

Shoal: Improving DAG-BFT Latency and Robustness

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Contents

1	Context: DAG-based BFT Consensus	4
1.a	BFT Consensus	5
1.b	DAG application	6
1.c	DAG Example	7
1.d	Vertices dissemination	8
1.e	Consensus Mechanism	9
1.f	Consensus Structure	10
1.g	DAG Waves example	11
2	Problem	12
2.a	First Slide	13
3	Solution: Pipelining	13

Contents (ii)

3.a First Slide	14
4 Evaluation	14
4.a First Slide	14

1 Context: DAG-based BFT Consensus

BFT Consensus



- $N \geq 3f+1$ validators in total
- At most f validators are faulty

Global agreement on an infinitely growing sequence of some values.

DAG application

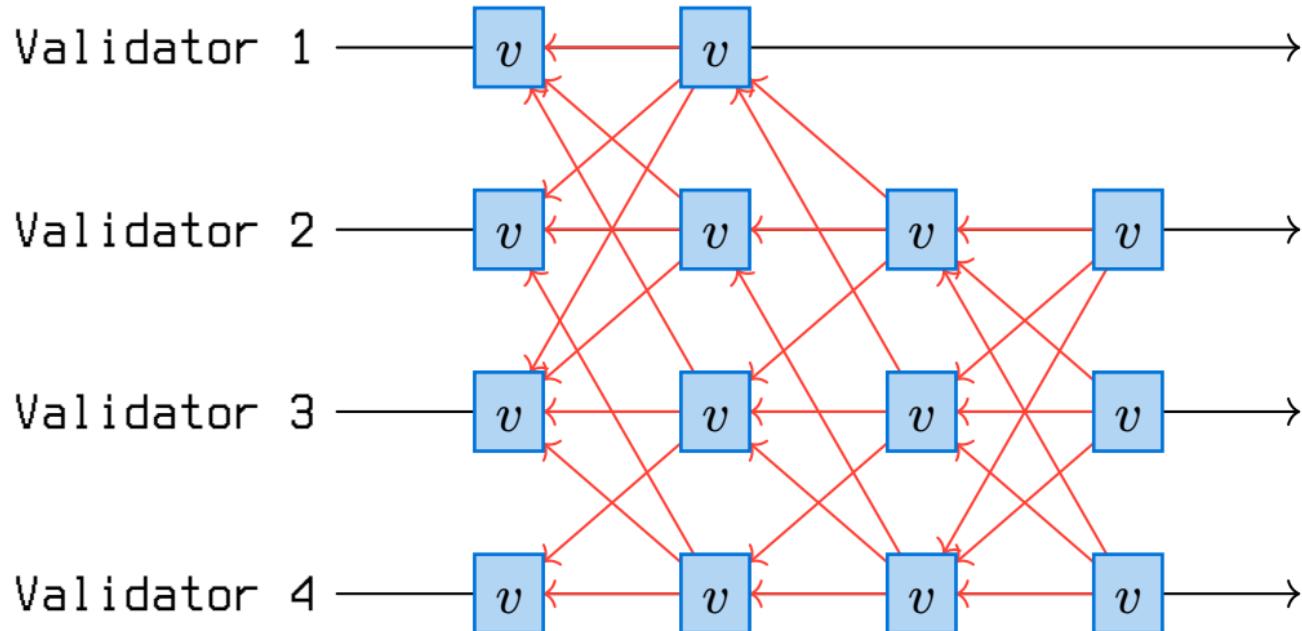


Idea

Separate the network communication layer from the consensus logic.

- Each message contains a set of transactions, and a set of references to previous messages.
- Together, all the messages form a DAG that keeps growing - a message is a vertex and its references are edges.

DAG Example



Vertices dissemination



Unifies abstraction

Reliable BFT broadcast (Not all protocols)

Result:

- All honest validators eventually deliver the same vertices and all vertices by honest validators are eventually delivered.
- Causal history of any vertex in both local views is exactly the same.

Consensus Mechanism



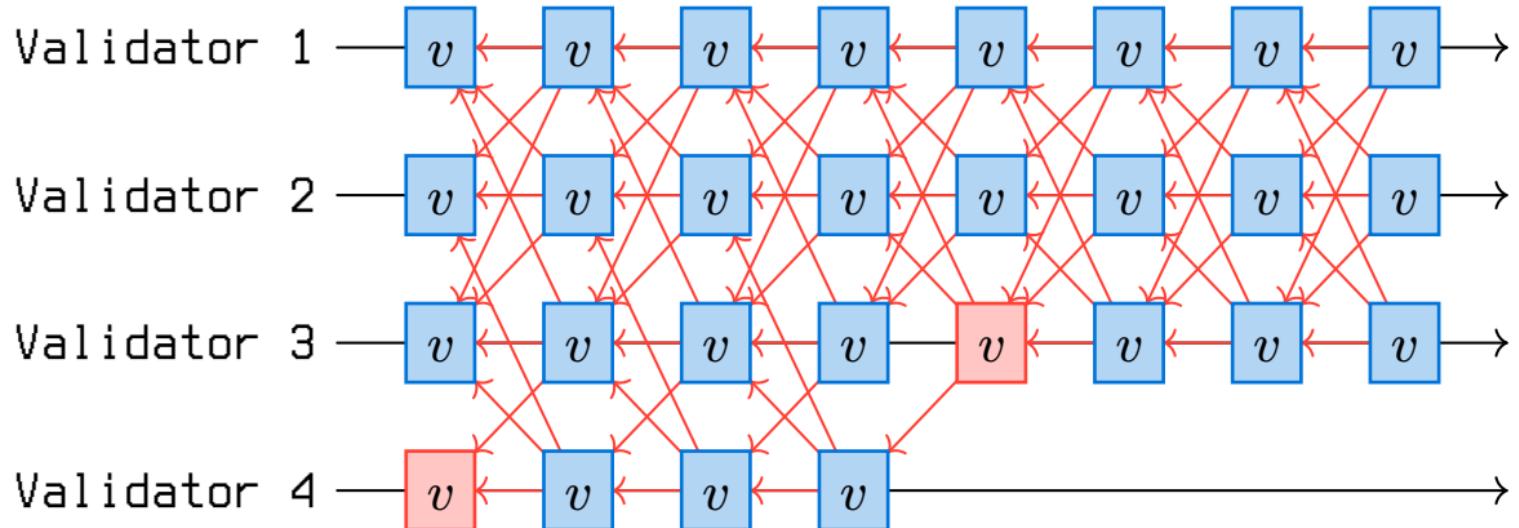
- Solving locally!!
- No need of any extra communication.

Consensus Structure



- Consensus divided into rounds
- Rounds groups waves
- Each wave contains a leader

DAG Waves example



Round

1 2

3

4

5

6

7

8

wave 1

wave 2

2 Problem

3 Solution: Pipelining

4 Evaluation