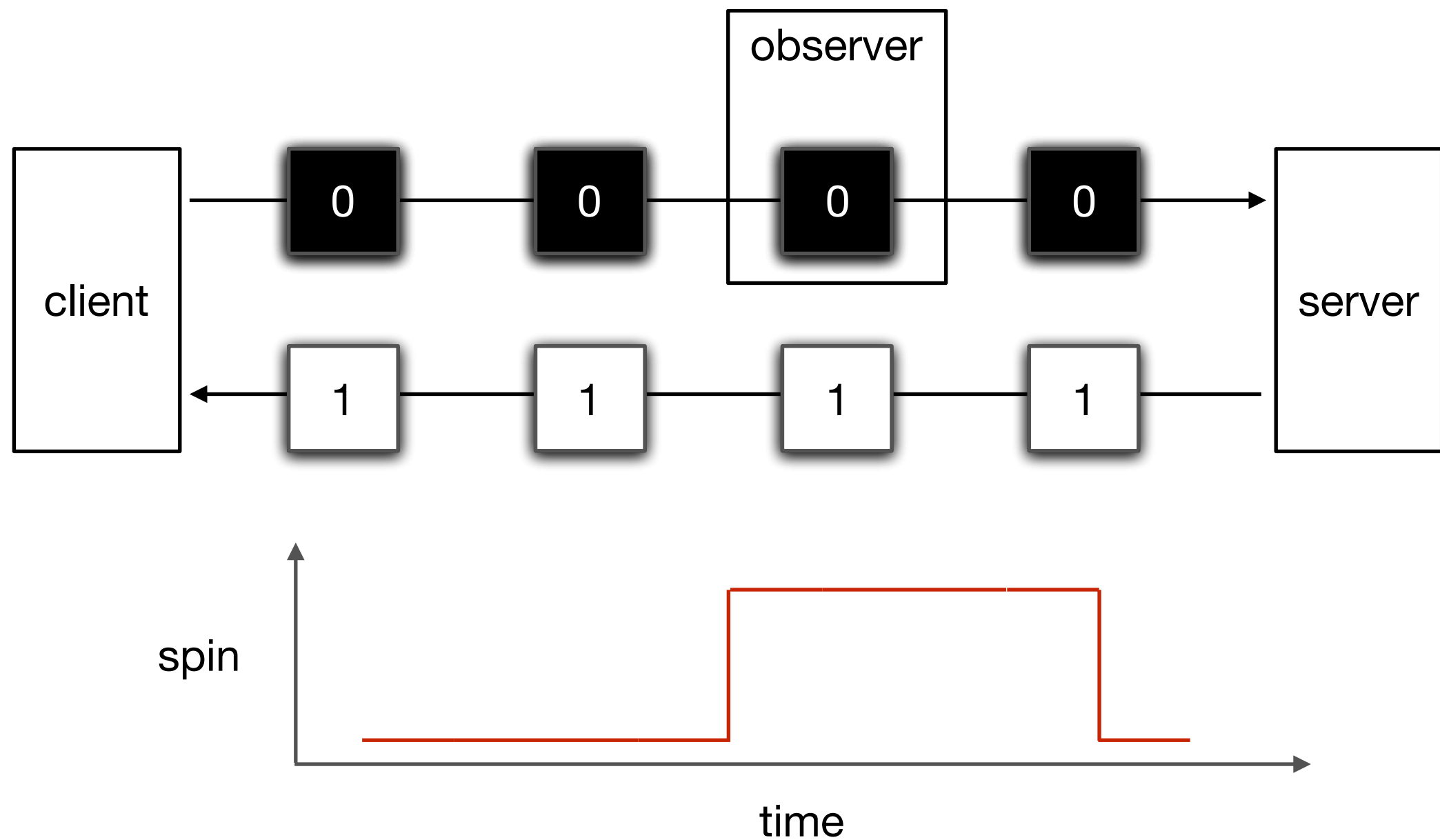


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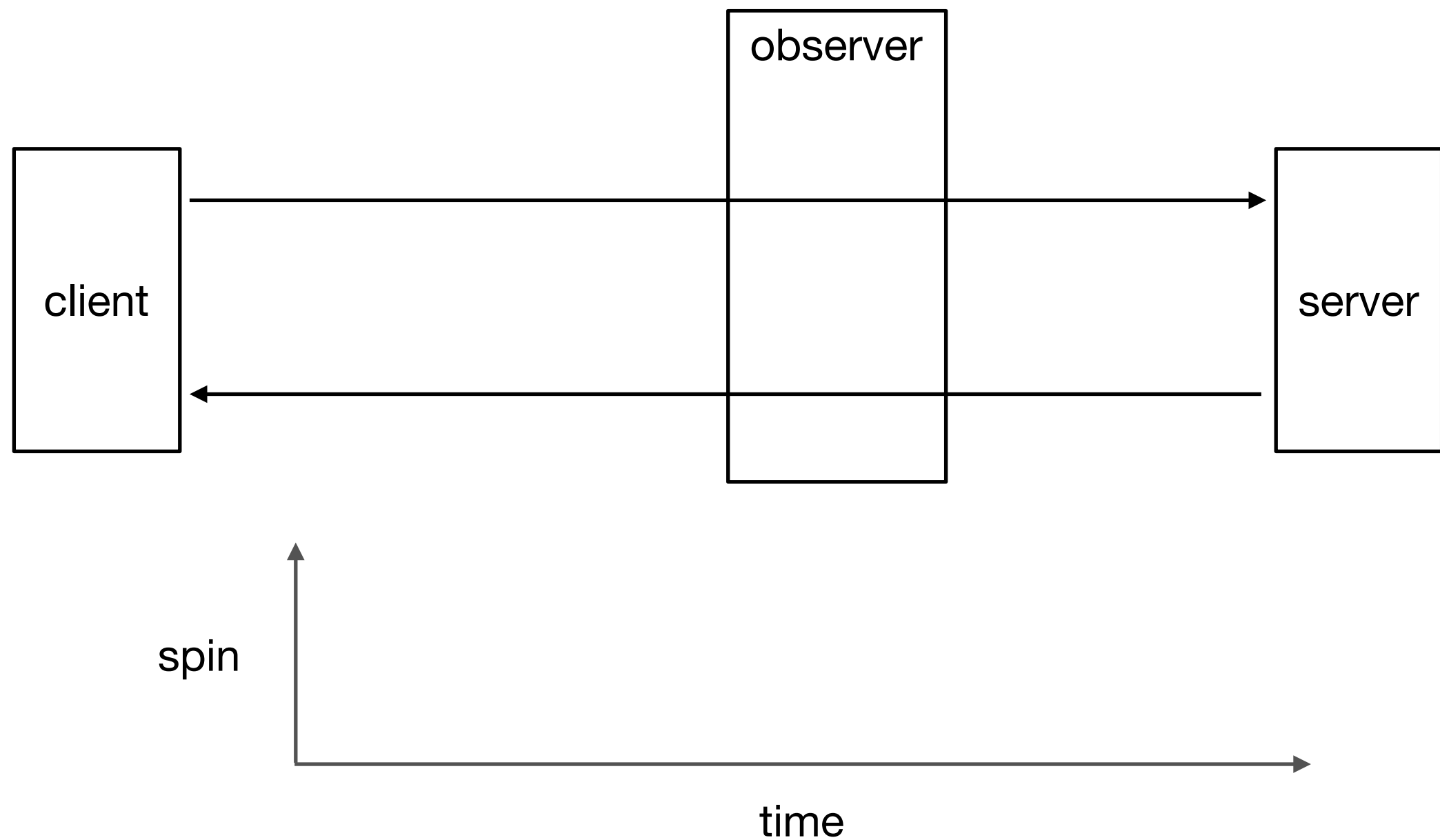


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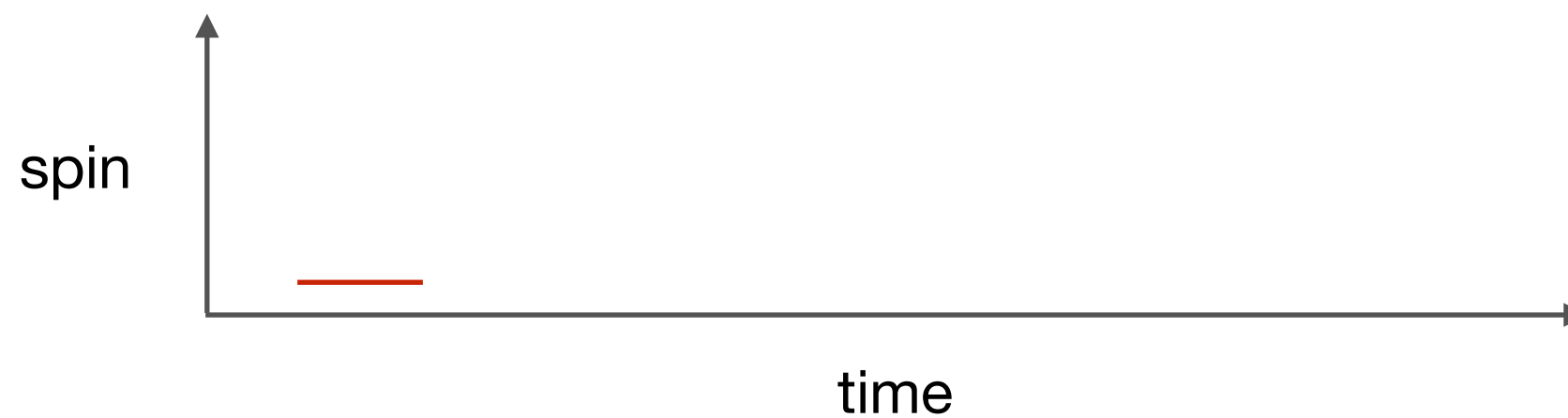
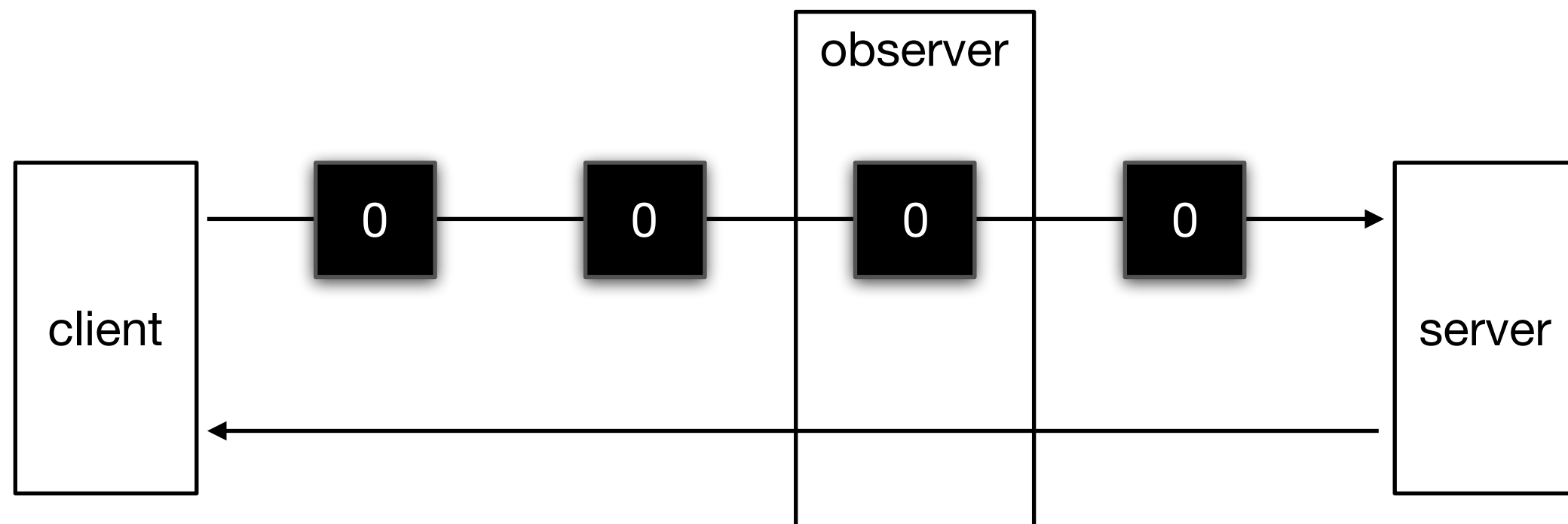
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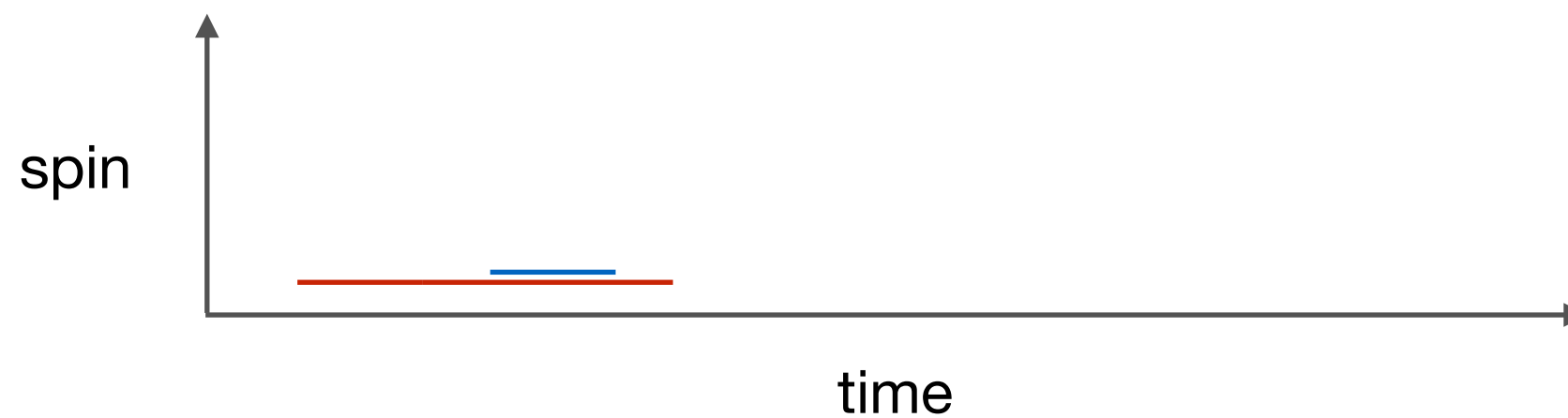
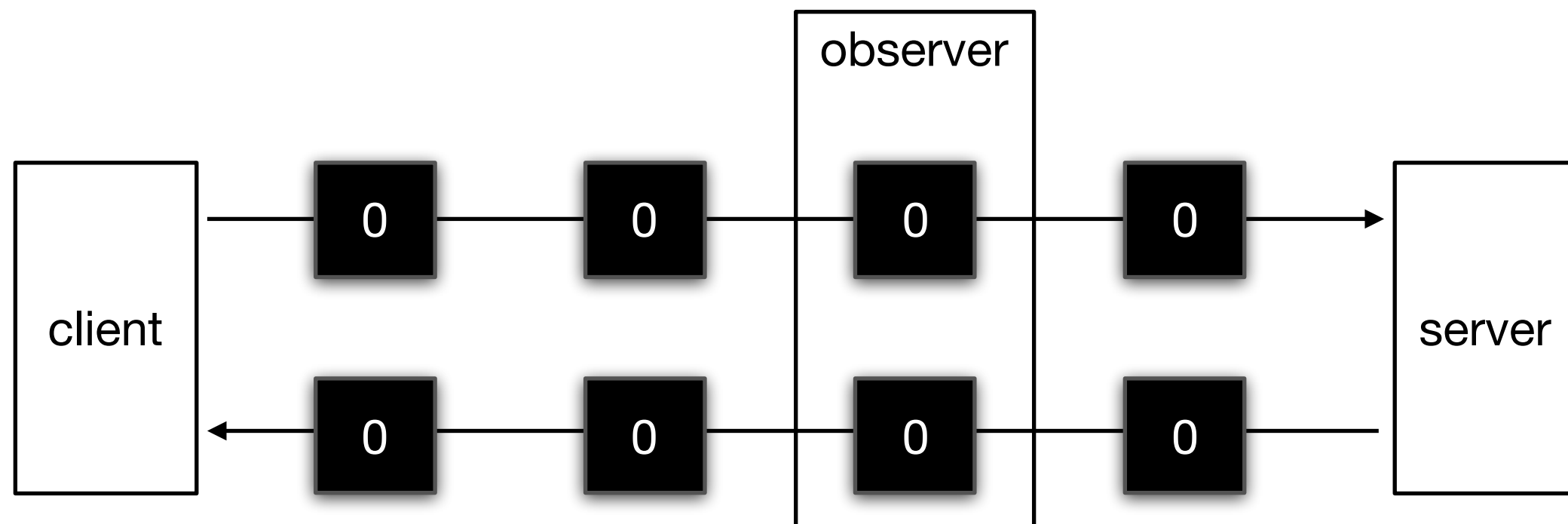


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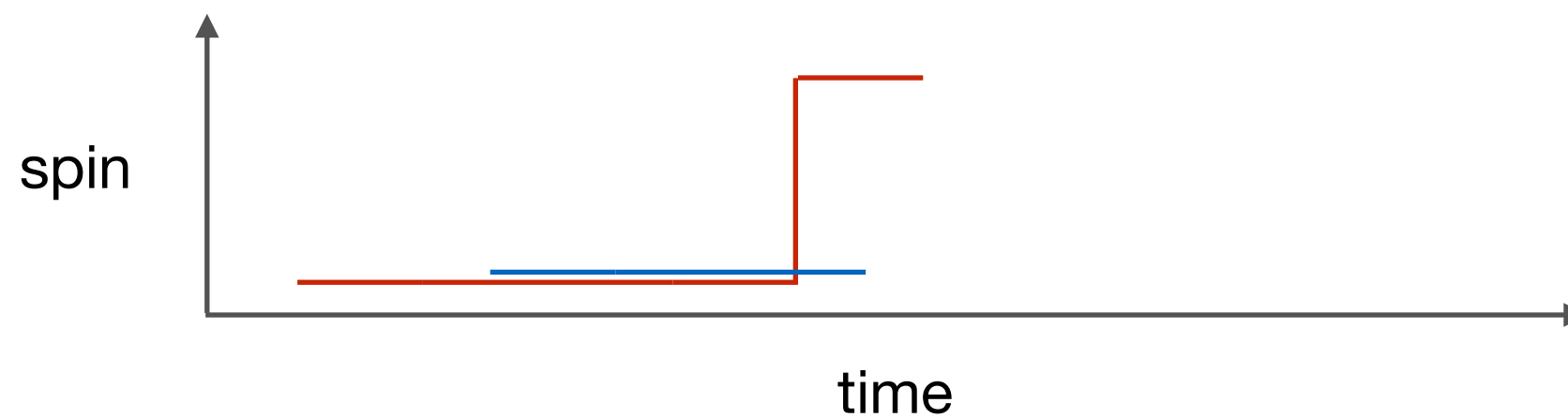
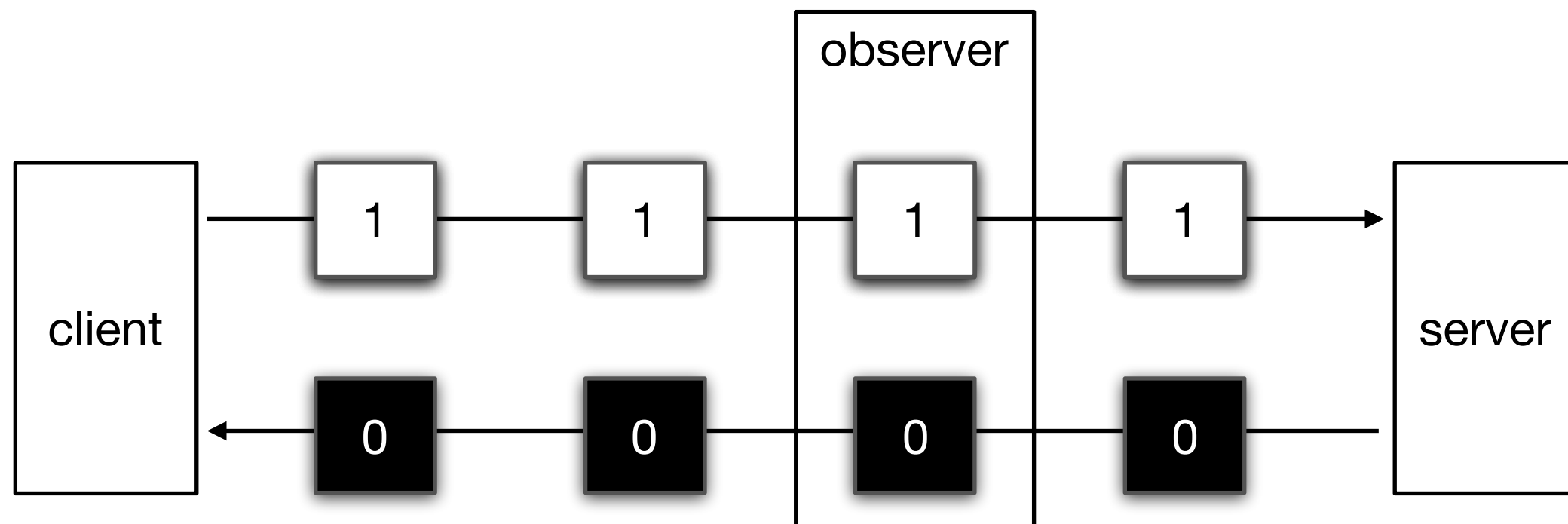


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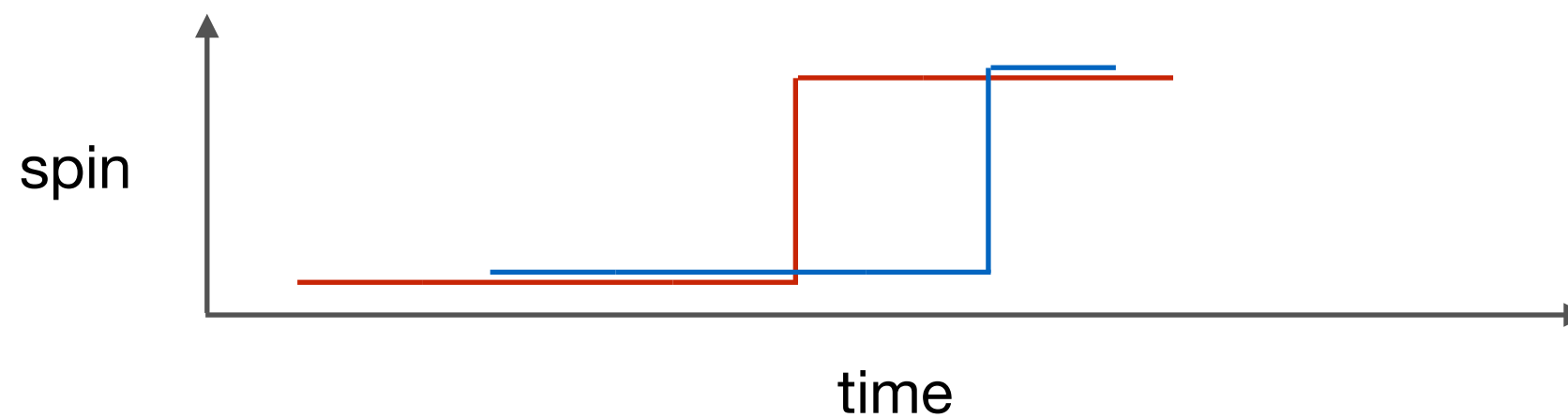
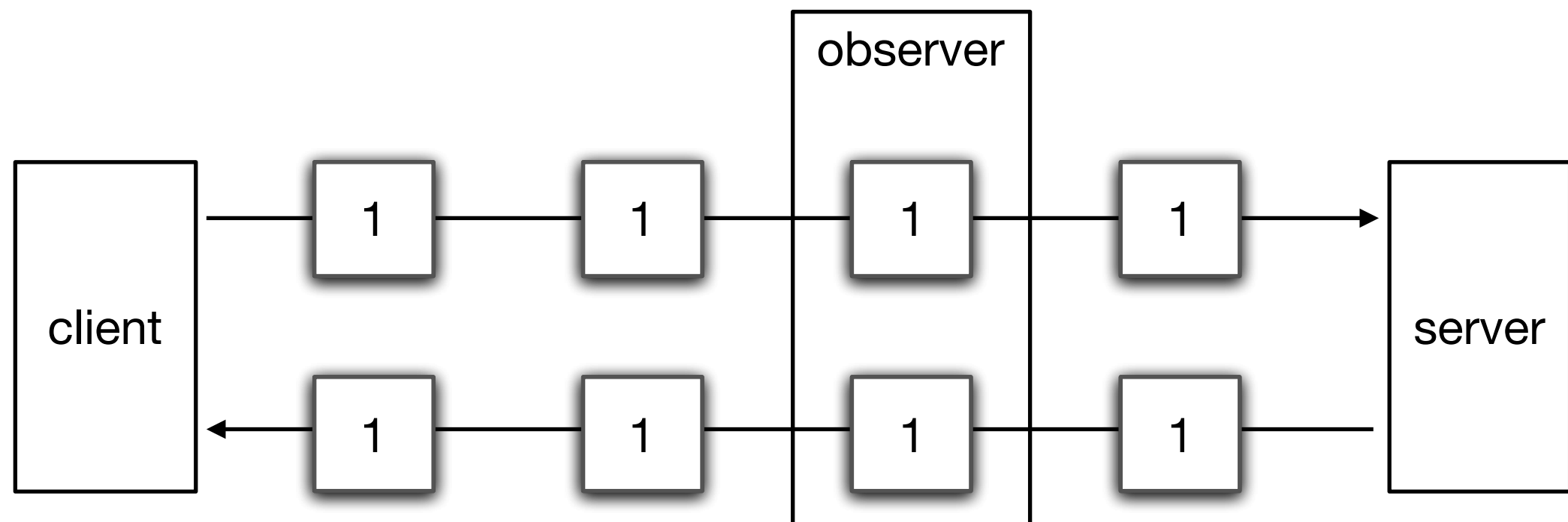


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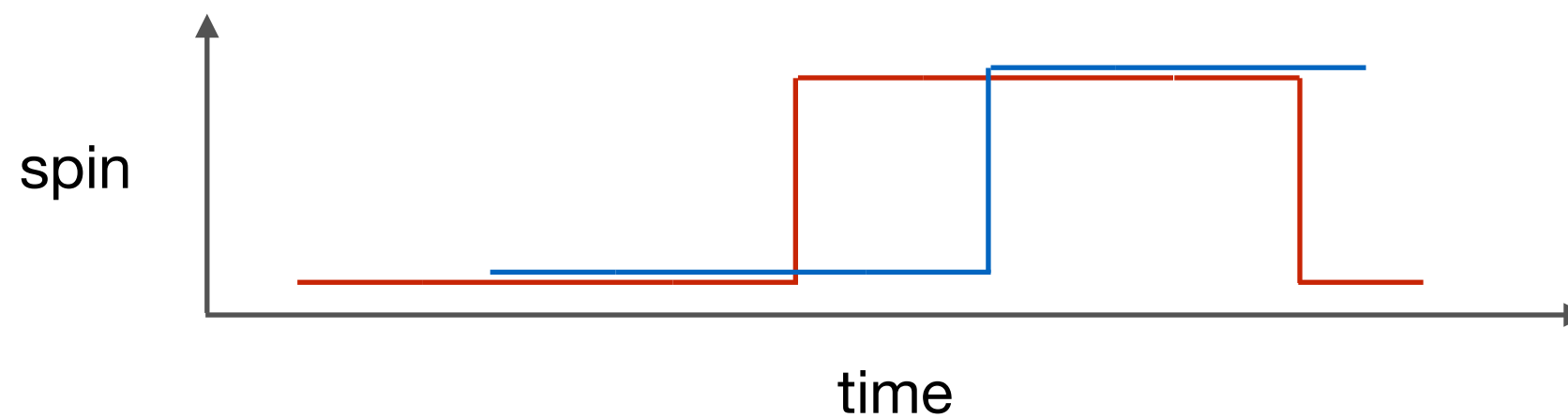
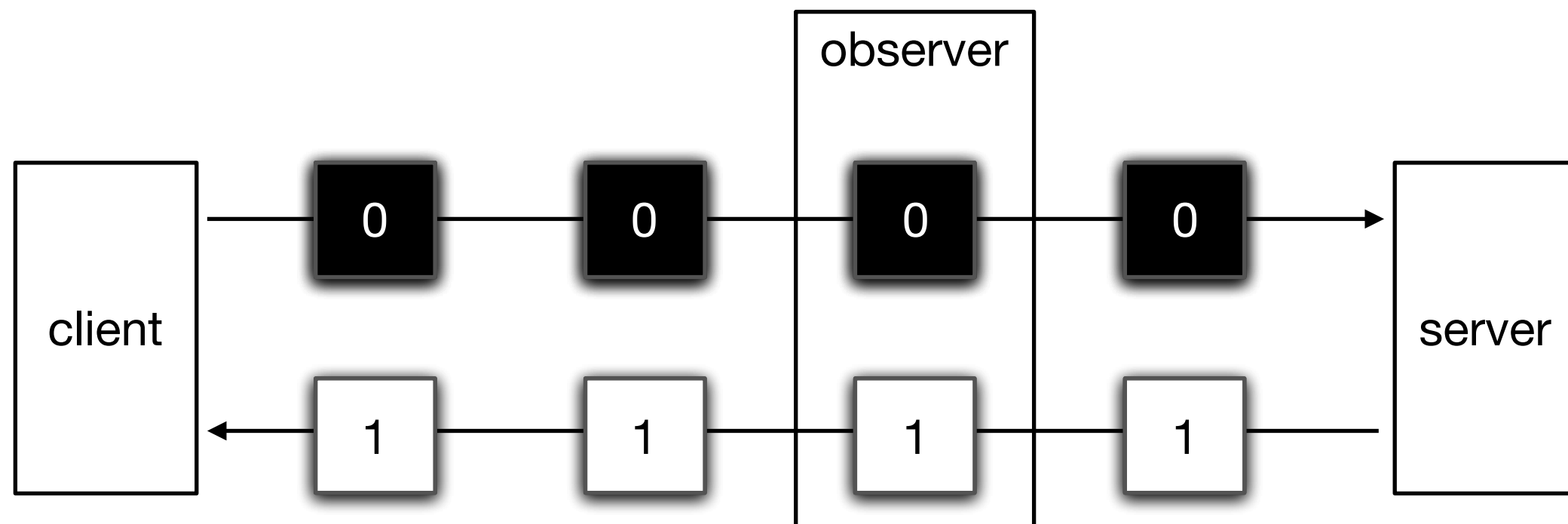


# Bidirectional one-point measurement





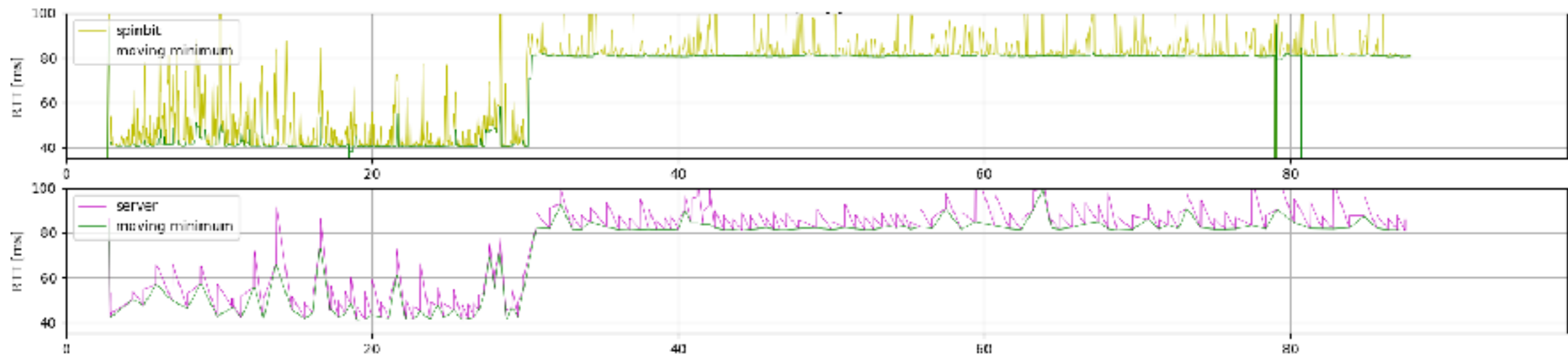
# Bidirectional one-point measurement





# Does it work?

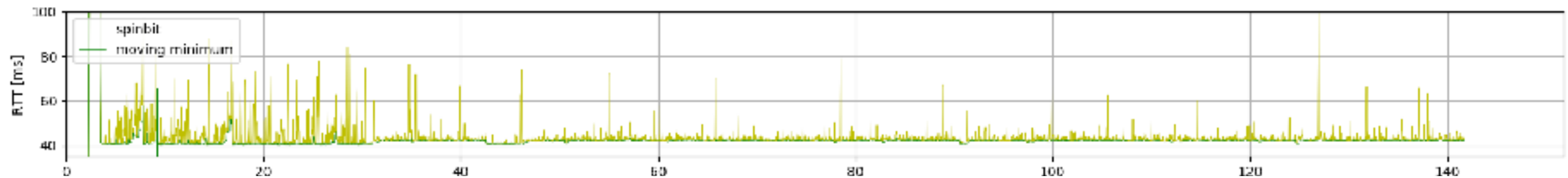
- Piet De Vaere (ETH student) has implemented the spin bit in minq (a minimal QUIC implementation in Golang)
- Spin signal gives high-resolution information to observers about the RTT series the endpoints experience.



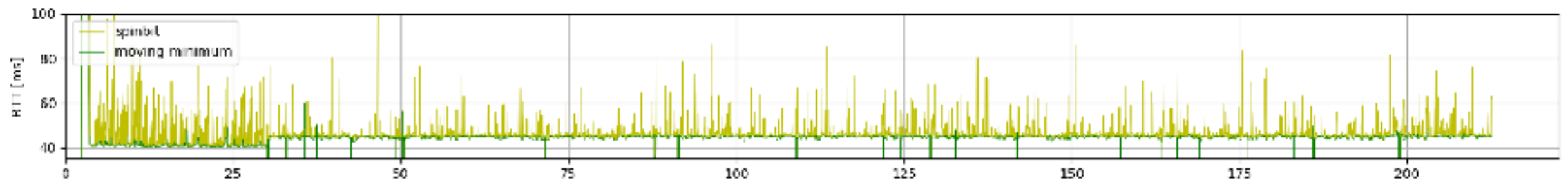


# Coping with Loss and Reordering

- Signal survives heavy loss with slight RTT overestimation:



- Some loss of fidelity with heavy reordering:

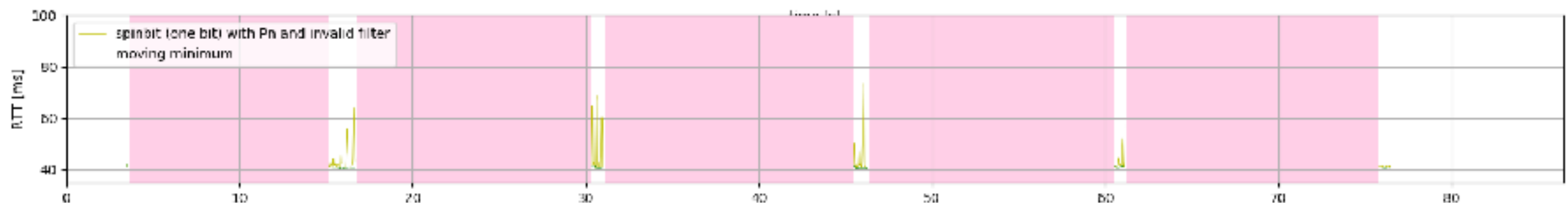


- Packet numbers can be used to detect loss/reordering at endpoints
- Packet numbers can be used to detect loss/reordering on the path when they increment monotonically in the wire image



# Coping with bursty traffic

- Addition of a spin valid bit can reject bad samples when endpoint delay would cause vast overestimation of RTT
- Set when a spin edge contains a value less than  $k$   $\mu$ s old (static experimentation with  $k=1000$ )



- Current work on valid bit vs. "don't worry" (i.e., "this flow is not network-limited") bit.





# Developments in the QUIC WG

- Following discussion in Singapore, chairs asked for an Enhanced Justification process.
- → draft-trammell-quic-spin-01
- pull requests on -transport ([1046](#)) and -manageability ([24](#))
- Transport Measurement (i.e., spin bit) table at IETF 101 London hackathon
  - ETH will bring minq, [fd.io](#)-based measurement
  - other stuff to do in the project?





# Breaking News from Melbourne

- Suggestion: use the four bits we got back from the packet type as a subsequence number (low 4 bits or packet number, or some 4 bits from the packet number that have a defined temporal pattern)

