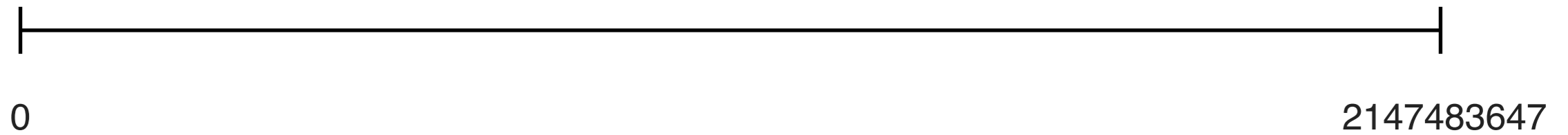


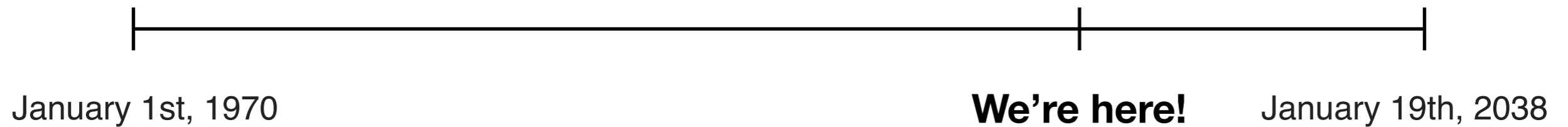
The Hitchhiker's Guide to Time in Computers

Mistral Contrastin (mojpc2)

UNIX Creationism

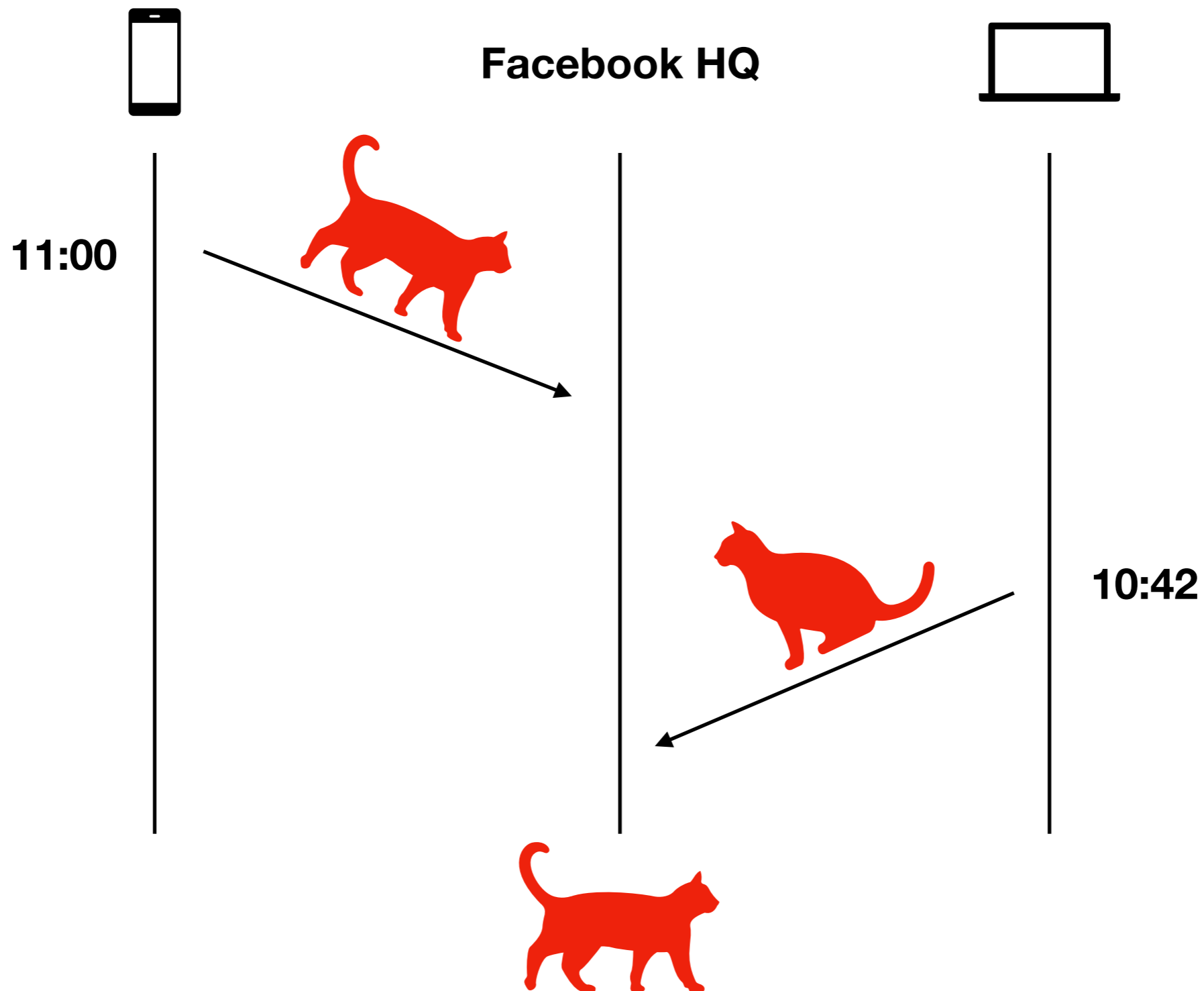


UNIX Creationism

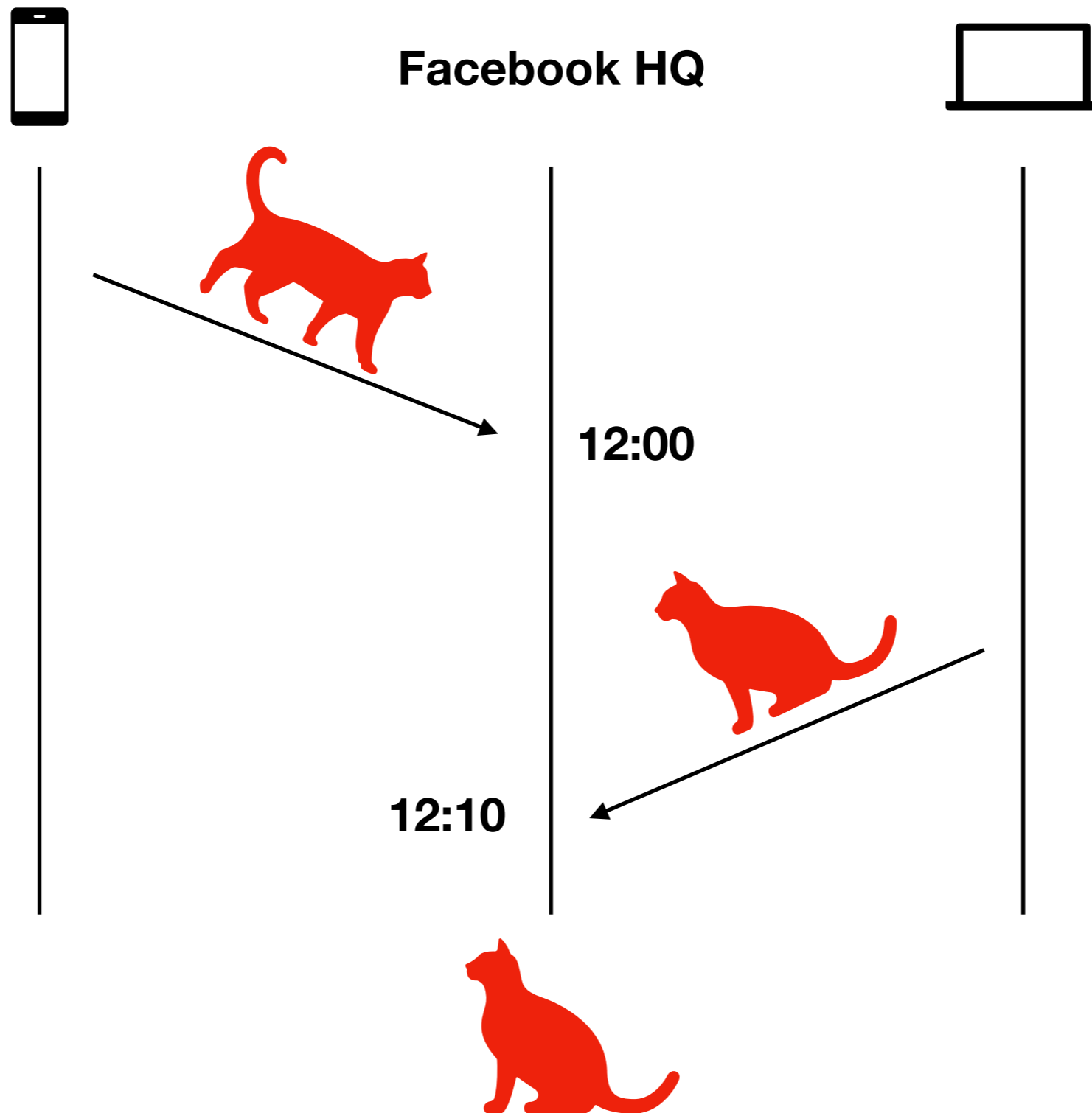


We hope by that time, everything switches to 64 bits,
postponing the problem by 293 billion years!

Local clocks run behind



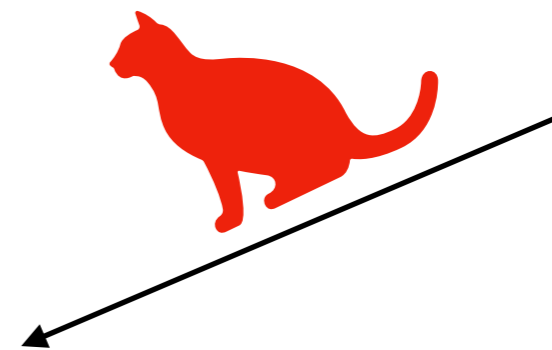
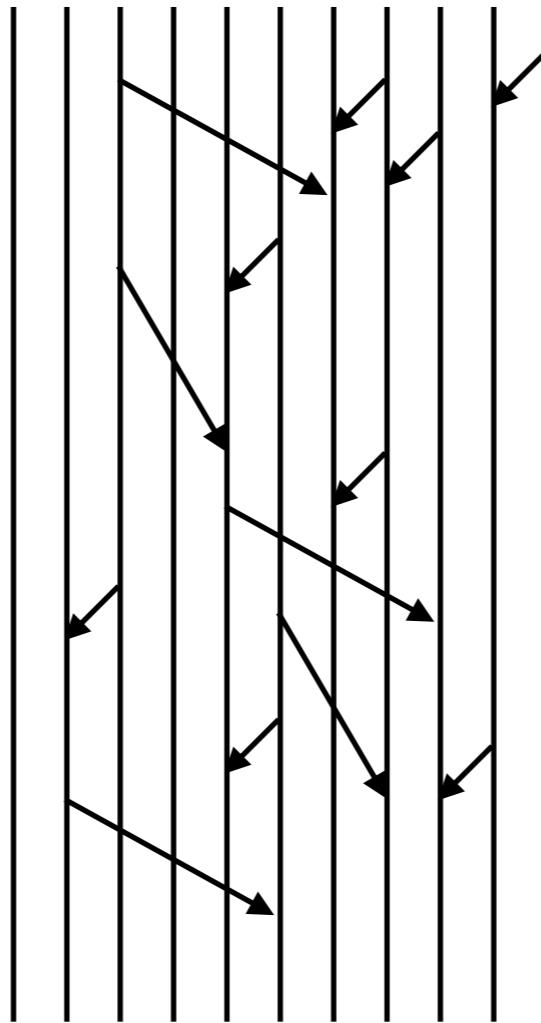
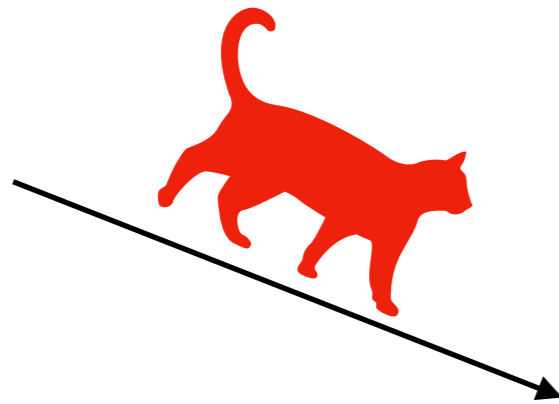
Just use the receiver time



There are many receivers

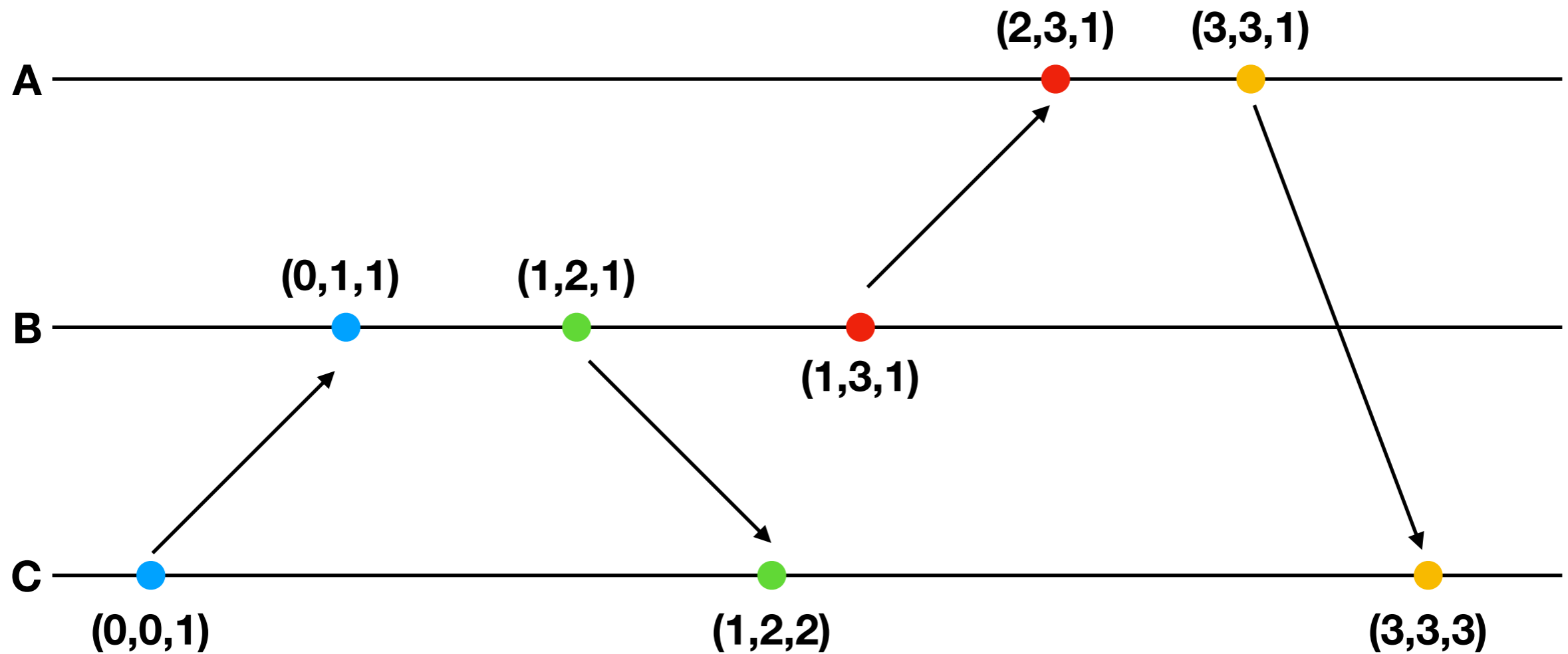


Facebook HQ

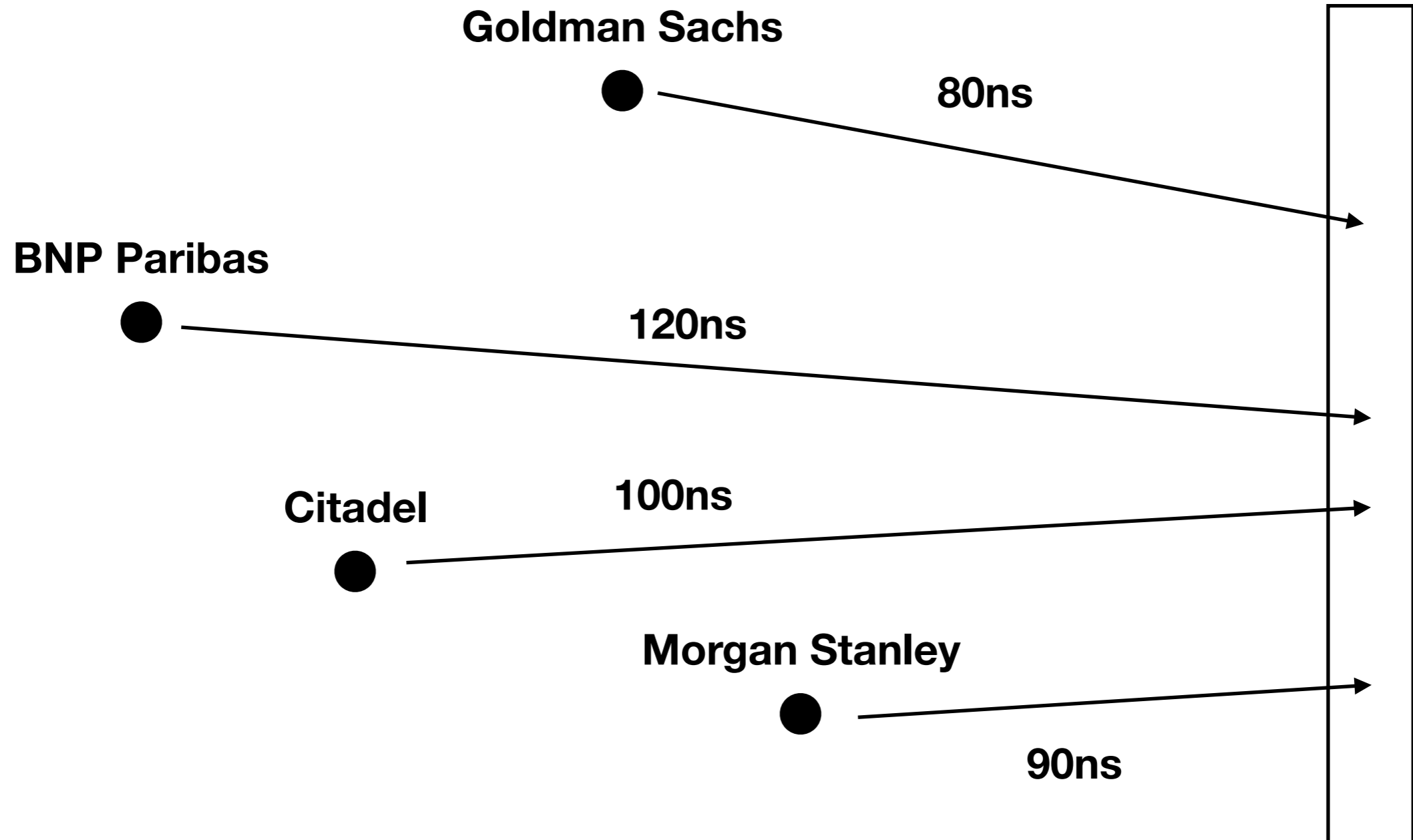


Thousands and thousands of computers

Time is a matter of perspective



Transactions under ~100ns

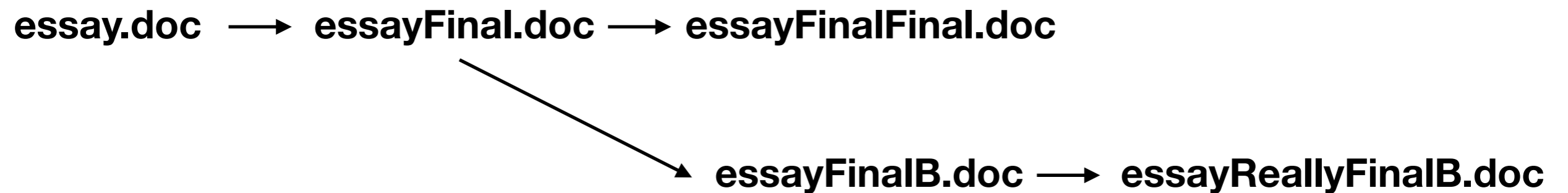


sec: 123456.123456789

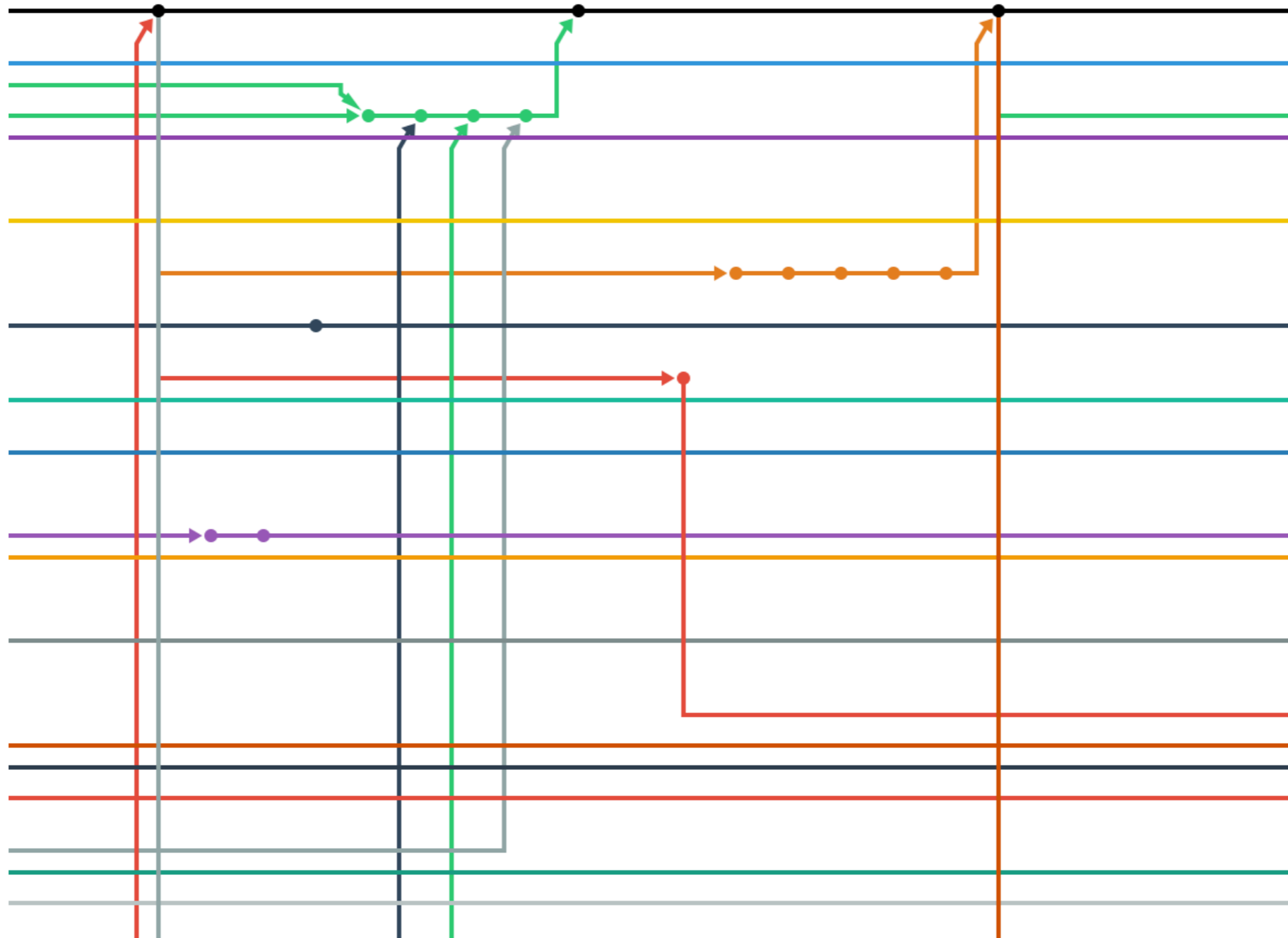
Financial forensics

- Are buy & sell orders consistently simultaneous?
- Are there synthetic patterns of buy and sell orders?

Versioning essays



Versioning software



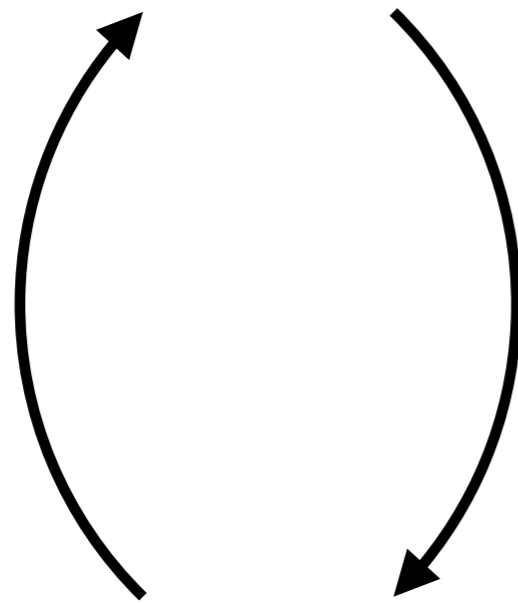
Versions explain evolution

- Where does this data fragment come from?
- How did my software grow over time?

**Game of Thrones
Spoiler Alert!**

Hold the door!

**Adult: die while someone screaming
“hold the door!”**



**Child: Hodor becomes the only word
he can say.**



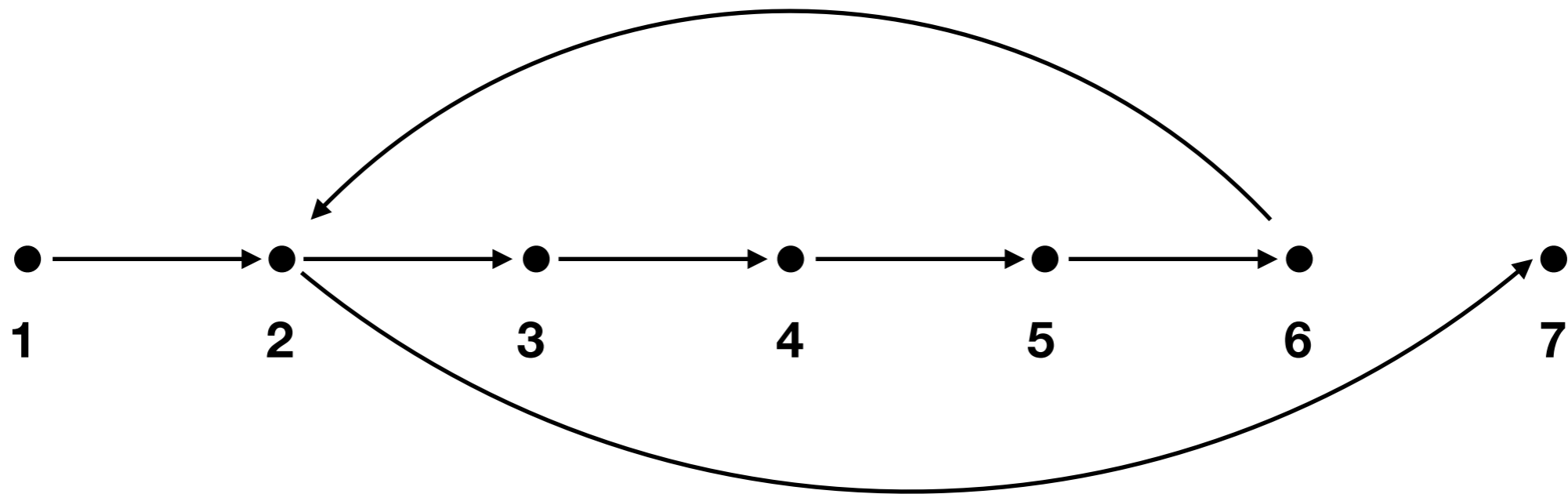
Cyclical time as “accident”

- ▶ Corrupted hard disks
- ▶ Faulty routers
- ▶ Software faults in general
- ▶ Bad protocol design
- ▶ Covering up evidence

Natural cyclical time: ~~code~~ poached egg recipe

1. Bring a pot of salted water to barely simmer
2. Make a whirlpool with a spoon
3. Crack an egg in the middle of the whirlpool
4. Wait for 4 minutes
5. Take out the egg with a slotted spoon
6. Go to step (2) until no eggs left
7. Season eggs with black pepper

Natural cyclical time: ~~code~~ poached egg recipe



Useful queries to ~~code~~ poached egg recipe

- ▶ Do I ever finish cooking?
- ▶ Is the slotted spoon always necessary?

Temporal logic to the rescue

- ▶ “It is raining.”
- ▶ O “It is raining.” = “It will rain in the next hour.”
- ▶ \square “It is raining.” = “It is always raining.”
- ▶ \diamond “It is raining.” = “It will eventually rain.”
- ▶ $\forall \square, \exists \square, \forall \diamond, \exists \diamond, \forall O, \exists O$ when time is branching

Questions?