

# The Properties of riak

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- Distributed
- Scalable
- Replicated
- Fault-tolerant
- High availability
- Low latency
- No SQL—just keys and values



***QuickCheck!***

# Keep It Simple!

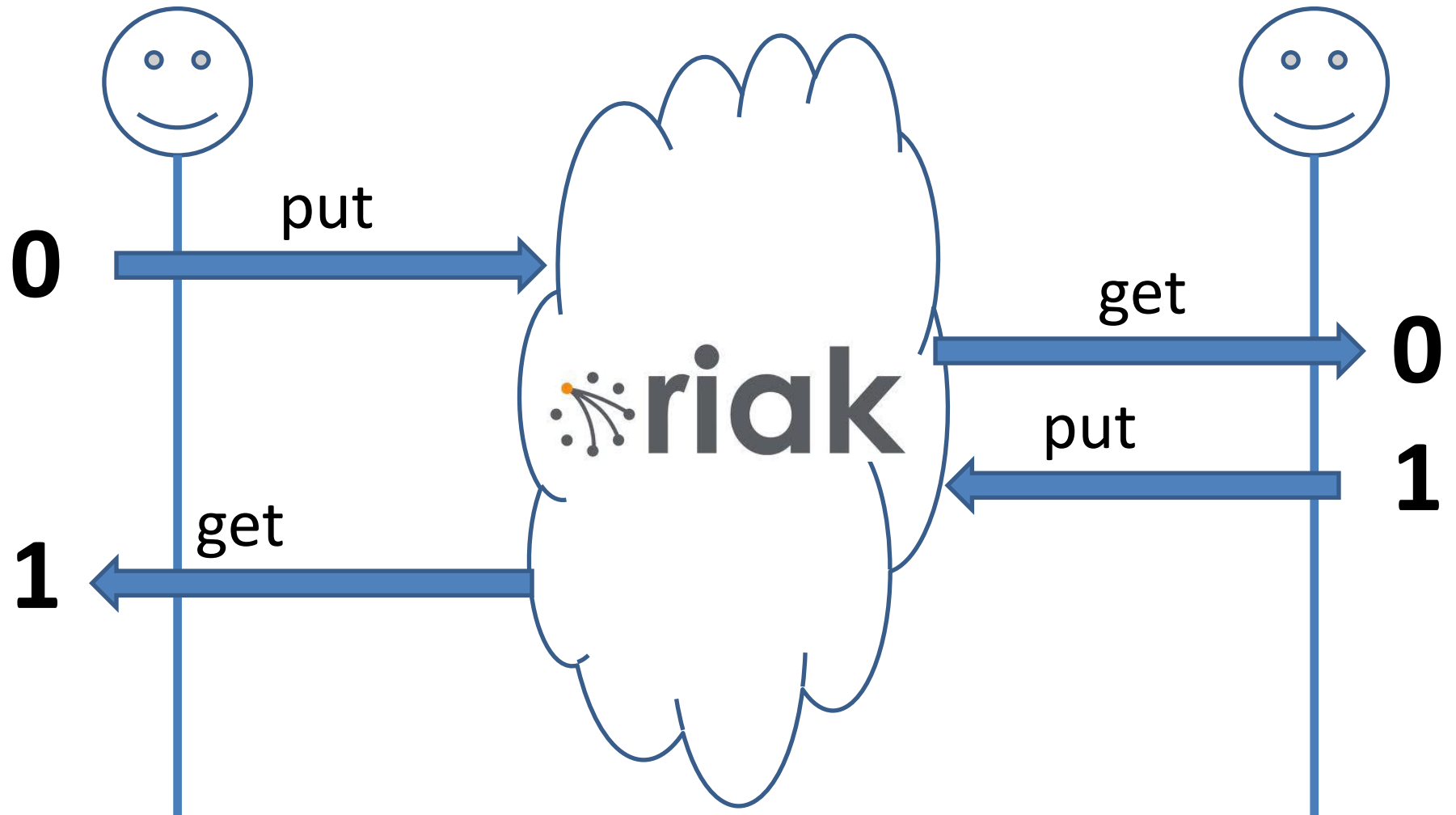
one



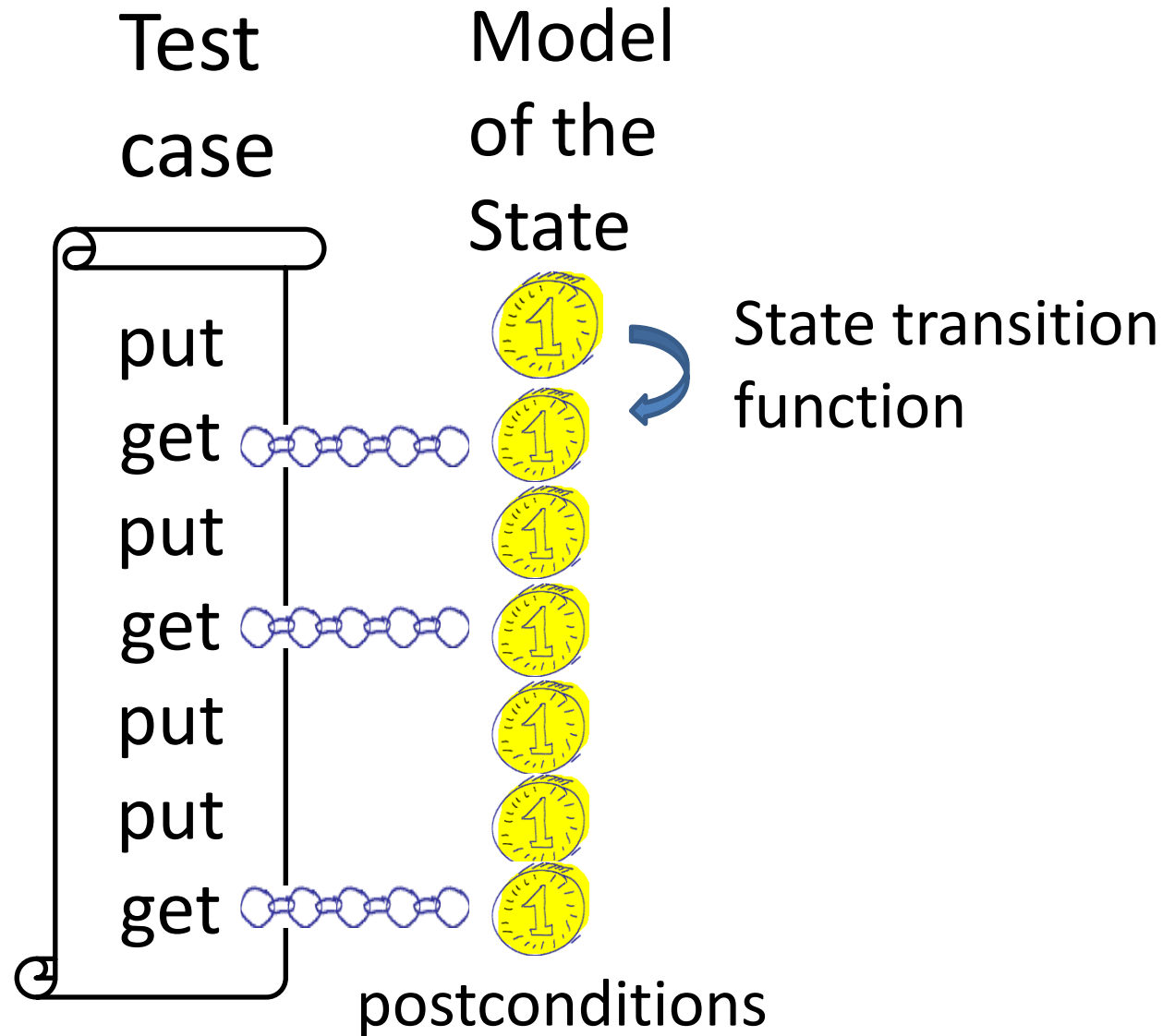
one



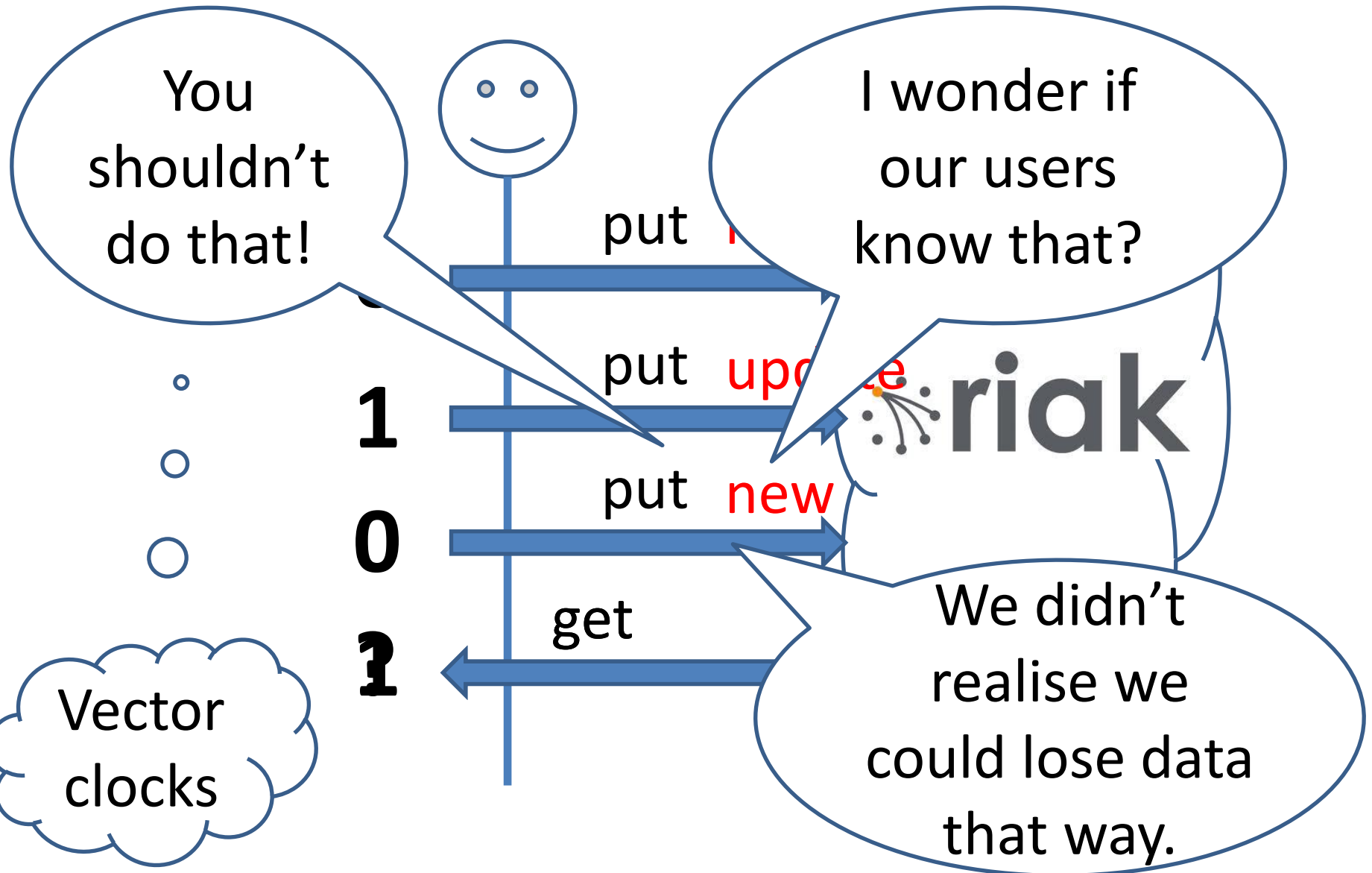
# Put and Get

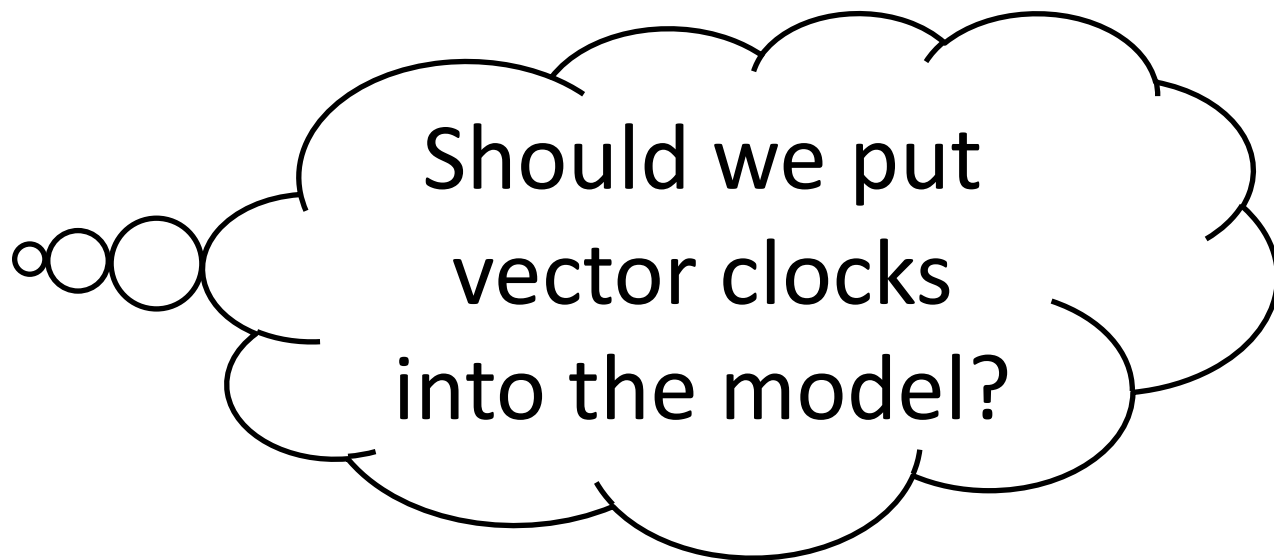


# *Quick Check*



# Example





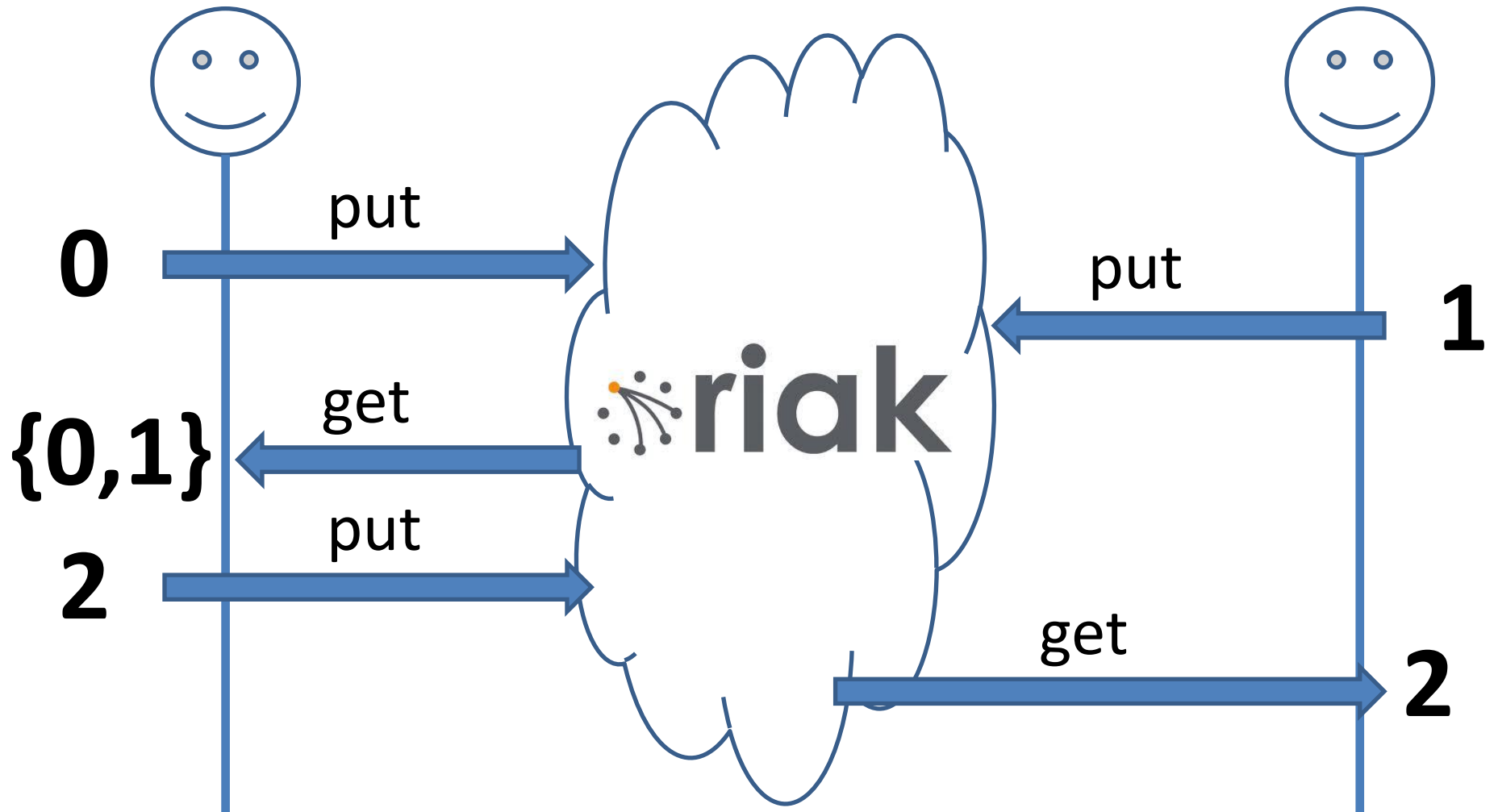
**NO!!!**



# Formalise "You shouldn't do that!"

- Add to the model:
  - Client's last view of the value (result of get)
- Add a *precondition*:
  - Every put must update the client's view (if present)
- QuickCheck generates tests respecting the precondition

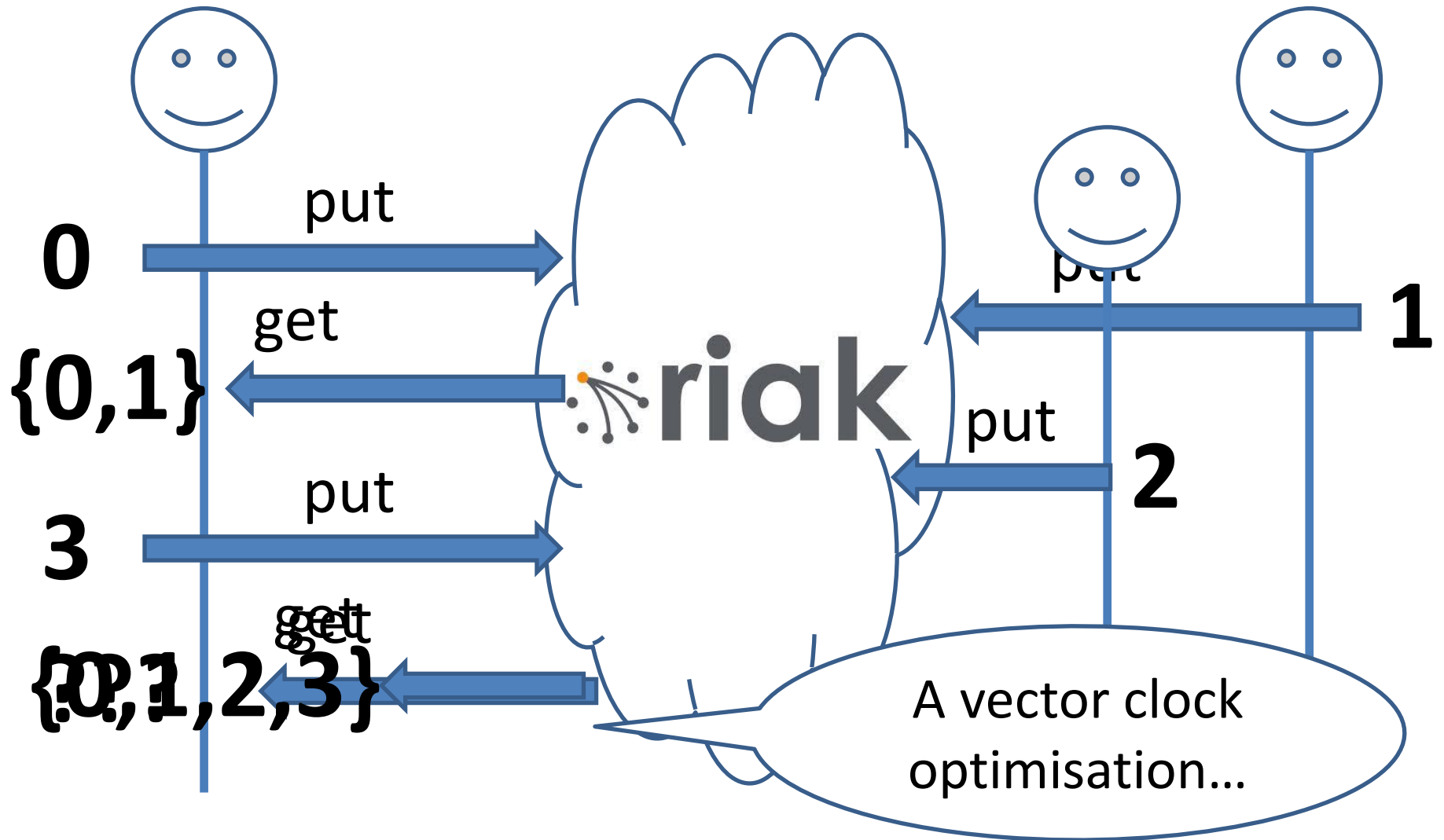
# Conflicts



# Modelling Conflicts

- The state is a *list* (actually bag) of values
- The client's view is a list of values
- put replaces those values in the state

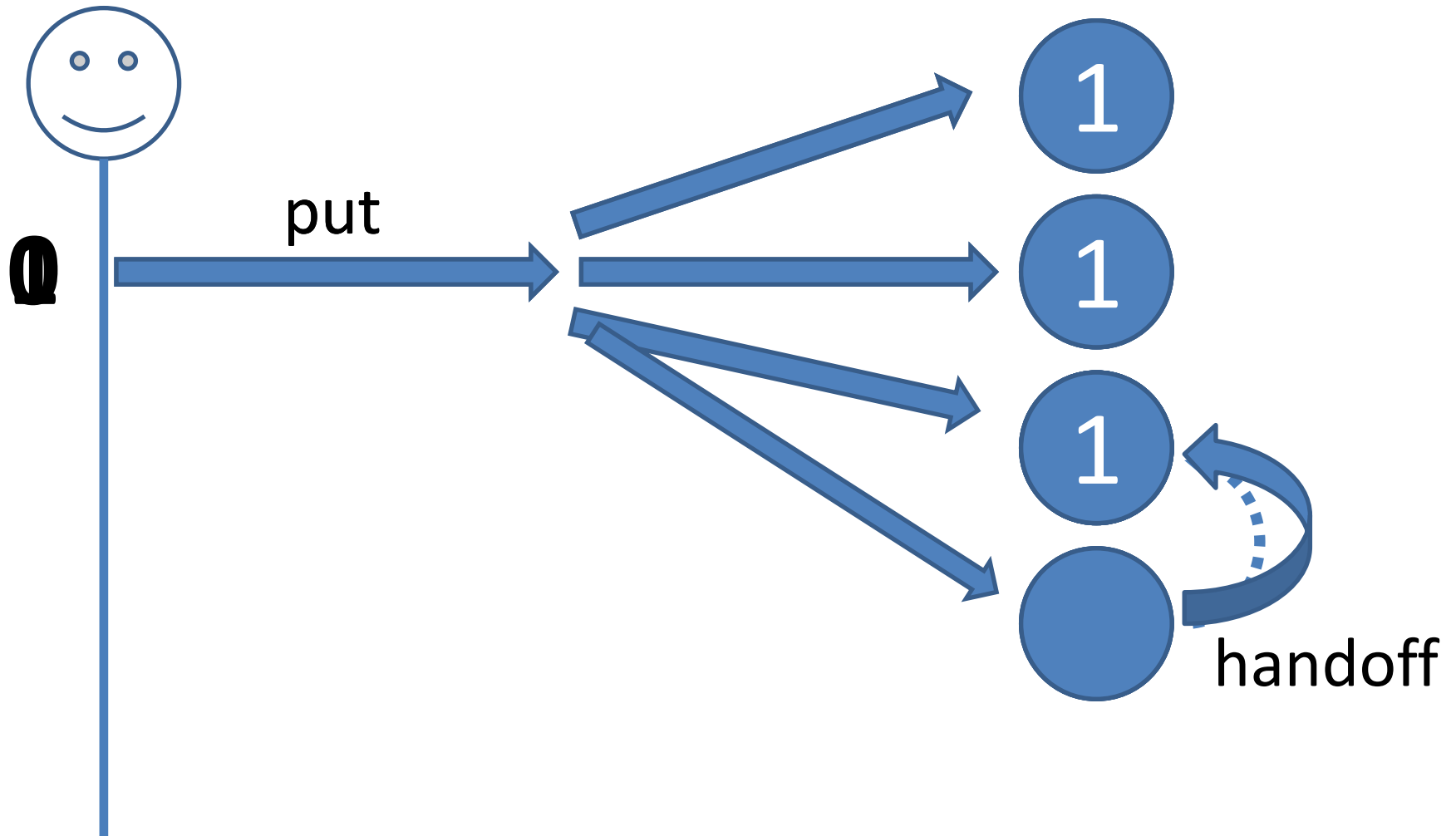
# Example



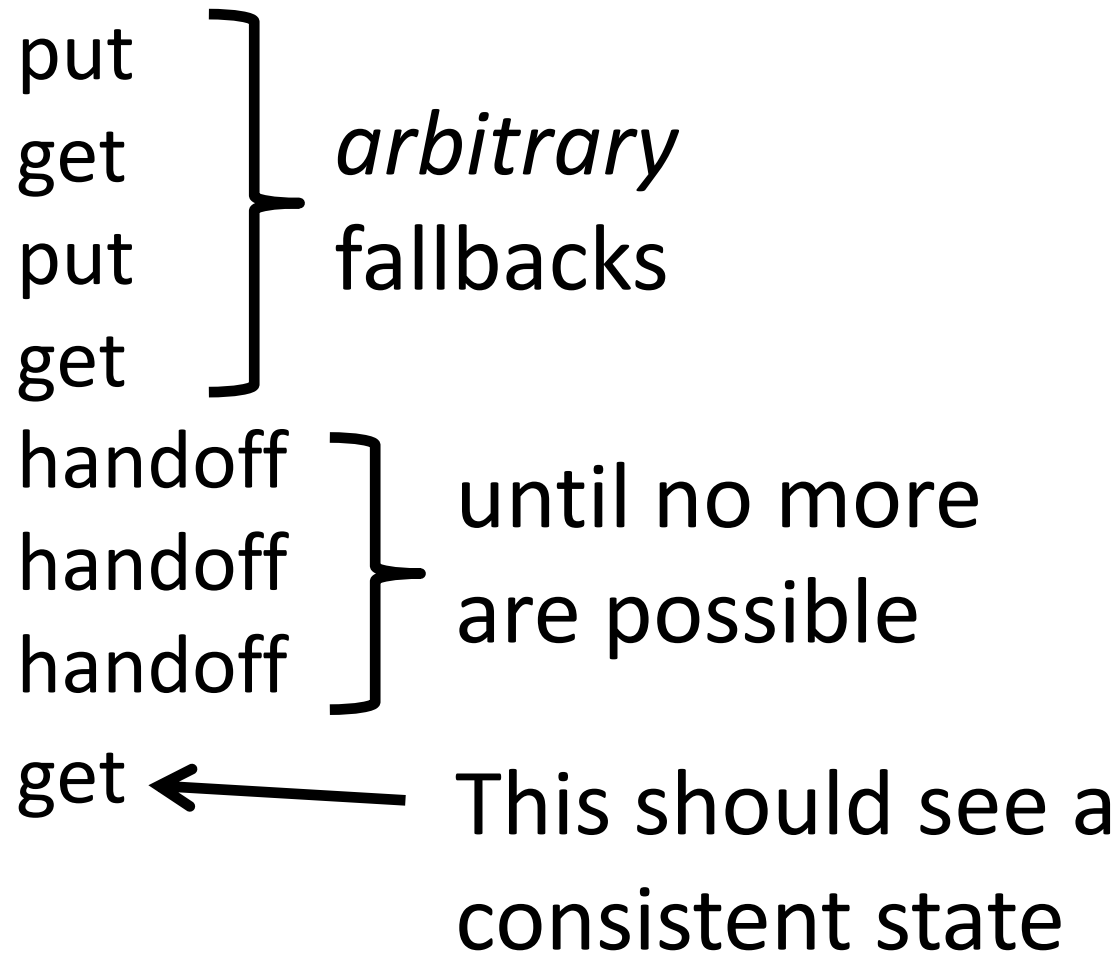
# Modelling Conflicts

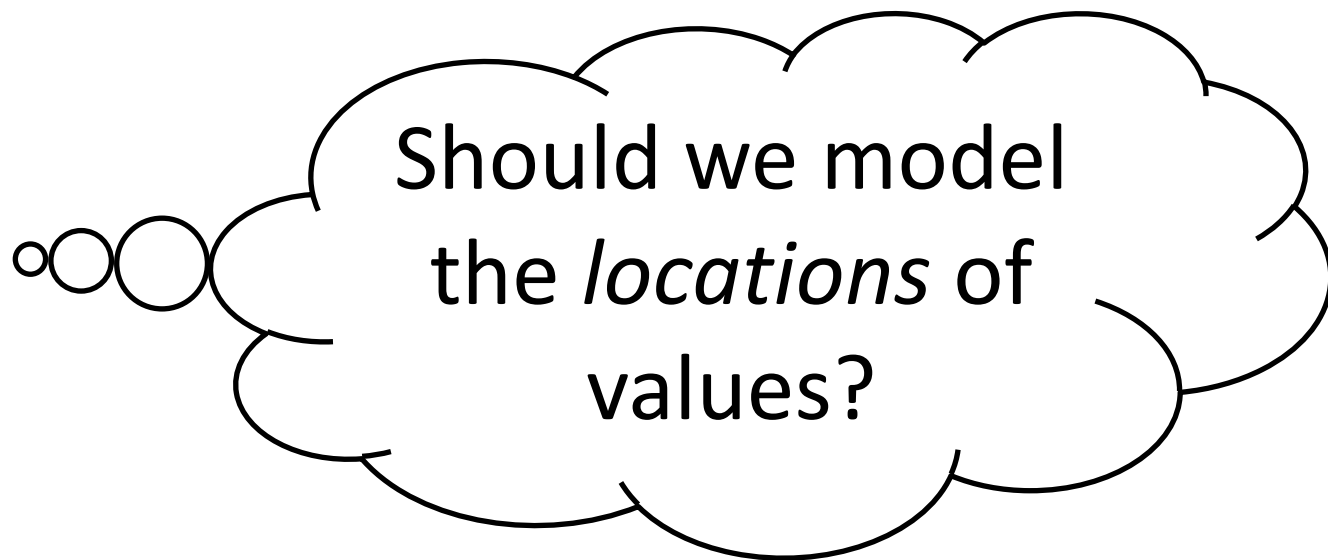
- The state is a *list* (actually bag) of values  
"fresh" or "stale"
- The client's view is a list of values
- put replaces those values in the state  
the state if the client's view was fresh  
adds a conflict if the client's view was stale

# Redundancy and Fault Tolerance



# Testing Eventual Consistency



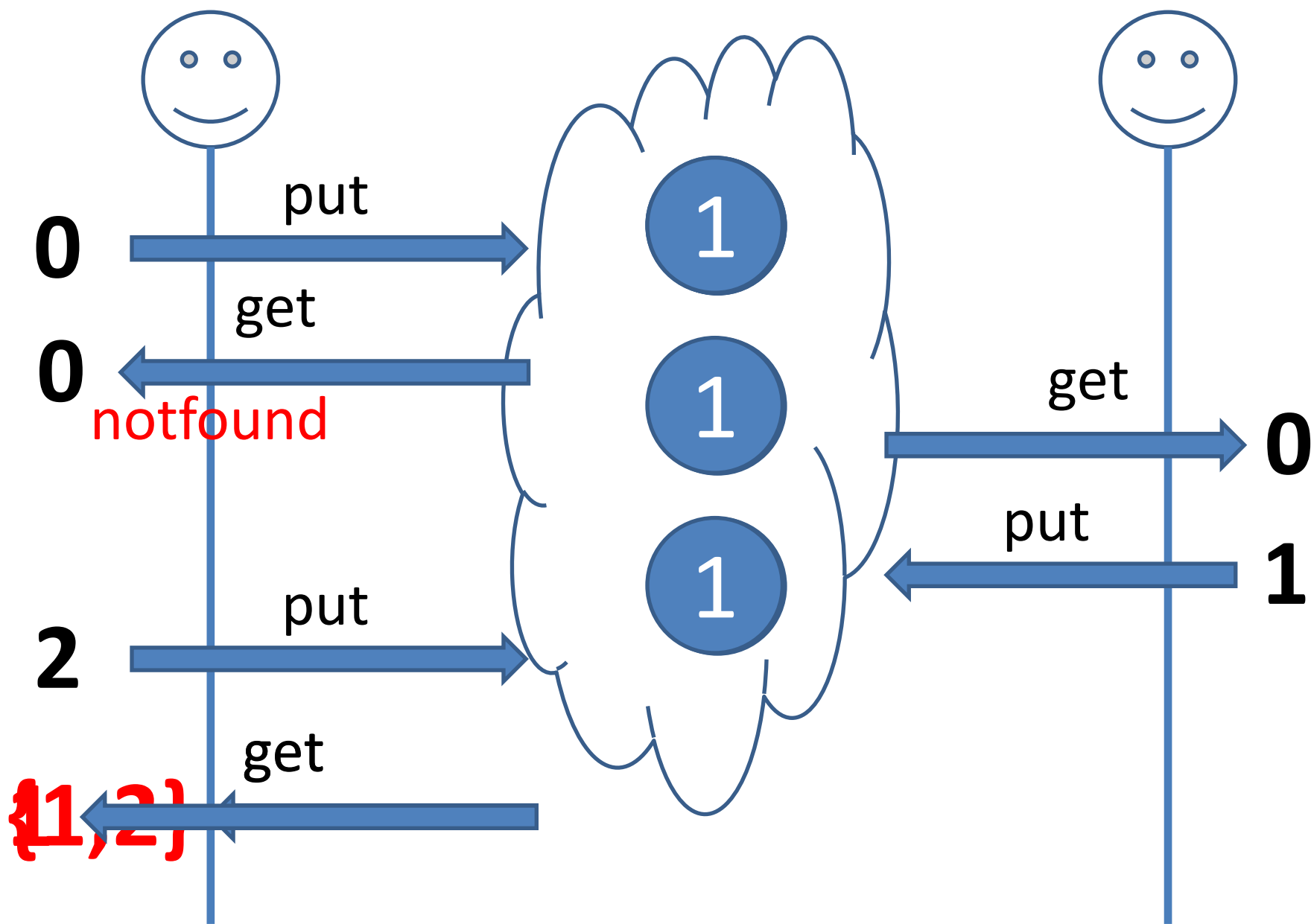


**NO!!!**



# Modelling Eventual Consistency

- A value ***may*** appear in the final get, if it was ever put
- A value ***must*** appear in the final get, if it was put, and never replaced



**SHOCK!!**

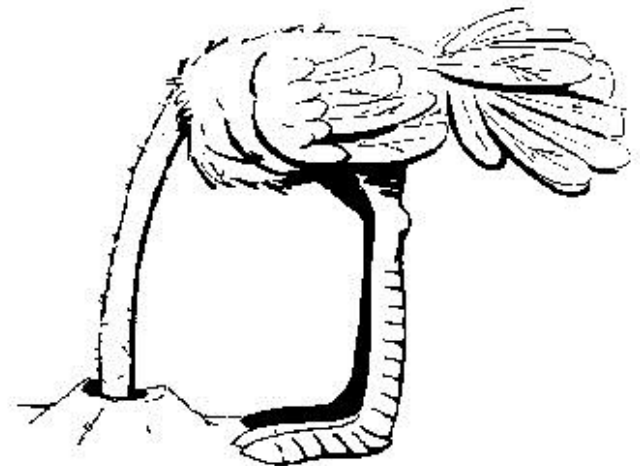
**HORROR!**

Riak is not eventually consistent!

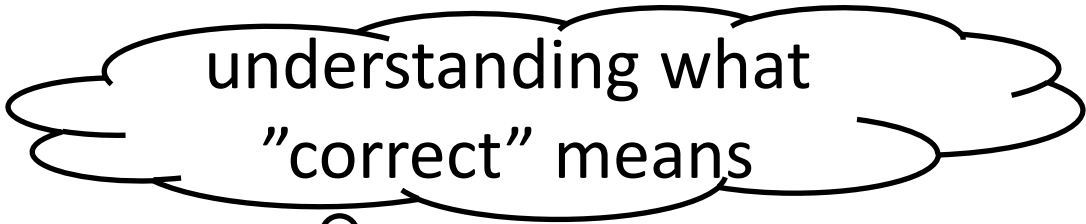
# What does it mean?

- QuickCheck found...
  - An extreme failure scenario
    - Two quite different failures in a short interval
  - Leading to loss of data
  - A failure of eventual consistency

- So does this mean  
Riak is buggy?



# QuickCheck...



understanding what  
"correct" means

- ...let us gradually develop a specification, validated against the implementation
- ...revealed potentially serious bugs
- ...guided the development of alternative solutions that fix the problems

# GOOD NEWS!!

Riak *IS* eventually consistent!  
— *(at least partially) thanks to QuickCheck* 😊