The Raft Protocol Distributed Consensus for Dummies

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- By the way, **Murex is hiring!**

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- **Consensus** is a basic building block for all kind of distributed systems features

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- Uses on *Raft Distributed Consensus* implemented in Go

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- zab ensures distributed consensus across ZK nodes

Distributed Consensus is A Very Old Problem...

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8. Not all horses are created equal.

... Even in Distributed Computing

The 8 Fallacies of Distributed Computing

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7. Transport cost is zero.
8. The network is homogeneous.

Fundamental Impossibility

Figure : The Fischer-Lynch-Paterson Theorem (aka. FLP)

In an Asynchronous Network...

> *It is not possible to reach distributed consensus with arbitrary communication failures*
> Distributed Algorithms, *Nancy Lynch, 1997, Morkan-Kaufmann*

In a Partially Synchronous Network...

> *It is possible to reach consensus assuming* f *processes fail and there is an upper bound* d *on delivery time for all messages, provided the number of processes is greater than* 2f
> *Nancy Lynch, op.cit.*

In Practice

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> *Paxos Made Live - An Engineering Perspective, T.Chandra et al.*

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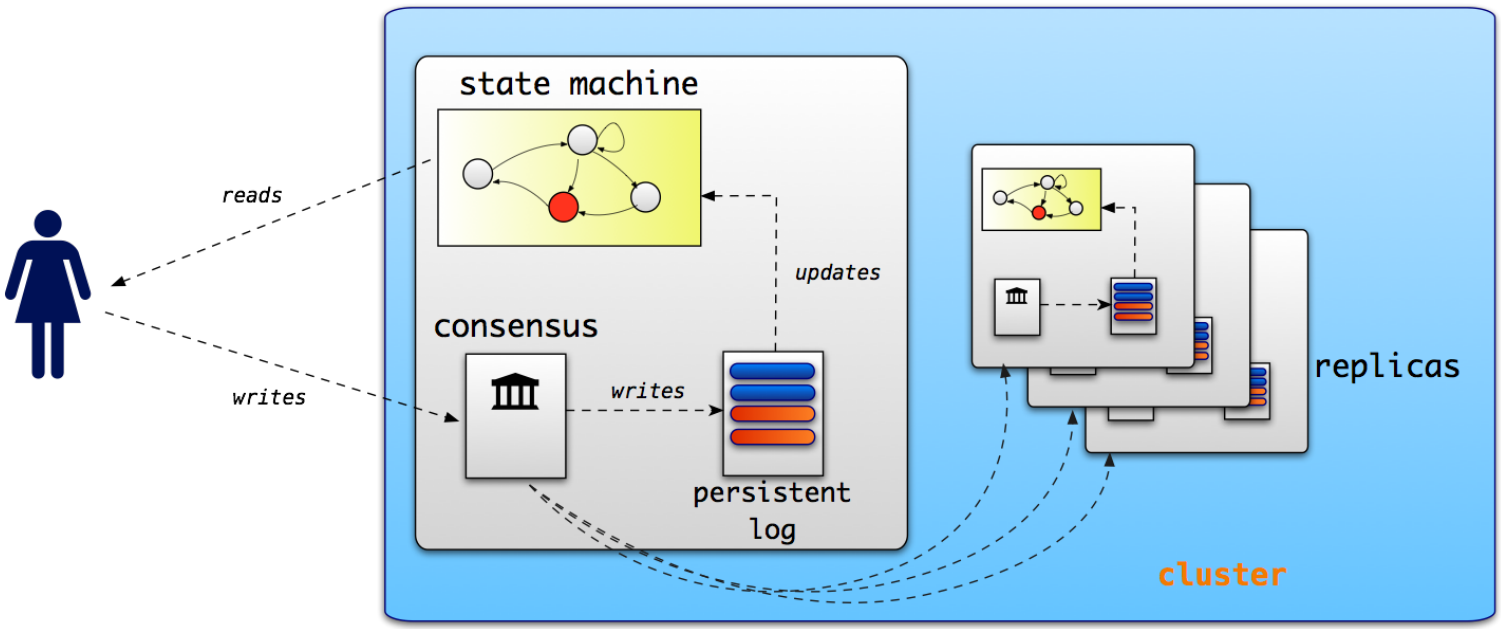
- Novel algorithm designed with *understandability* in mind
- Dozens of implementations in various language
- Most prominent use is currently Go version for etcd distributed configuration system in CoreOS

Principle: Replicated State Machine With Persistent Log



Principles of Operation

- *Leader-follower* based algorithm: Leader is the single entry point for all operations on the cluster

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- Leader orchestrates *safe log replication* to its *followers*

Raft Algorithm

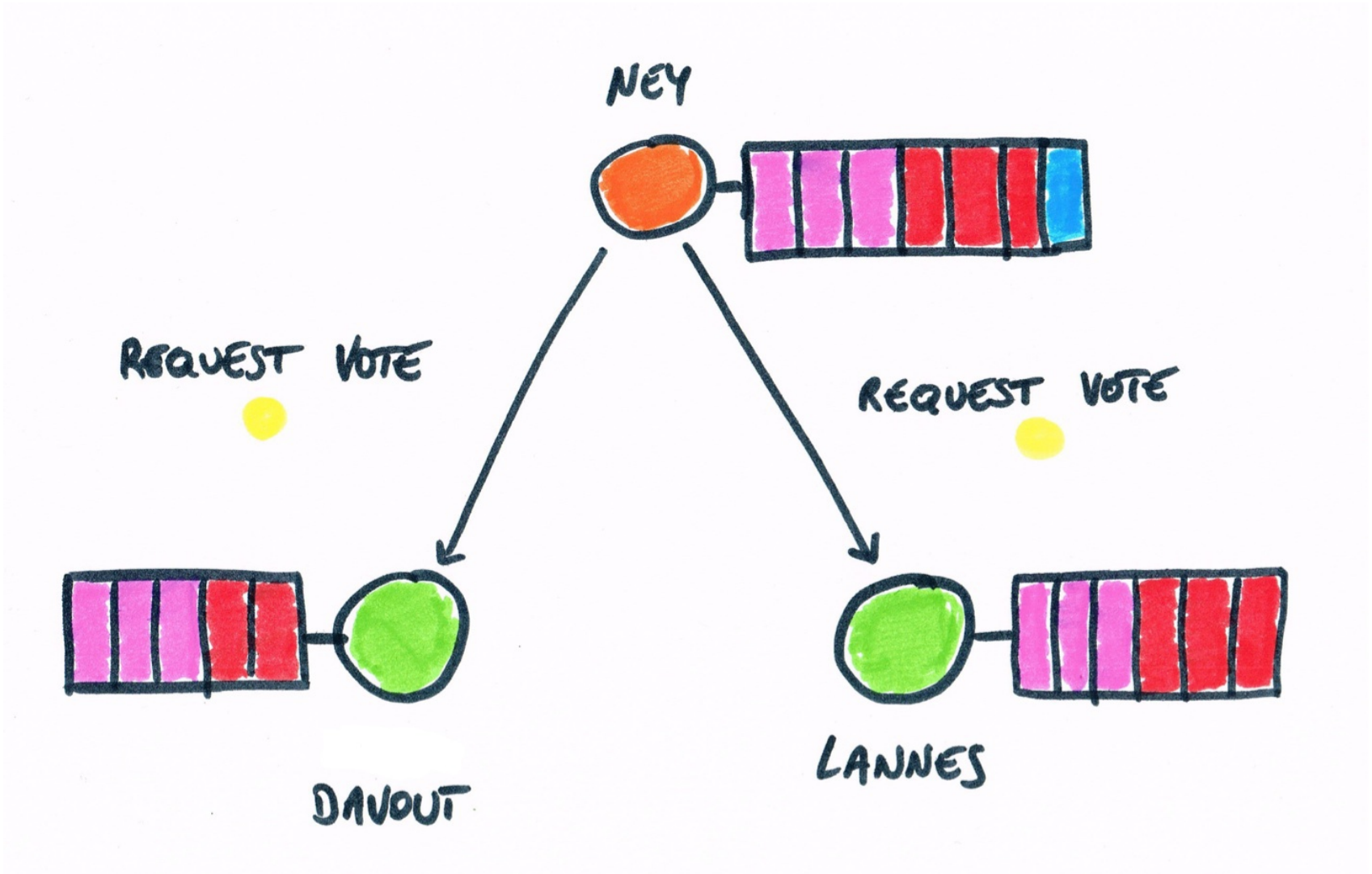

Figure : Ney requests being appointed leader

Raft Algorithm

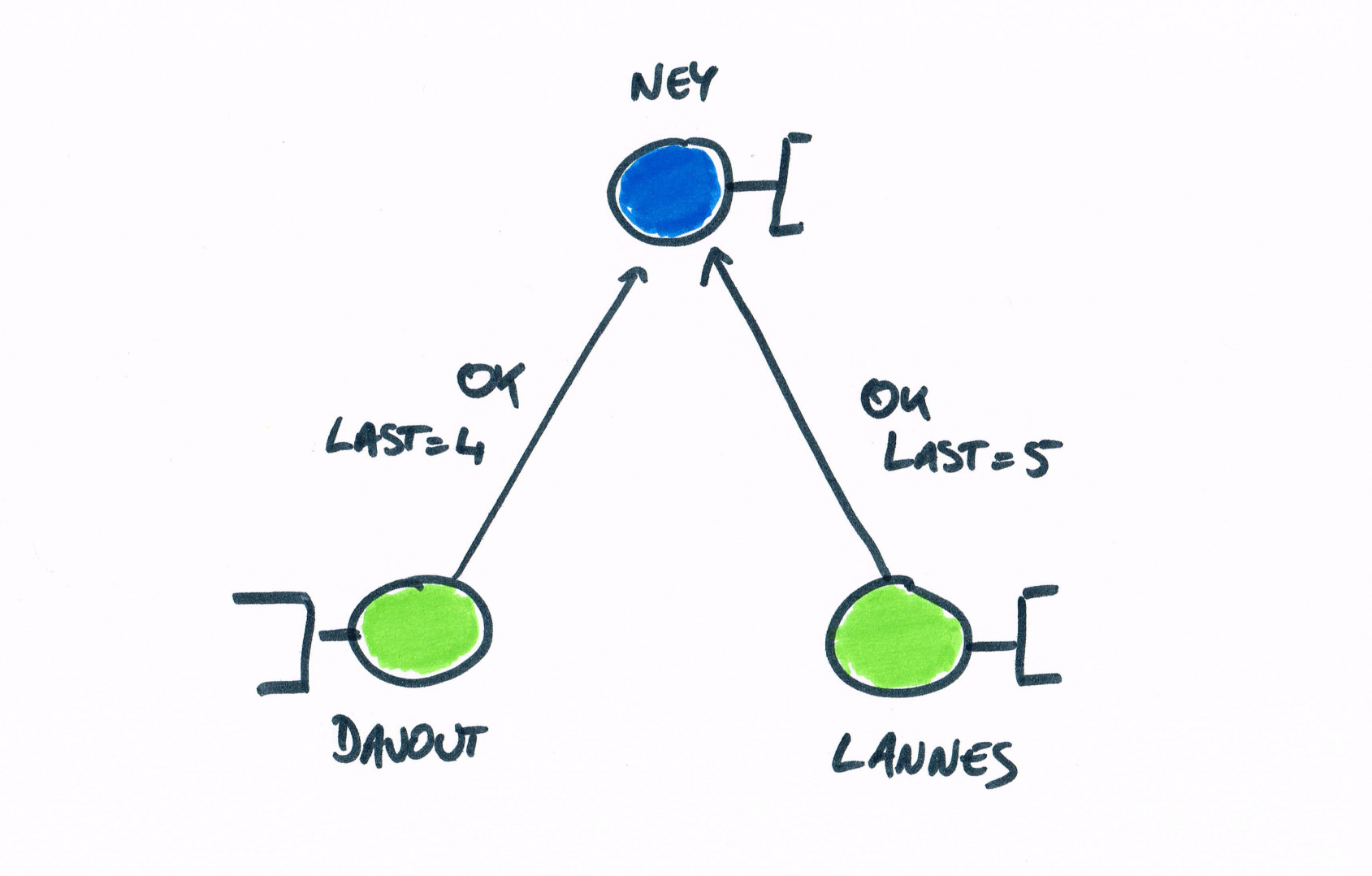

Figure : Ney becomes leader

Raft Algorithm

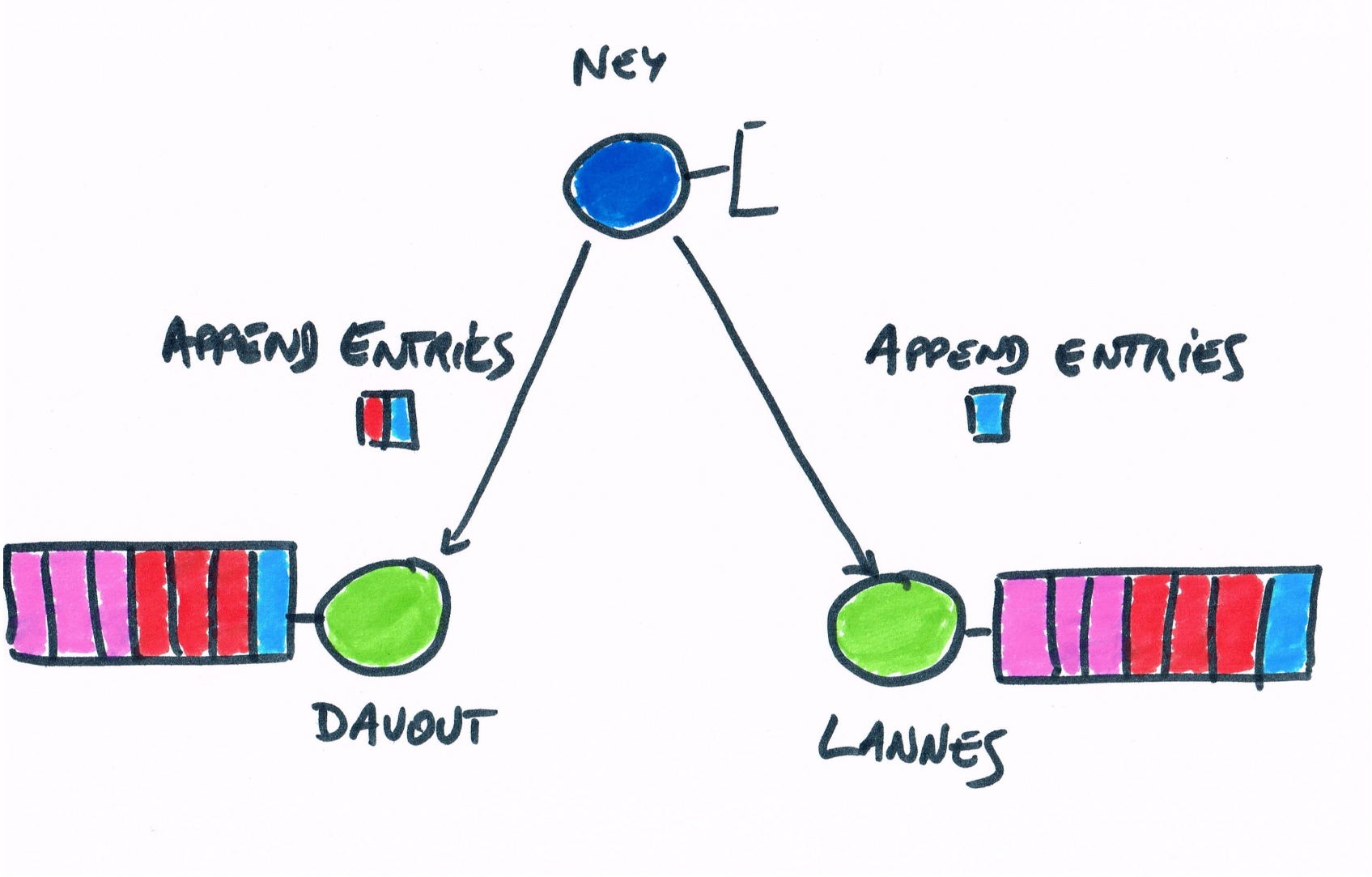

Figure : Leader replicates own log to followers

Raft Algorithm

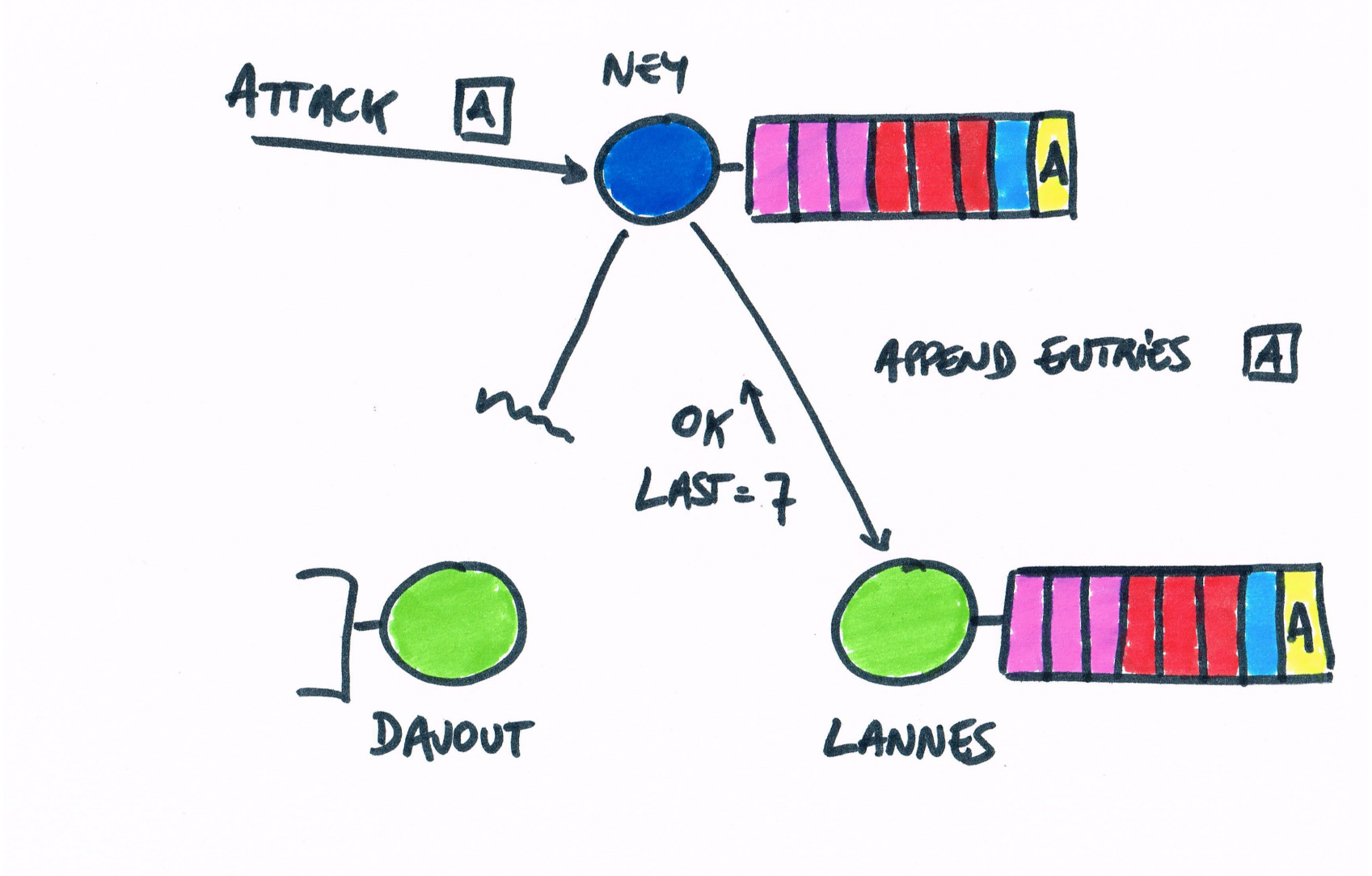

Figure : Ney receives attack order and propagates it

Raft Algorithm

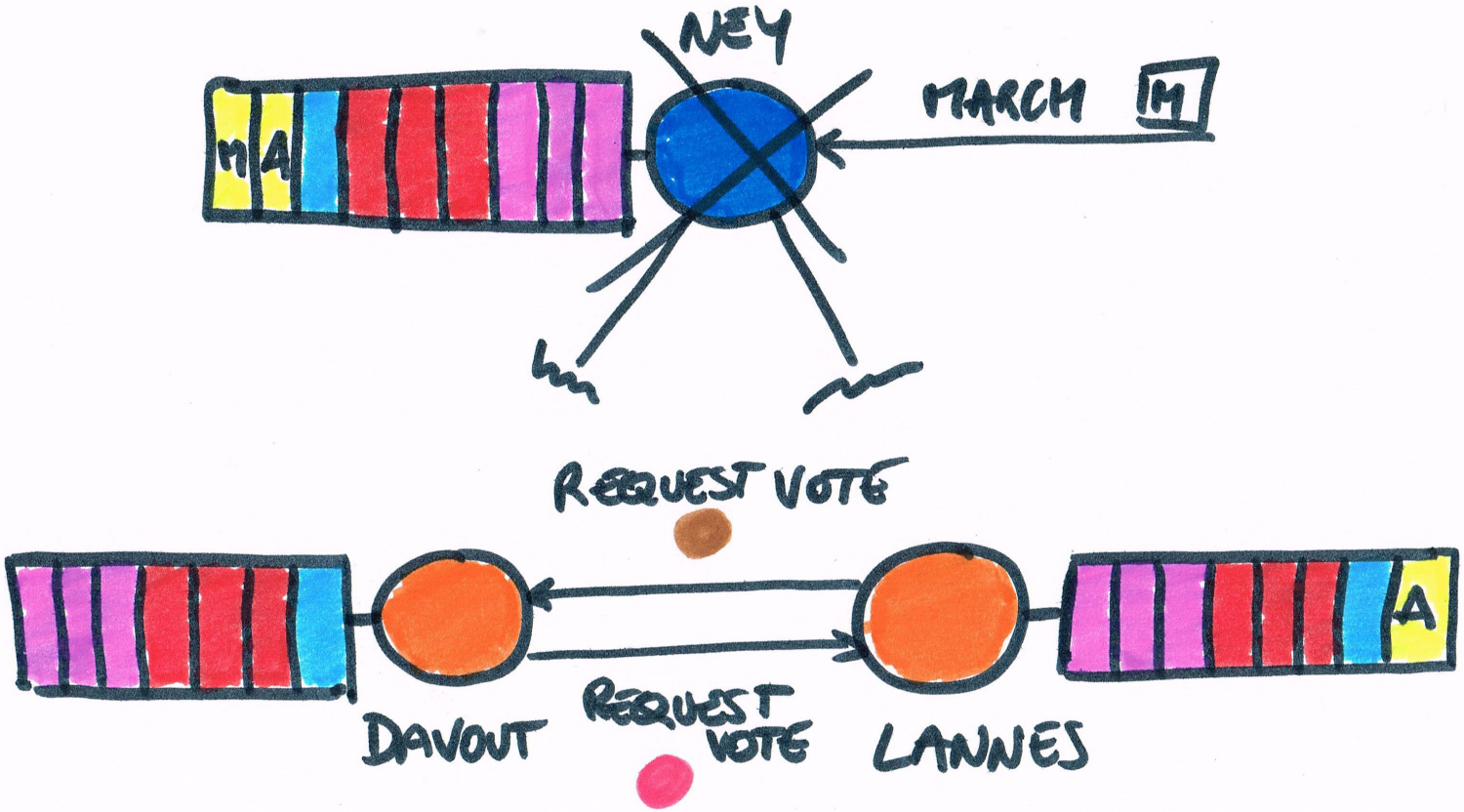

Figure : Ney receives march order but is isolated

Raft Algorithm

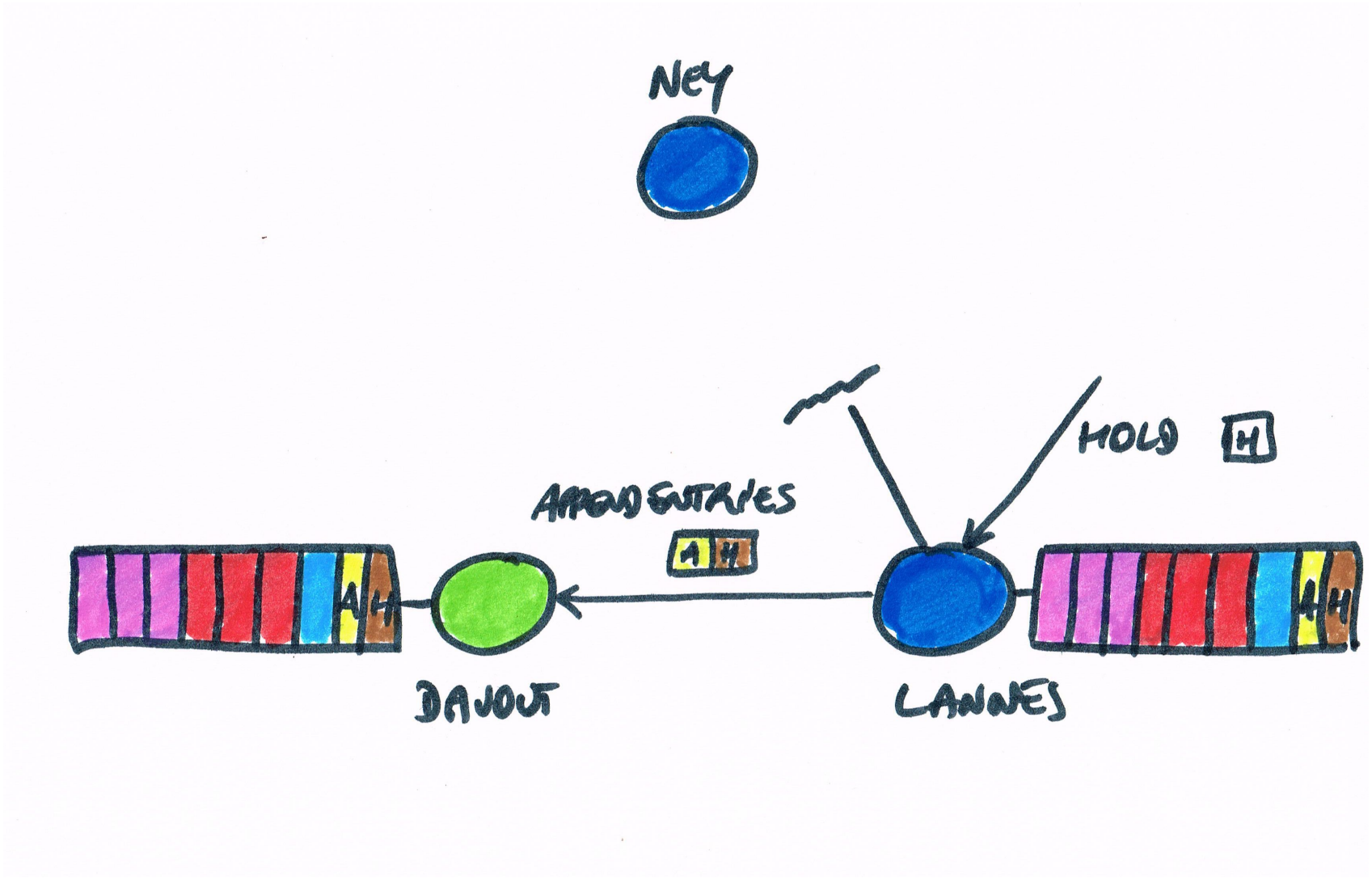

Figure : Lannes is appointed leader for new term

Raft Algorithm

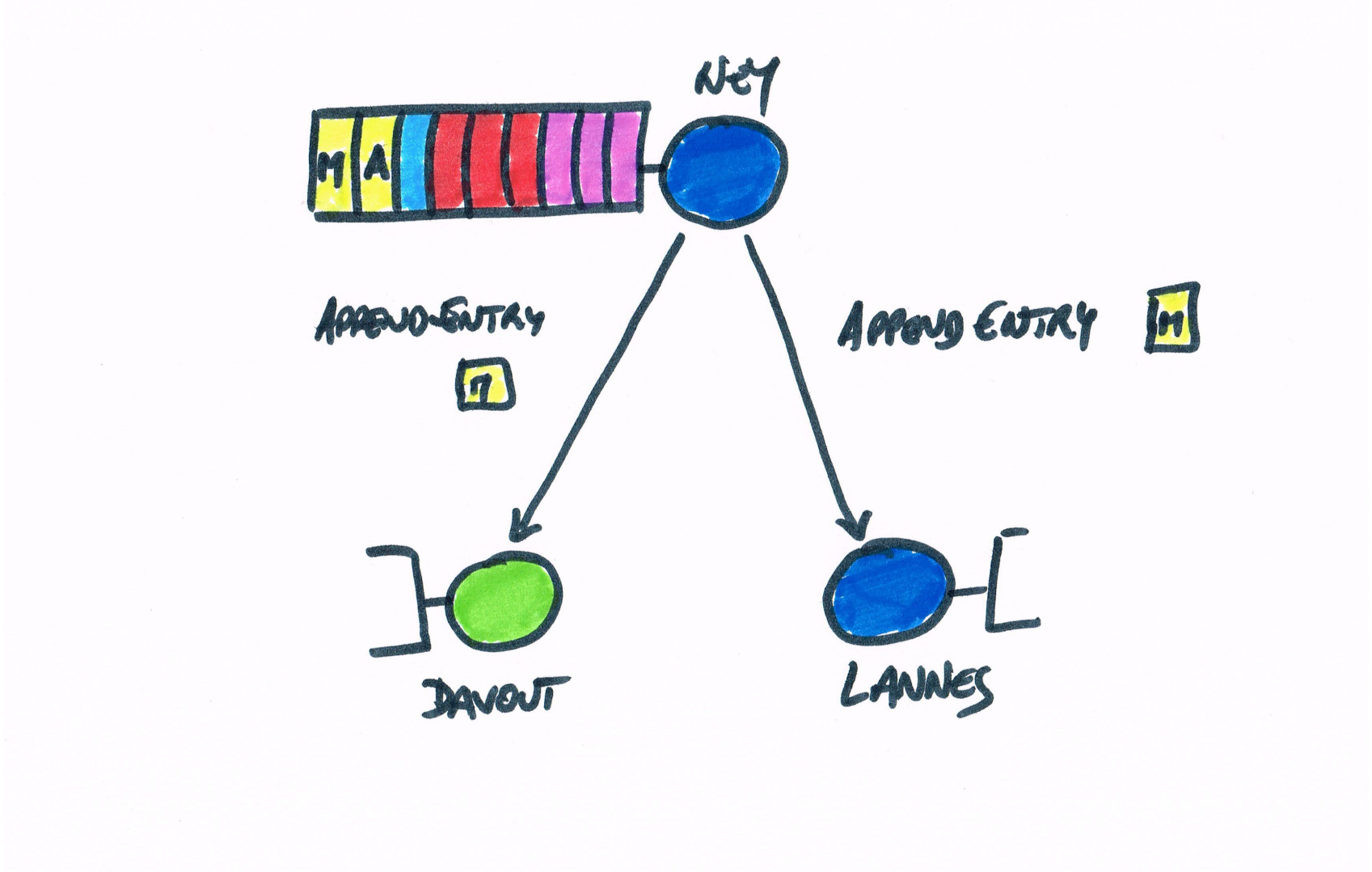

Figure : Ney comes back and tries to propagates march order

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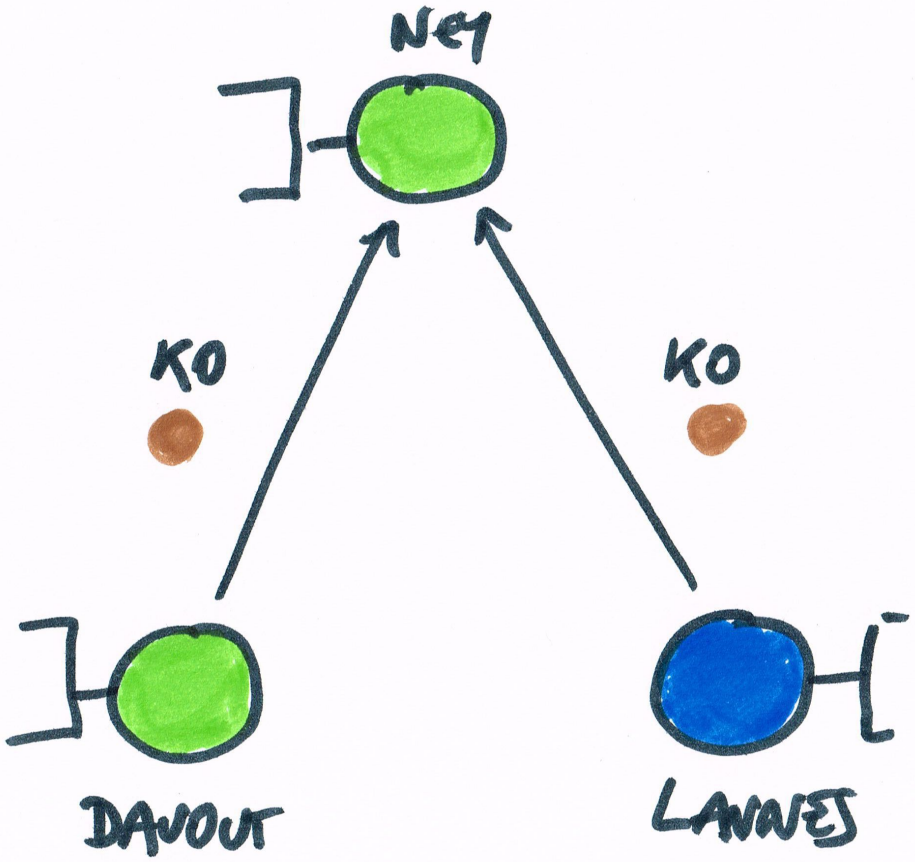

Figure : Ney fallback to follower state

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- *Snapshotting* replaces history prefix with a representation of the state

Java Implementation: Barge

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- Friendly (Apache 2.0) License, *Pull Requests* are welcomed

Demo

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  - Raft is lightweight and understandable
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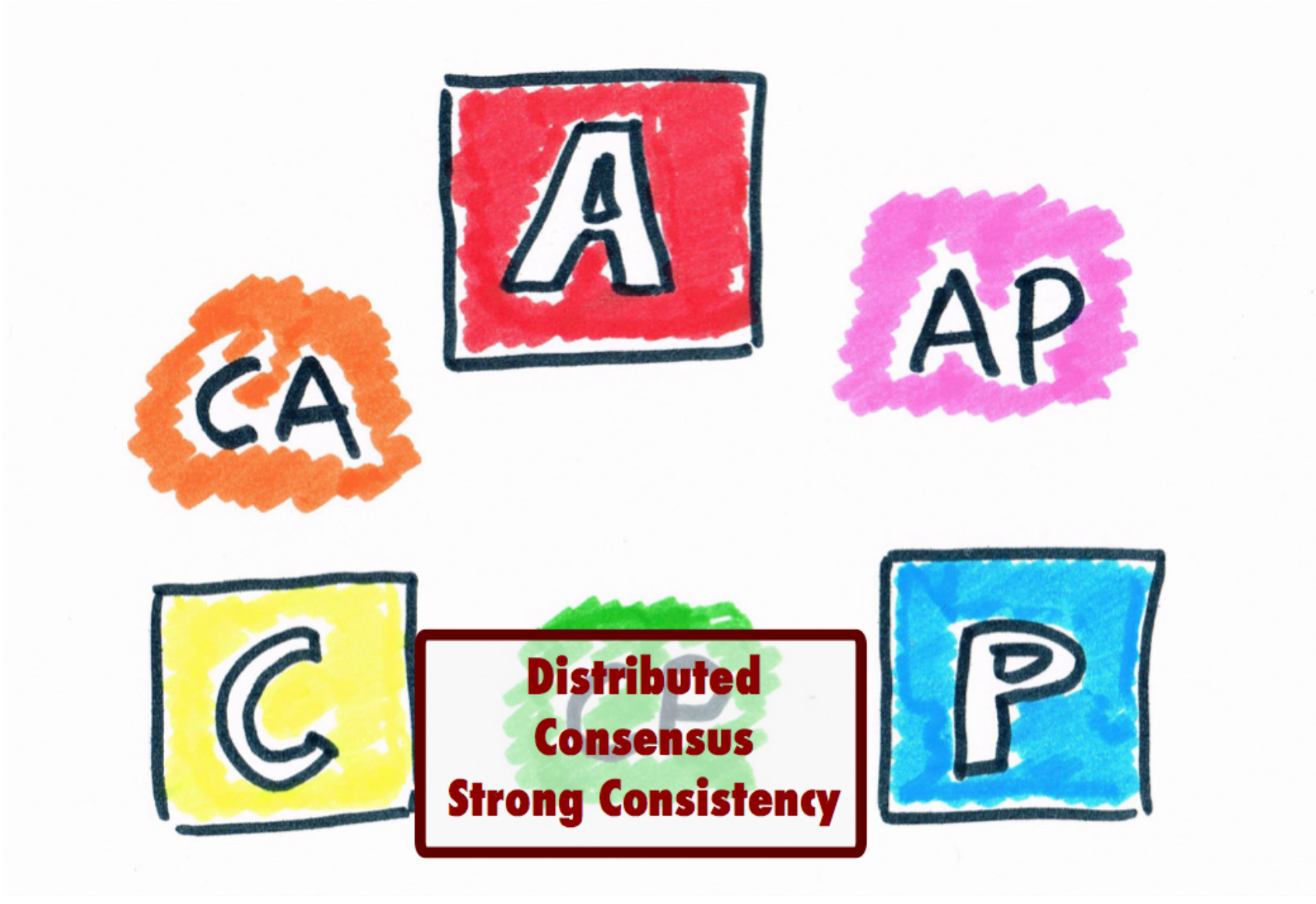
  - Strong Consistency has a cost you don't want to pay for high throughput and large data sets
  - Sweet spot: Configuration data, synchronizing clients at key points

TINSTAAFL



Questions?

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