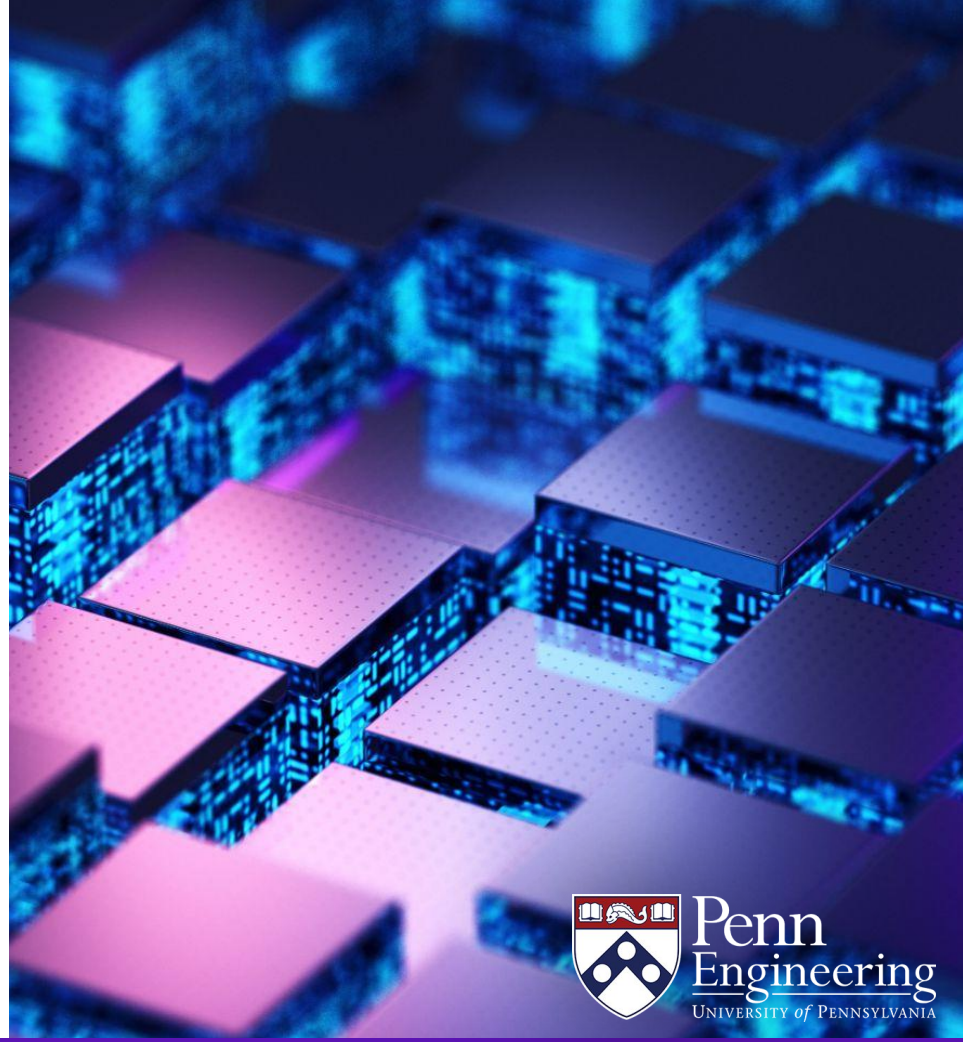
EAS 5830: BLOCKCHAINS

Avalanche

Dr. Brett Hemenway Falk



← **Tweet**

Emin Gün Sirer ▲
@el33th4xor

Someone dropped this paper on IPFS and some IRC channels yesterday. It describes a new family of consensus protocols that combines the best of Nakamoto consensus with the best of classical consensus. Huge breakthrough: ipfs.io/ipfs/QmUy4jh5m...

7:58 AM · May 17, 2018 · Twitter for Android

433 Retweets **70** Quote Tweets **1,274** Likes

Snowflake to Avalanche: A Novel Metastable Consensus Protocol Family for Cryptocurrencies

Team Rocket[†]
t-rocket@protonmail.com

Revision: 05/16/2018 21:51:26 UTC

$ FUNDING ROUND

Series A - Ava Labs

Summary

Overview

Organization Name
Ava Labs

Announced Date
Feb 1, 2019

Funding Type
Series A

Funding Stage
Early Stage Venture

Money Raised
$6M

arXiv > cs > arXiv:1906.08936

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Computer Science > Distributed, Parallel, and Cluster Computing

[Submitted on 21 Jun 2019 (v1), last revised 24 Aug 2020 (this version, v2)]

Scalable and Probabilistic Leaderless BFT Consensus through Metastability

Team Rocket, Maofan Yin, Kevin Sekniqi, Robbert van Renesse, Emin Gün Sirer

FUNDING

Avalanche developer raising $350 million at $5.25 billion valuation: report

by Yogita Khatri

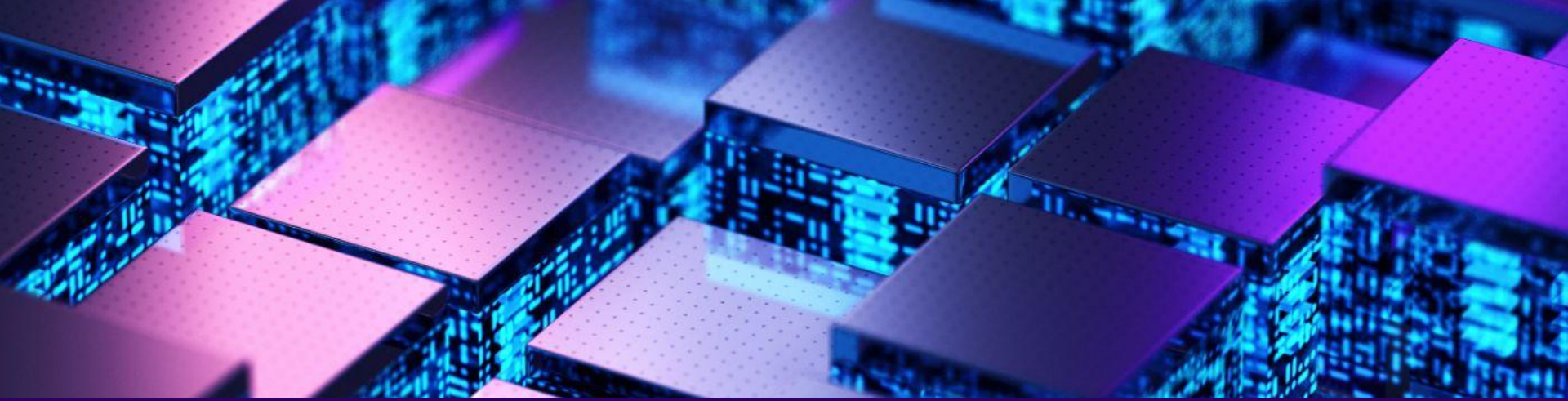
April 14, 2022, 3:43AM EDT · 1 min read

Avalanche

- P-Chain
  - Platform chain
- X-Chain
  - Exchange chain
- C-Chain
  - Contract chain (EVM compatible)
- Anyone can create a new subnet

EVM Compatibility

- Avalanche C-Chain is EVM compatible
- Ethereum DeFi projects can easily re-deploy on Avalanche
  - Aave
  - Curve
- Native DeFi like TraderJoe
- Avalanche bridge makes it easy to send assets from Ethereum

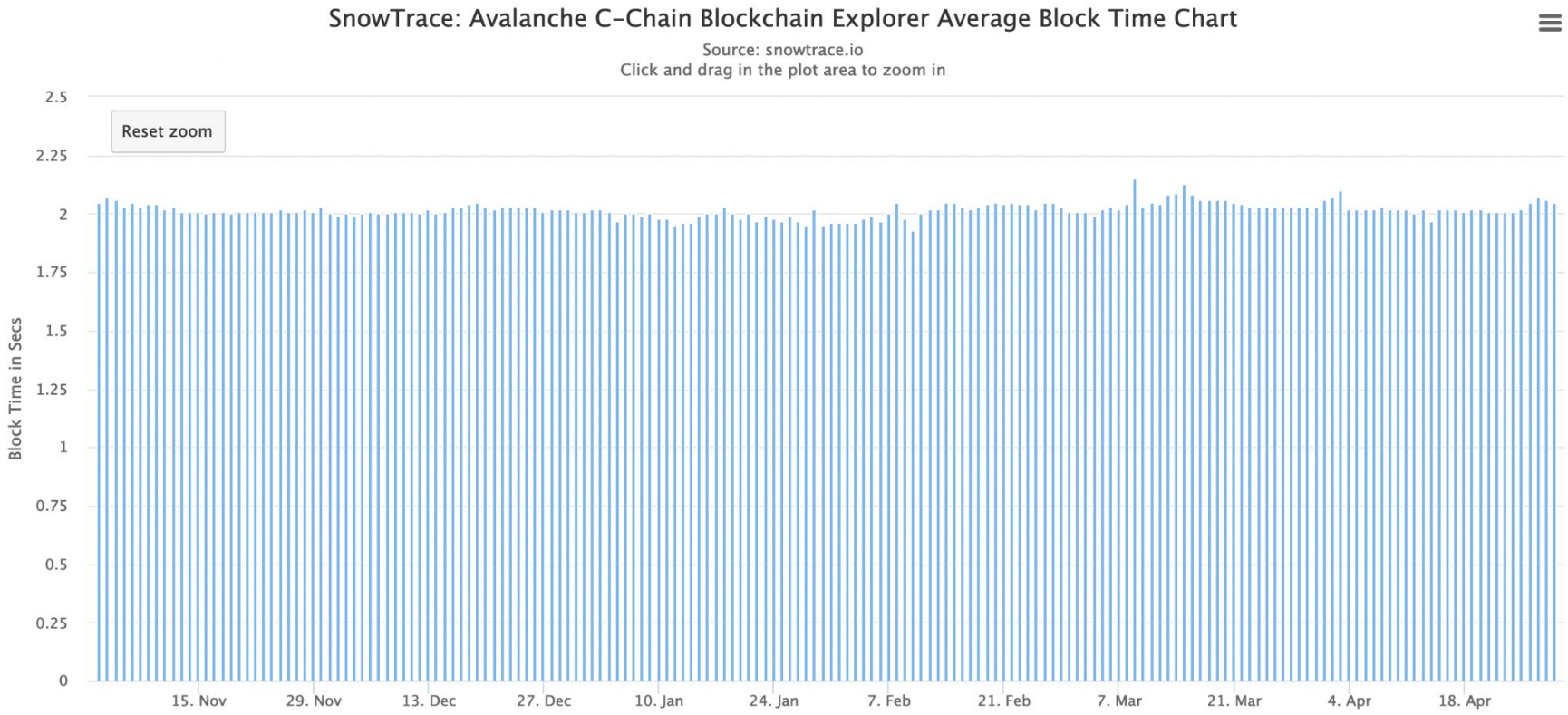


Scalability

Scalability

- Two main metrics:
  - Transactions Per Second (TPS)
    - (Transactions per Block)*(Blocks per Second)
  - Time to Finality (TTF)
- TTF may be longer than block production time
  - Block time can be lower than TTF
  - Bitcoin, Ethereum, Solana, Polkadot produce blocks “optimistically,” so block time is lower than TTF
- TPS is an average, so it’s possible to have high TPS, but long TTF
  - Enormous blocks produced infrequently could lead to high TPS but long TTF

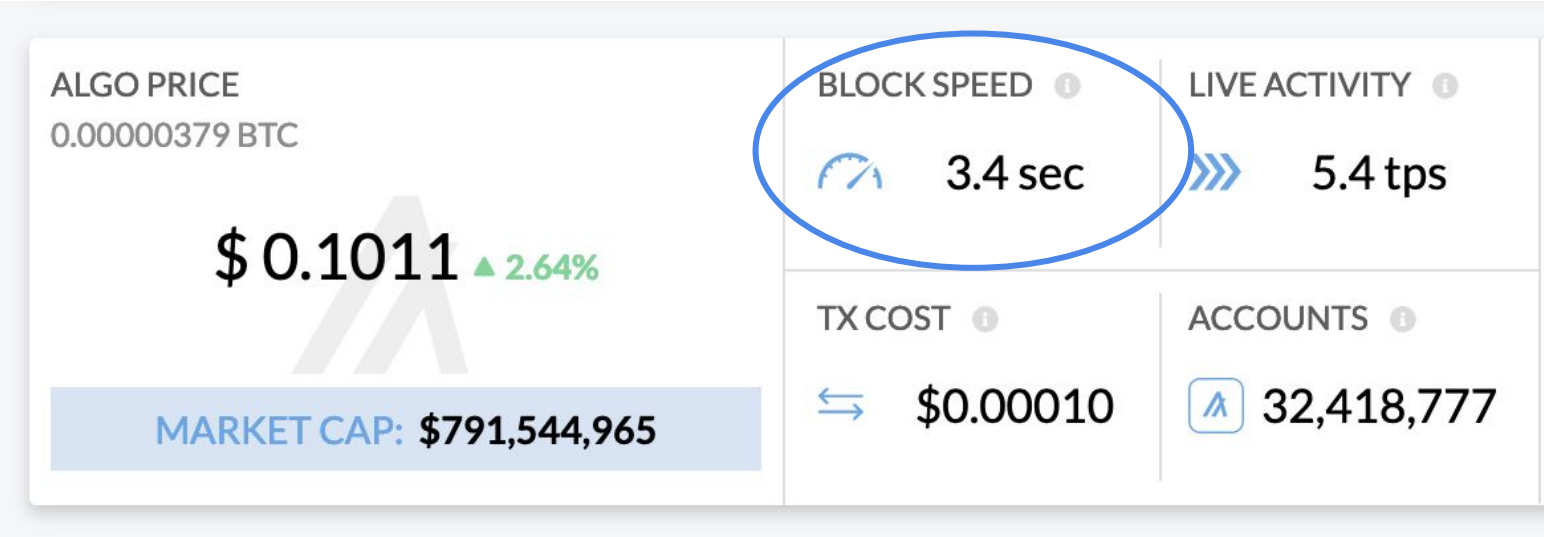
Avalanche is the **fastest smart contracts platform** in the blockchain industry, as measured by time-to-finality.


SnowTrace: Avalanche C-Chain Blockchain Explorer Average Block Time Chart
Source: snowtrace.io
Click and drag in the plot area to zoom in
Reset zoom
Block Time in Secs
2.5
2.25
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0
15. Nov
29. Nov
13. Dec
27. Dec
10. Jan
24. Jan
7. Feb
21. Feb
7. Mar
21. Mar
4. Apr
18. Apr

Solana Block Times

Live Cluster Stats	
Slot	134,398,884
Block height	121,799,963
Cluster time	May 19, 2022 at 12:22:24 Coordinated Universal Time
Slot time (1min average)	674ms
Slot time (1hr average)	997ms
Epoch	311
Epoch progress	10.9%
Epoch time remaining (approx.)	~4d 10h 39m

Algorand Block Times



Osmosis (Cosmos) Block Times

Onchain Metrics

Block Height 11,568,413	Transactions 145,721,100
Current TPS 1.02	Block Time 5.77 s
Inflation 10.80%	Staking APR 10.67%
Bonded Tokens 50.6% / 312.35m	Supply Tokens 617.51m
Community Pool 14.61% / 90.24m	Community Pool Value $ 29,317,978

Ethereum Block Times

- ETH 2 Target TTF: 14 Minutes (or 6 minutes)

Most recent epochs

View more

Epoch	Time	Final	Eligible (ETH)	Voted
230,659	5 mins ago	No	Calculating...	Calculating...
230,658	11 mins ago	No	26,015,432	25,090,933 (96.45%)
230,657	18 mins ago	No	26,015,048	25,933,205 (99.69%)
230,656	24 mins ago	Yes	26,014,664	25,931,285 (99.68%)
230,655	30 mins ago	Yes	26,014,280	25,933,941 (99.69%)
230,654	37 mins ago	Yes	26,013,896	25,930,389 (99.68%)

Polkadot Block Times

- Target TTF: 12-60 seconds

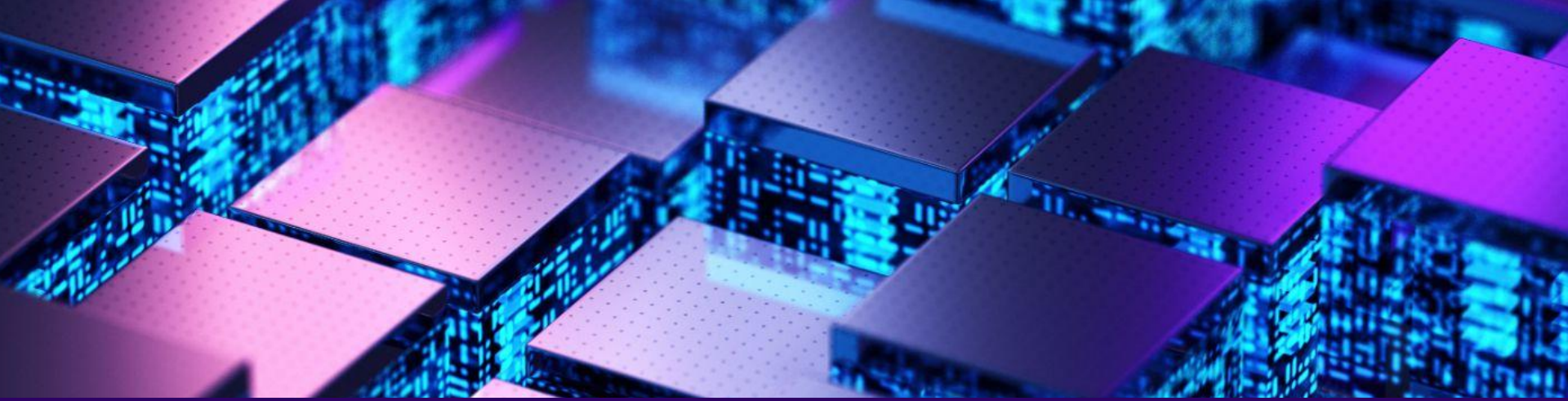
Block# 10,372,628	Includes 3 Extrinsic 16 Event	47 secs ago
Block# 10,372,627	Includes 3 Extrinsic 18 Event	53 secs ago
Block# 10,372,626	Includes 3 Extrinsic 18 Event	59 secs ago
Block# 10,372,625	Includes 2 Extrinsic 12 Event	1 min ago

Cardano

Latest Blocks

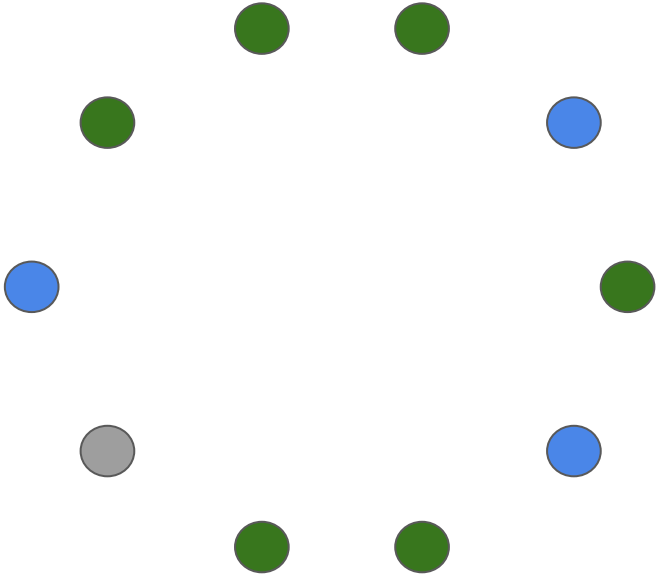
EPOCH	SLOT	BLOCK	CREATED AT	TRANSACTIONS	OUTPUT (₳)	SIZE (BYTES)	CREATED BY
437	103831556	9322926	2023/09/22 15:50:47	8	47943.241854	23609	1af3ab3
437	103831545	9322925	2023/09/22 15:50:36	4	296042.950021	16224	22cfa3b
437	103831539	9322924	2023/09/22 15:50:30	42	515825.85181	53883	6d9ce53
437	103831520	9322923	2023/09/22 15:50:11	25	947936.251996	87114	7d7ac07
437	103831415	9322922	2023/09/22 15:48:26	0	0	4	9924e7d
437	103831402	9322921	2023/09/22 15:48:13	31	4648487.63299	54798	0338d4f
437	103831347	9322920	2023/09/22 15:47:18	2	1394.159974	14321	1596878
437	103831340	9322919	2023/09/22 15:47:11	10	4237486.101504	31318	397f04e
437	103831325	9322918	2023/09/22 15:46:56	5	1196.898728	16439	03fbee9
437	103831315	9322917	2023/09/22 15:46:46	1	1806.054868	893	ed40b0a

True finality takes 36 hours



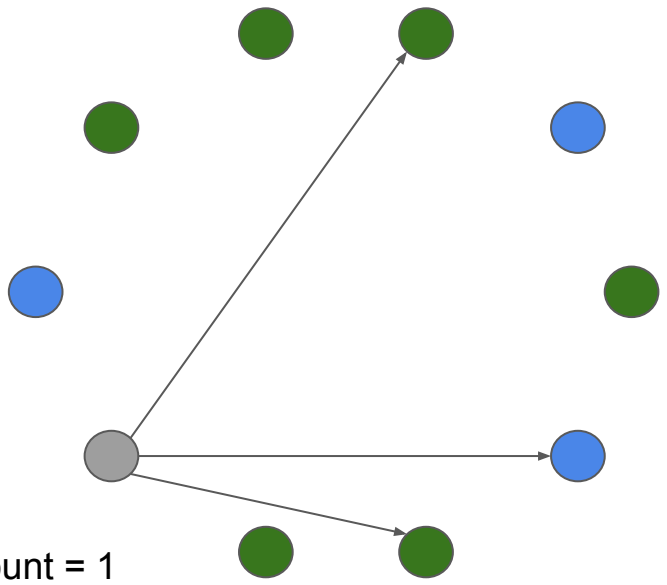
Consensus

Snowball Consensus



1. Ask k random nodes their preference
2. If at least α give same response
   a. Count consecutive successes
3. If less than α give same response, reset count
4. If successive count exceeds β, finalize

Snowball Consensus



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Suppose:
k = 3
α = 2

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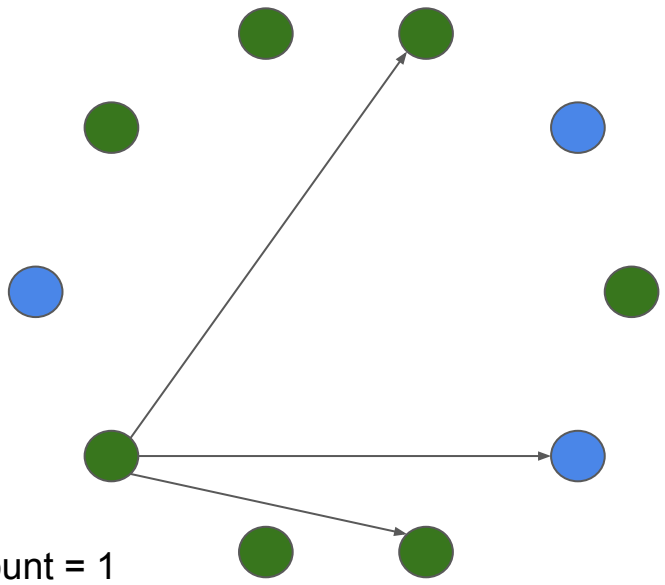

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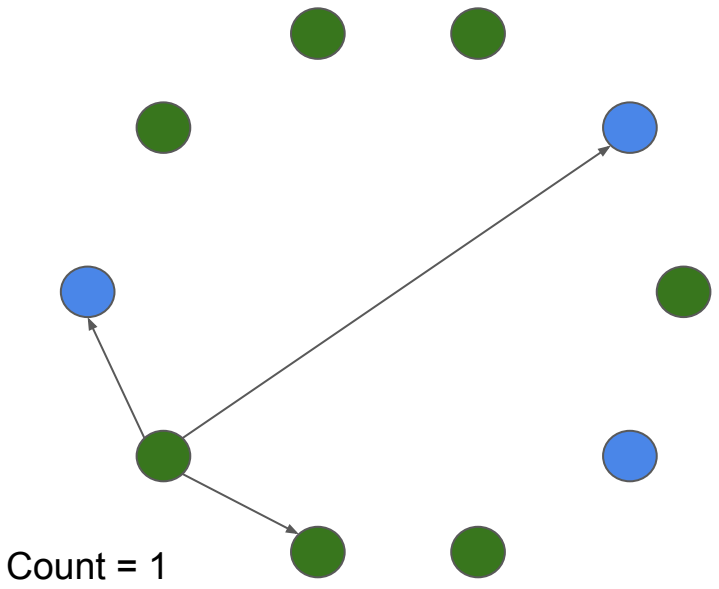

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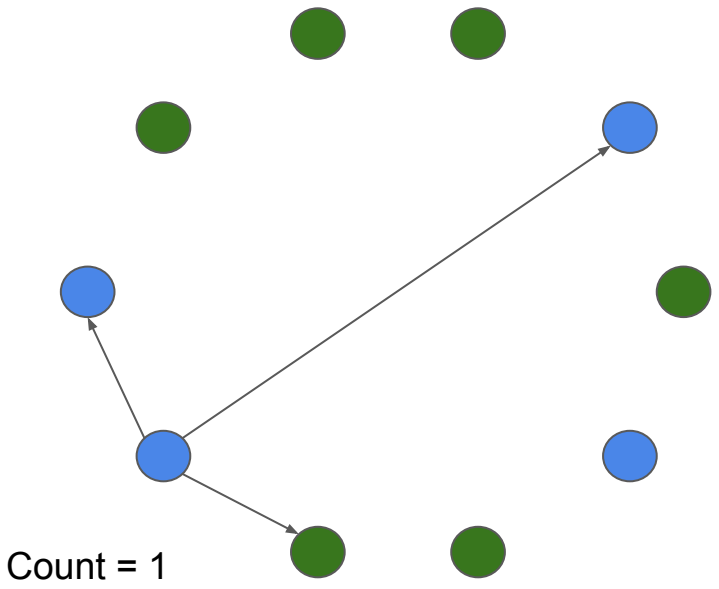

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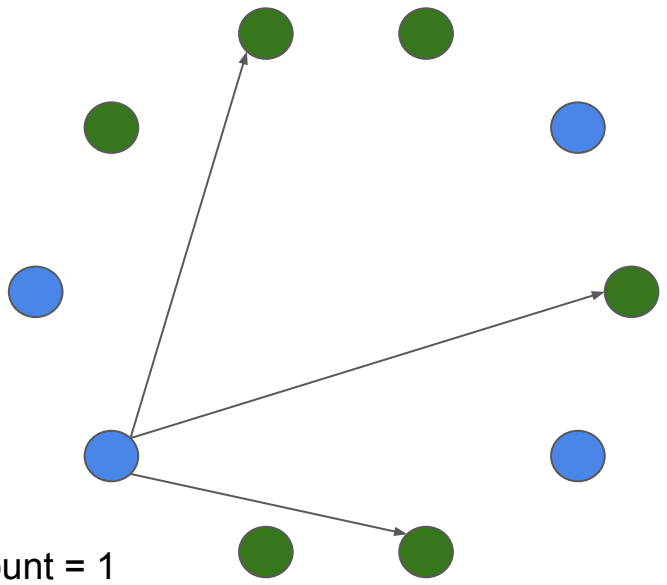

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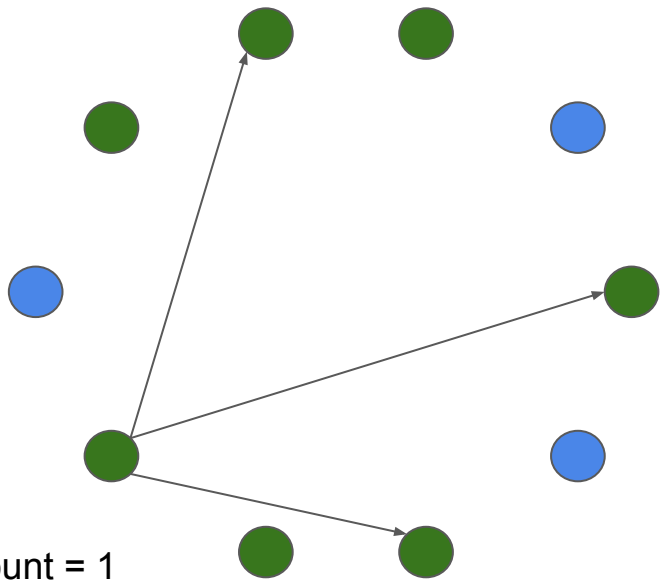

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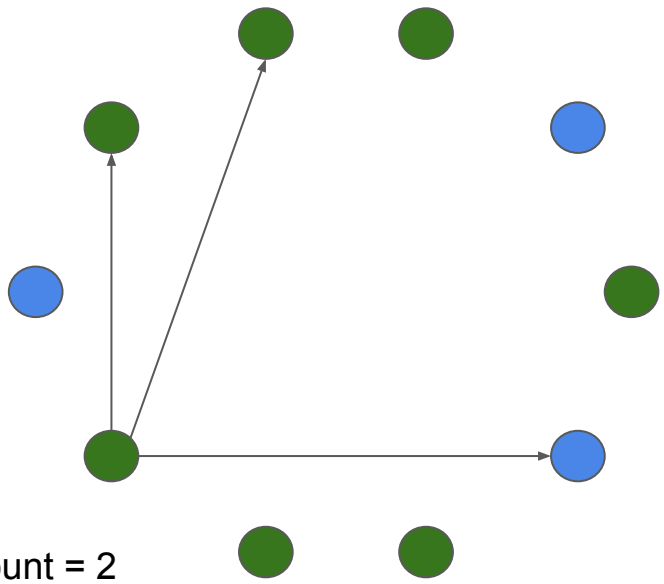

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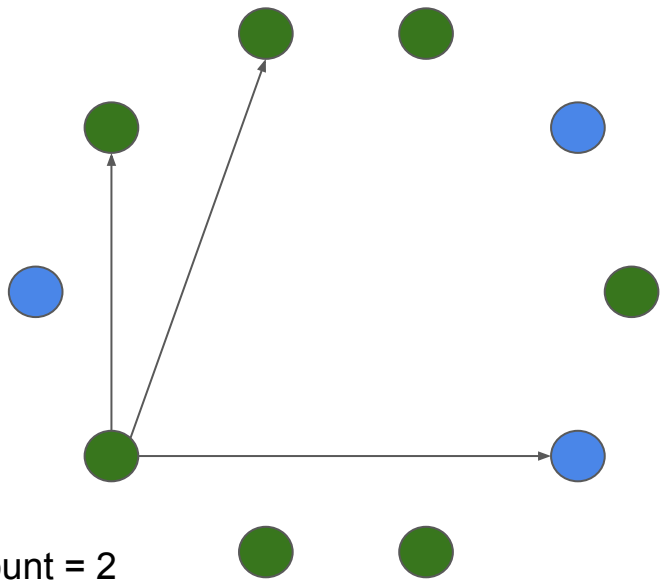

Count = 2

If β = 1,
stop here

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2. If at least α give same response
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3. If less than α give same response, reset count
4. If successive count exceeds β, finalize

Suppose:
k = 3
α = 2

Snowball Consensus

```
preference := blue
consecutiveSuccesses := 0
while not decided:
 ask k random people their preference
 if >= α give the same response:
   preference := response with >= α
   if preference == old preference:
     consecutiveSuccesses++
   else:
     consecutiveSuccesses = 1
 else:
   consecutiveSuccesses = 0
 if consecutiveSuccesses > β:
   decide(preference)
```

Parameters:
k - number of nodes to sample
α - number needed to change your mind
β - number of rounds of consistency before finality

Avalanche consensus

In practice:

- k = 20 (Number of nodes to query)
- α = 14 (Threshold of responses needed to change your view)
- β = 20 (Number of consistent rounds before finalizing)

Proof of Stake

To make this proof of stake, each node selects its random sample weighted by validator stake

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