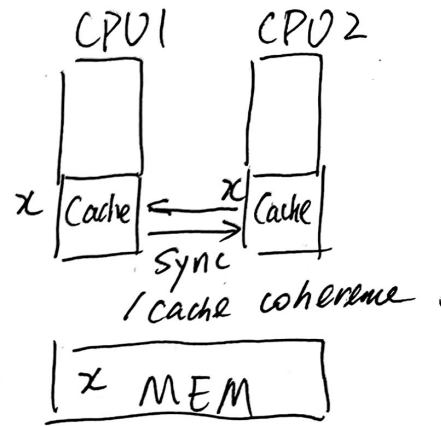


→ Strong Consistency

replicas { concurrency  
failures

e.g. File system (GFS)  
Database.  
Computer Arch (Multi Processor / CPU)

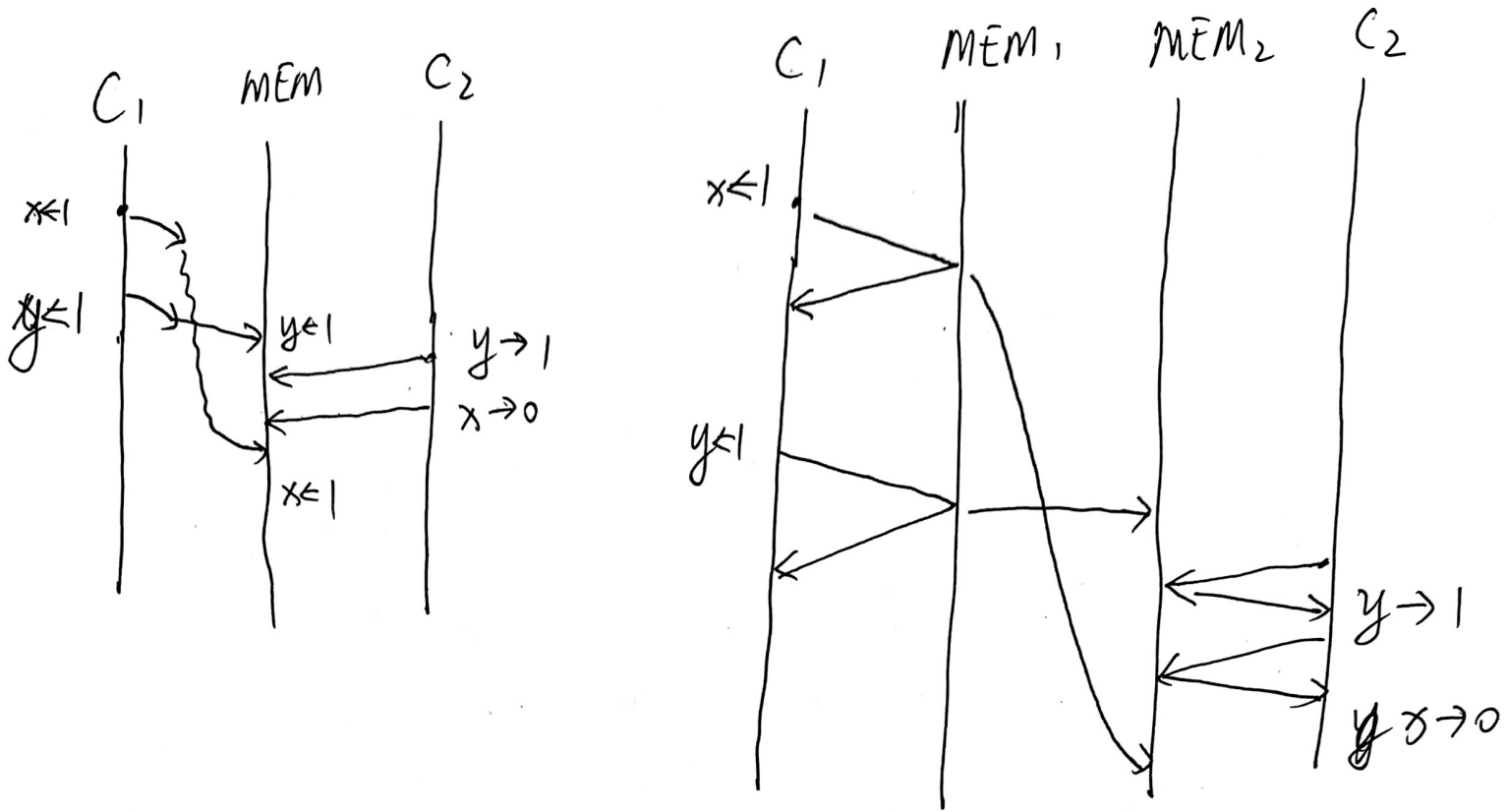


## Models .

Abstract data types (object) list vector tree  
files / chunks . / Tables / Columns / Cells . / Register  
Key - value . store . (Memory)

E.g.	$C_1: (put)$	$C_2: (get)$	✓	✓	?
	$x \leftarrow 1$	$y \rightarrow ?$	0	1	1
	$y \leftarrow 1$	$x \rightarrow ?$	0	1	0

$x=0$   
 $y=0$



What to expect?

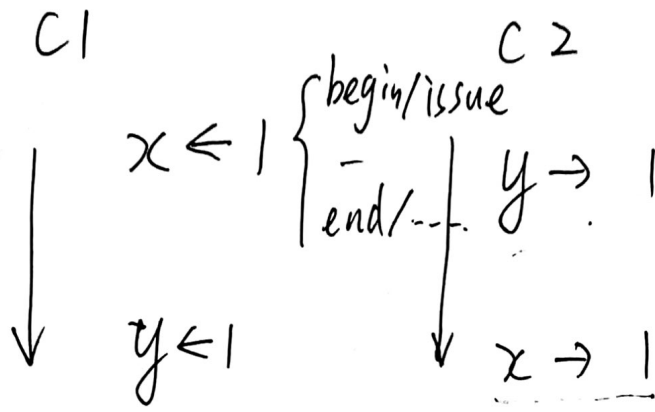
consistency = client contract memory/system

What is a good contract?

sequential

one-copy

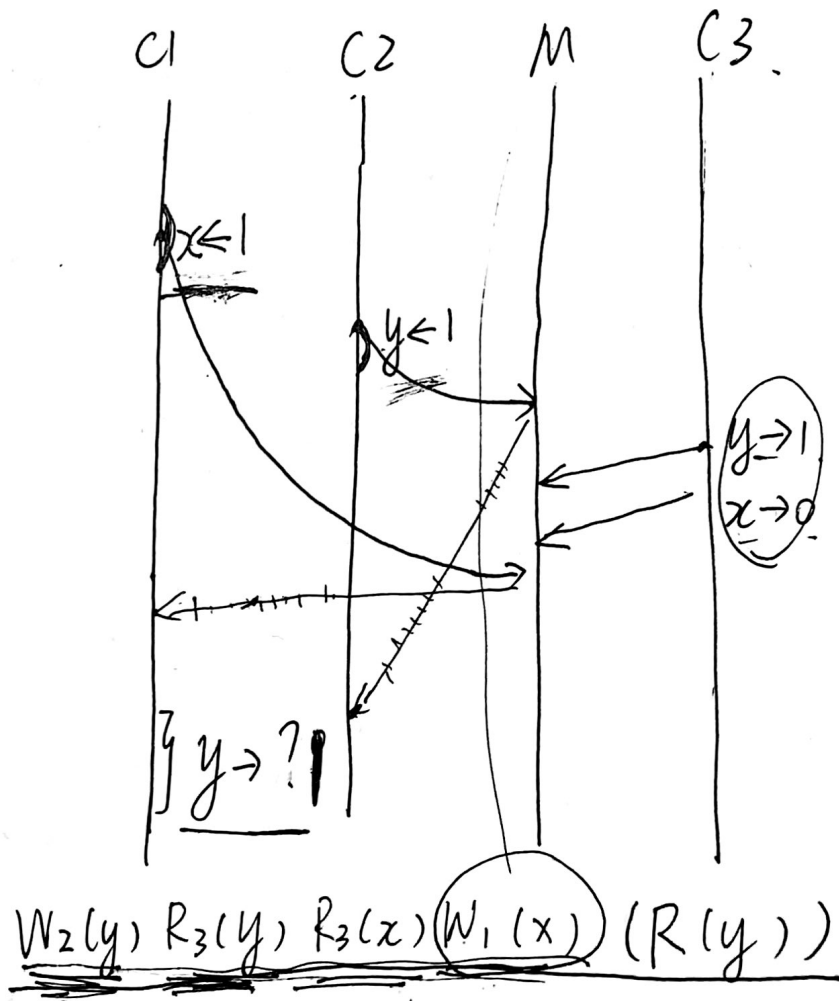
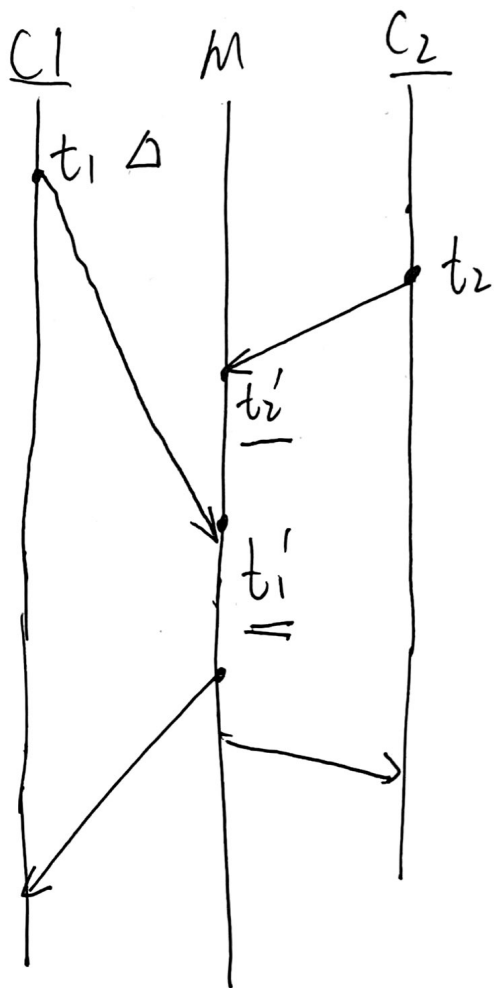
E.g.



Sequential  $\circ$  C1:  $x \leq 1$   $y \leq 1$  C2:  $y \rightarrow 1$   $x \rightarrow 1$

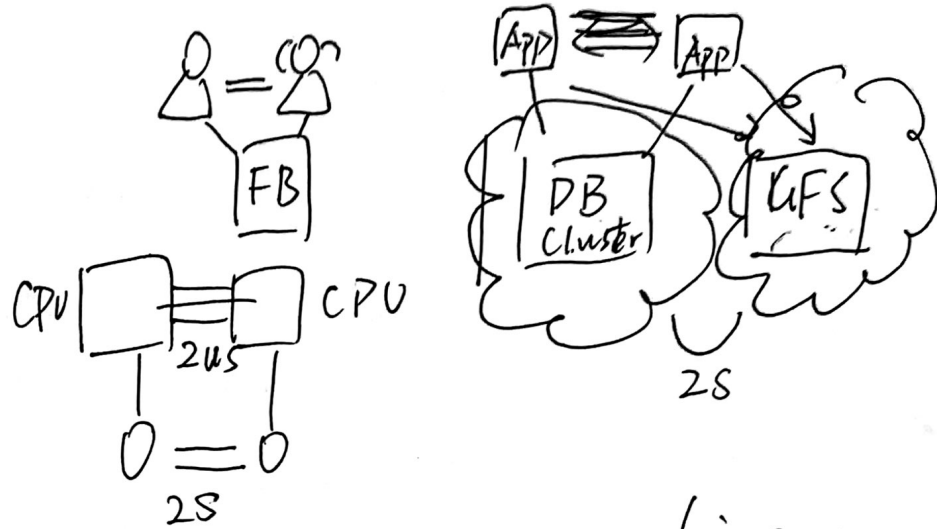
not practical  
 sequential consistency  
 linearizable

- ① global issue
  - ② global completion
  - ③ per-process/session completion-to-issuing (C2I)
  - ④ global C2I
- } Client's view



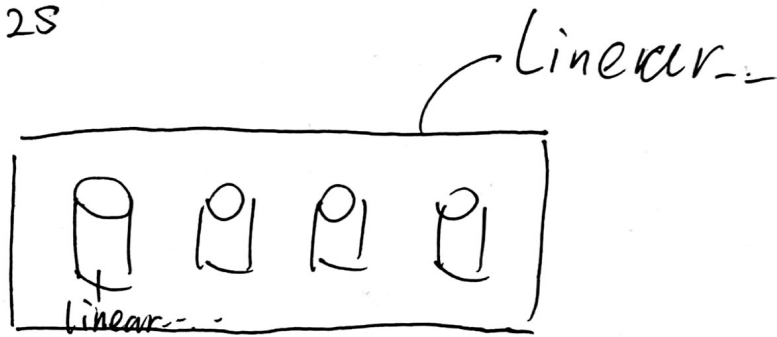
Why Linear - - -

External



Properties.

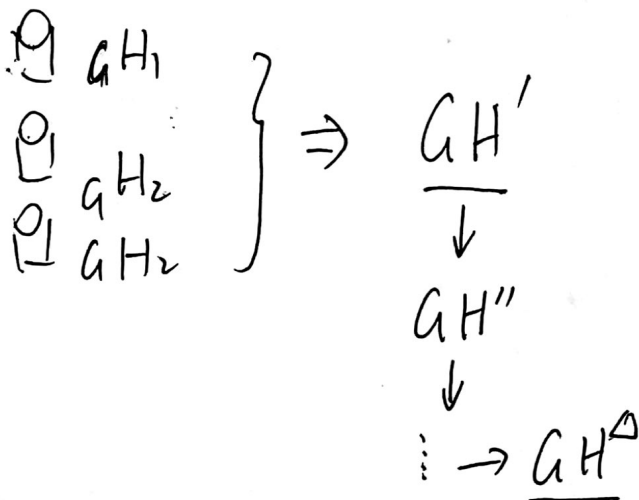
local



Proof.

Construction

$GH \rightarrow C2I$



Contradiction.

$\nexists GH : GH \rightarrow C2I$  violation

any.  $\rightarrow$  swap. them

$\Rightarrow \nexists H_i : @ H_i C2I_i$  violation

$\exists H_i :$