Lesson 16

EIP165

See https://eips.ethereum.org/EIPS/eip-165
Also see for example

https://docs.openzeppelin.com/contracts/4.x/utilities#introspection

https://docs.openzeppelin.com/contracts/4.x/api/token/erc721#IERC721Receiver

Issues around Wallets

- Hardware wallets vs Browser wallets vs exchange wallets
- Single user vs multisig
- Seed vs private key

Gnosis safe

Example of someone losing their funds from a browser wallet after a phishing email

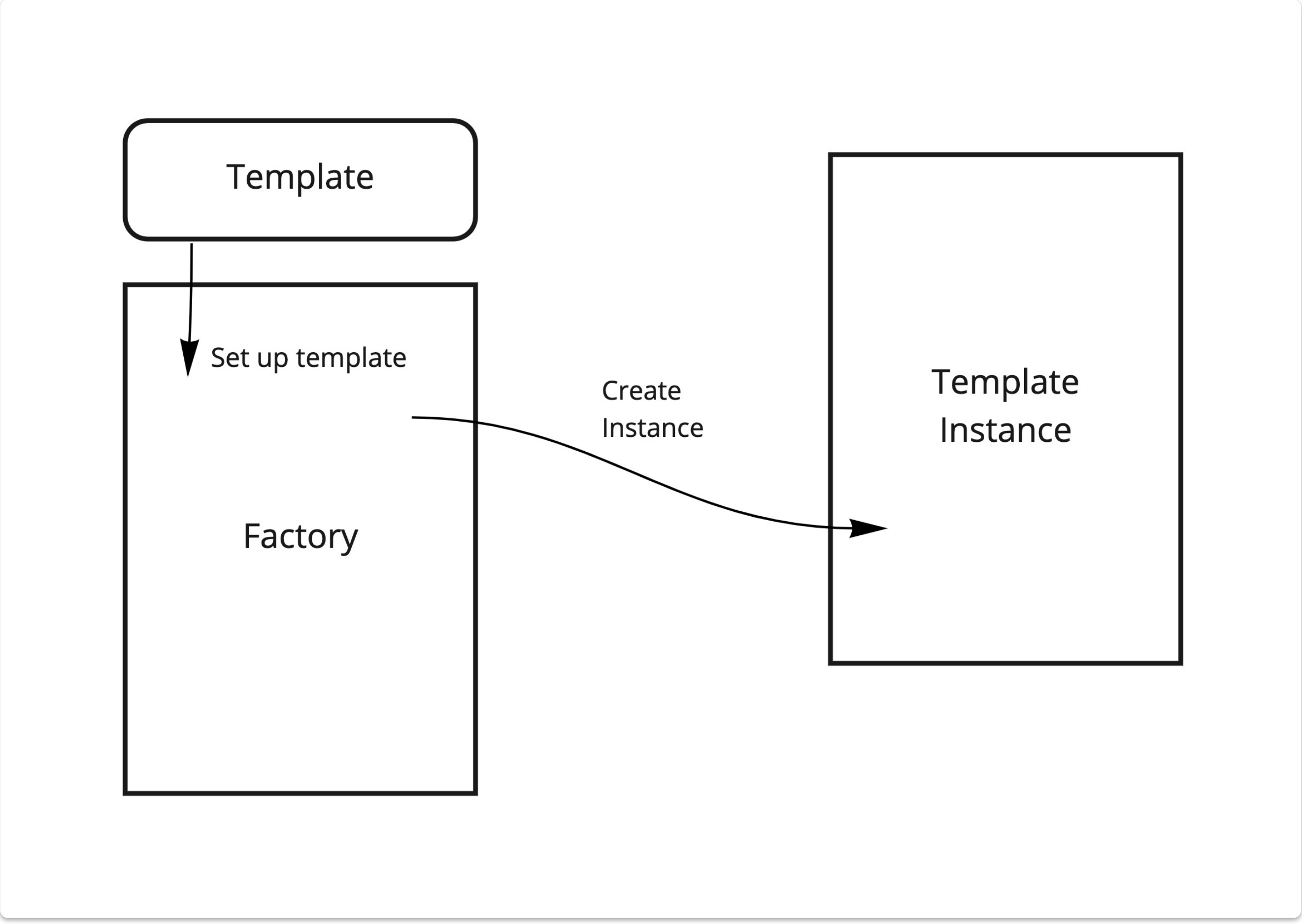
Patterns review

Contract Registry

This can be seen as an anti pattern, if it is being used for upgradability, there are other approaches

Factory Contract

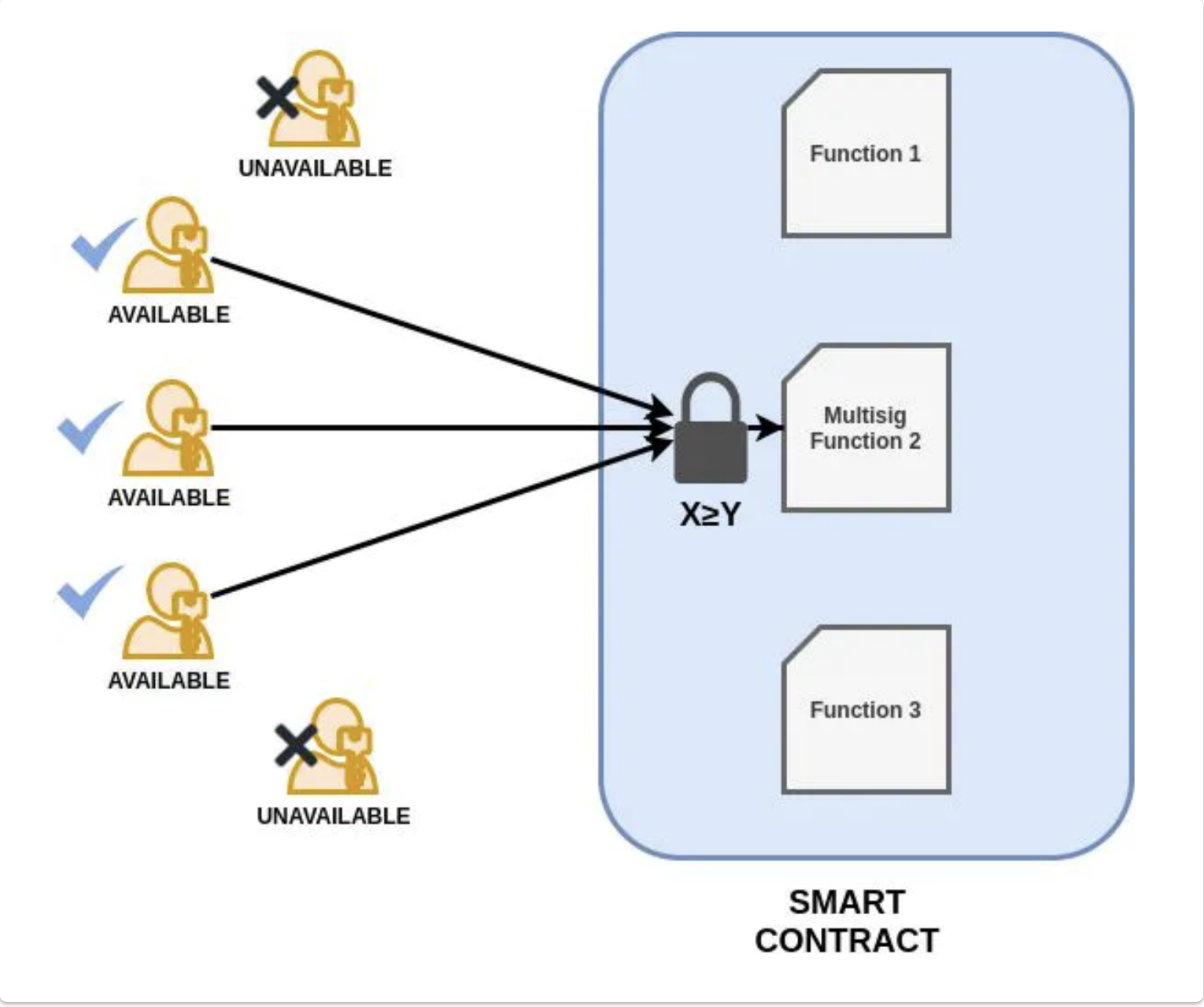
A factory contract is used to produce template contracts at runtime.



incentive execution

Offer other users an incentive for calling for functions
An example is the ethereum alarm clock
For an alternative approach, see Chainlink keepers

Multisig Authorisation



See Gnosis safe for an implementation

State machine

A well known pattern in cs
https://fravoll.github.io/solidity-patterns/state_machine.html

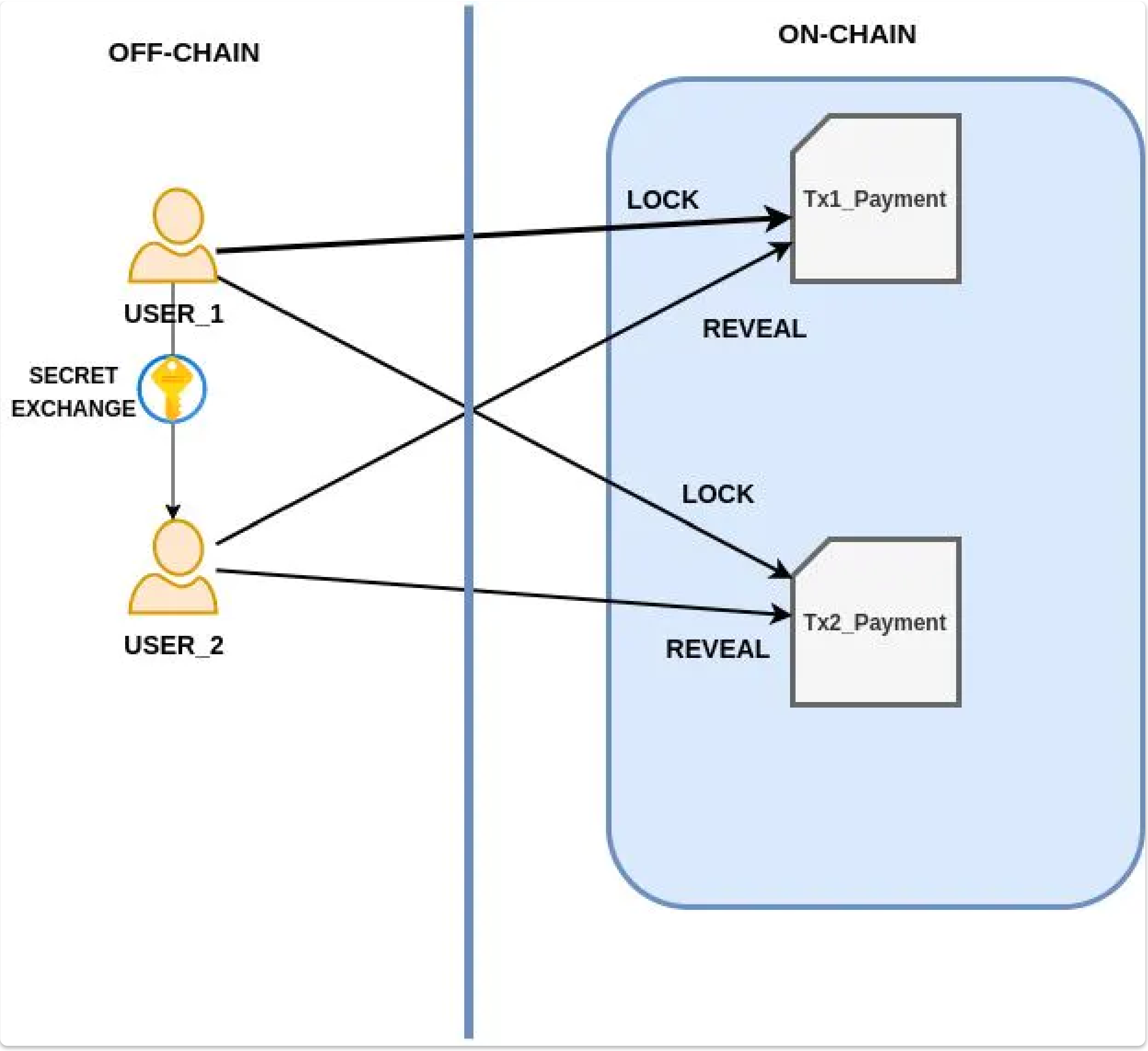
To implement a state machine we need to define

- The states allowed
- The transitions between those states
- Function logic that will vary depending on which state we are currently in, or access to functions may depend on our current state.

Role based access control

An example is Access Control from Open Zeppelin

Off chain authorisation



Circuit Breaker / Escape Hatch

See Open Zeppelin pausable

Checks-Effects-Interactions pattern

See Solidity Docs

First check that the transaction should proceed (is there sufficient allowance ?)
Next change the state in this contract (reduce the allowance)
Finally interact with other contracts (send ether to an address / contract)

Pull payments

```
function withdrawFund(address recipient, uint amount) external
{
        require(recipient != address(0));
        require(amount > 0);
         (bool sent, bytes memory data) = recipient.call{value: amount}
(""); require(sent, "Failed to send ");
```

```
            emit PaymentMade(recipient, amount);
  }
```

Oracle Patterns

See https://dev.to/ahmedmansoor012/ethereum-oracle-design-patterns-5api

- publish-subscribe
  broadcast service for frequently changing data
  when data is changed a flag is set / event
  interested (subscribed) parties poll the flag (or listen for events)
- immediate-read
  single lookup of (fairly fixed) data, probably stored in a contract
- request-response
  This is a comprehensive approach used by chainlink involving on and off chain components

Governance

“The greatest challenge that new blockchains must solve isn’t speed or scaling, it’s governance”

- Kai Sedgwick - Why Governance is the Greatest Problem for Blockchains To Solve

We are concerned with how blockchain protocols develop and can adapt to circumstances, rather than how blockchains are used in say administrative settings.

It is useful to think of governance in the following areas

- Consensus
  Who is involved and how do they come to consensus ?

- Information
  How does relevant information reach the participants ?

- Incentives
  How are the incentives aligned to ensure

  > - Correct Behaviour
  > - There is a sufficient level of participation

- Procedures
  In a decentralised system how are

  > - Proposals made
  > - Votes submitted
  > - Consensus reached

On Chain

Explicit on-chain governance is typically touted as having several major advantages.

- First, unlike the highly conservative philosophy espoused by Bitcoin, it can evolve rapidly and accept needed technical improvements.
- Second, by creating an explicit decentralized framework, it avoids the perceived pitfalls of informal governance, which is viewed to either be too unstable and prone to chain splits, or prone to becoming too de-facto centralized

Off Chain

The mechanism to change the protocol are external to the system

The process is often

- ad hoc
- may be poorly specified
- communication and coordination can be problematic

Developers may have a key role in deciding and implementing changes to the protocol

Bitcoin

Actors :

- Miners
- Developers
- Users (Exchanges / Wallets)

Governance mainly off chain through improvement proposals
A high degree of coordination is needed, done via mailing lists

Results of the nature of Bitcoin Governance :
“This results in a self-reinforcing cycle of more power becoming concentrated in a small group of early core developers, slower technological advancement, and conservatism. Developers are at risk of being bribed since they have a lot of power but weak economic incentives. “

“Similarly, asymmetries in ability to coordinate give miners disproportionate power. Communication amongst miners is easier because they are a small and concentrated group. Since mining is a business with economies of scale, we’d expect a continued trend towards natural monopoly in mining and even greater coordination advantage. “

From : article**

BITCOIN CASH HASH WARS IN LATE 2018.

“Jihan (Bitmain’s CEO) does have a lot of control for now, and much of that is simply due to mining centralization. As Bitmain is so vertically integrated, from selling ASICs, to operating mining farms, to running mining pools, he can prevent network upgrade and attempt to hijack the Bitcoin brand with things like Bitcoin Cash”

- Samson Mow (CSO of Blockstream - http://fortune.com/2017/08/25/bitcoin-mining/)

Ethereum

- Similar to Bitcoin
- Ethereum founder Vitalik Buterin seen as a “benevolent dictator”
- Some on chain governance over system parameters, e.g. Miners can vote on gas price. See article

Tezos

‘Self Amending Ledger’

- Proof of Stake Consensus
- Governance Process
- Code updates are open to anyone
- On chain vote pushes change to test network
- Confirming vote pushes change to the live network
- Contributions are rewarded with tokens
- Power moves away from miners and developers
- Allows delegated democracy

paper 1
abstract

Tezos white paper

- A blockchain protocol can be decomposed into three distinct protocols:

- The network protocol discovers blocks and broadcasts transactions.

- The transaction protocol specifies what makes a transaction valid.

- The consensus protocol forms consensus around a unique chain.

- Tezos implements a generic network shell. This shell is agnostic to the transaction protocol and to the consensus protocol.

- There is the ability to replace the current protocol by one on the test network

- Amendments are adopted over election cycles lasting 131 072 blocks each. Given the a one minute block interval, this is about three calendar months.

- The election cycle is itself divided in four quarters of 32 768 blocks.

**

Terzos implemented their first on chain governance in May 2019

There was a series of stages

Proposal Stage (gas limit)

```
Athens A: 71% (102 bakers)

Athens B: 29% (68 bakers)
```

Exploration Period

Yay/Nay/Pass vote:

```
Yay: 57.86% (178 bakers)

Nay: .02% (3 bakers)

Pass: 42.12% (13 bakers)
```

Testing Period

Promotion period

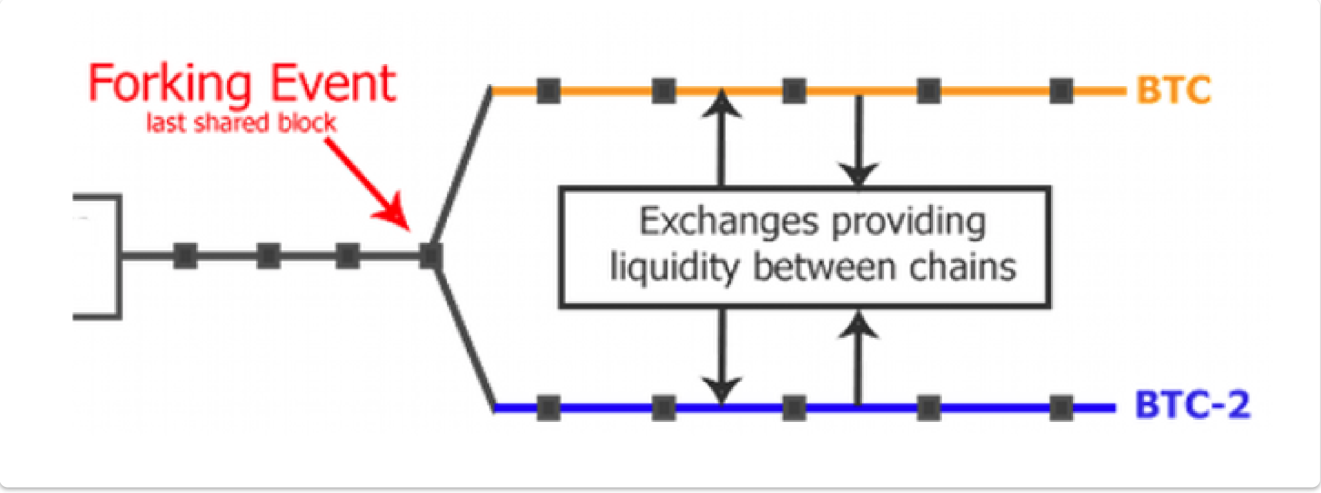
```
Yay: 64.94% (200 bakers)

Nay: .07% (3 bakers)

Pass: 34.98% (12 bakers)
```

When all else fails : Exit Strategies

- Hard and Soft Forks
- Software Forks



See https://fork.lol/

Governance Tokens

Governance is non trivial , as seen on Ethereum and Bitcoin
Various attempts at governance have been tried with on chain / off chain or hybrid models

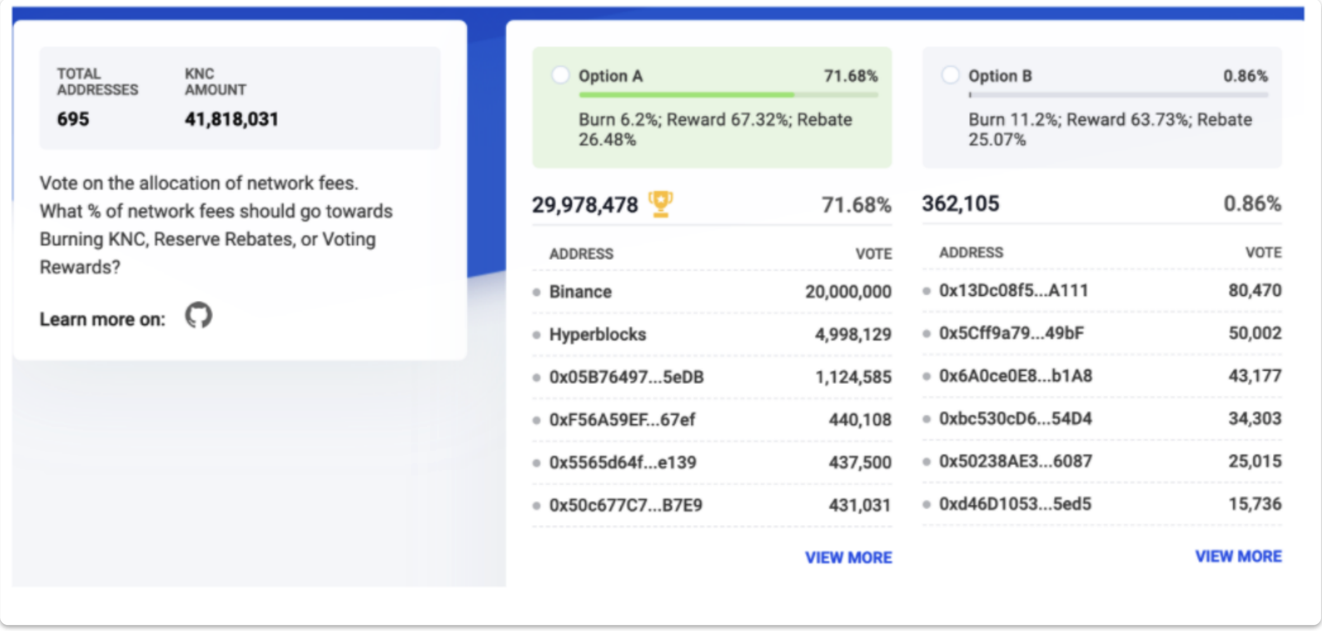
Incentives are (needed) given for participants in the governance process

Many DeFi projects issue governance tokens, though with a different purpose.

DEFI GOVERNANCE TOKENS

Holding the token gives the holder the right to vote on aspects of the protocol, typically economic settings, inclusion of assets

The tokens may have a yield



TOTAL ADDRESSES	KNC AMOUNT
695	41,818,031

Vote on the allocation of network fees. What % of network fees should go towards Burning KNC, Reserve Rebates, or Voting Rewards?

Learn more on:

○ Option A 71.68%
Burn 6.2%; Reward 67.32%; Rebate 26.48%

29,978,478 🏆 71.68%

ADDRESS	VOTE
Binance	20,000,000
Hyperblocks	4,998,129
0x05B76497...5eDB	1,124,585
0xF56A59EF...67ef	440,108
0x5565d64f...e139	437,500
0x50c677C7...B7E9	431,031

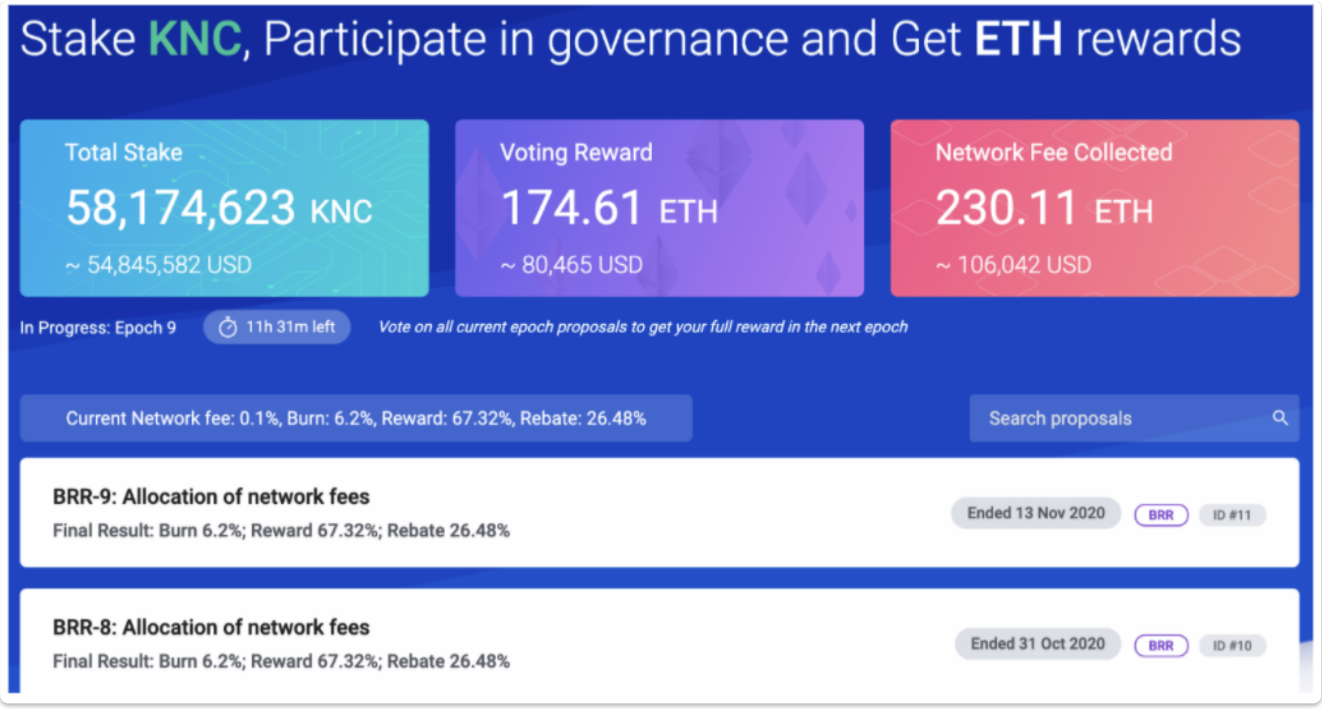
VIEW MORE

○ Option B 0.86%
Burn 11.2%; Reward 63.73%; Rebate 25.07%

362,105 0.86%

ADDRESS	VOTE
0x13Dc08f5...A111	80,470
0x5Cff9a79...49bF	50,002
0x6A0ce0E8...b1A8	43,177
0xbc530cD6...54D4	34,303
0x50238AE3...6087	25,015
0xd46D1053...5ed5	15,736

VIEW MORE



Stake **KNC**, Participate in governance and Get **ETH** rewards

Total Stake
58,174,623 KNC
~ 54,845,582 USD

Voting Reward
174.61 ETH
~ 80,465 USD

Network Fee Collected
230.11 ETH
~ 106,042 USD

In Progress: Epoch 9 11h 31m left *Vote on all current epoch proposals to get your full reward in the next epoch*

Current Network fee: 0.1%, Burn: 6.2%, Reward: 67.32%, Rebate: 26.48%

Search proposals

BRR-9: Allocation of network fees
Final Result: Burn 6.2%; Reward 67.32%; Rebate 26.48%
Ended 13 Nov 2020 BRR ID #11

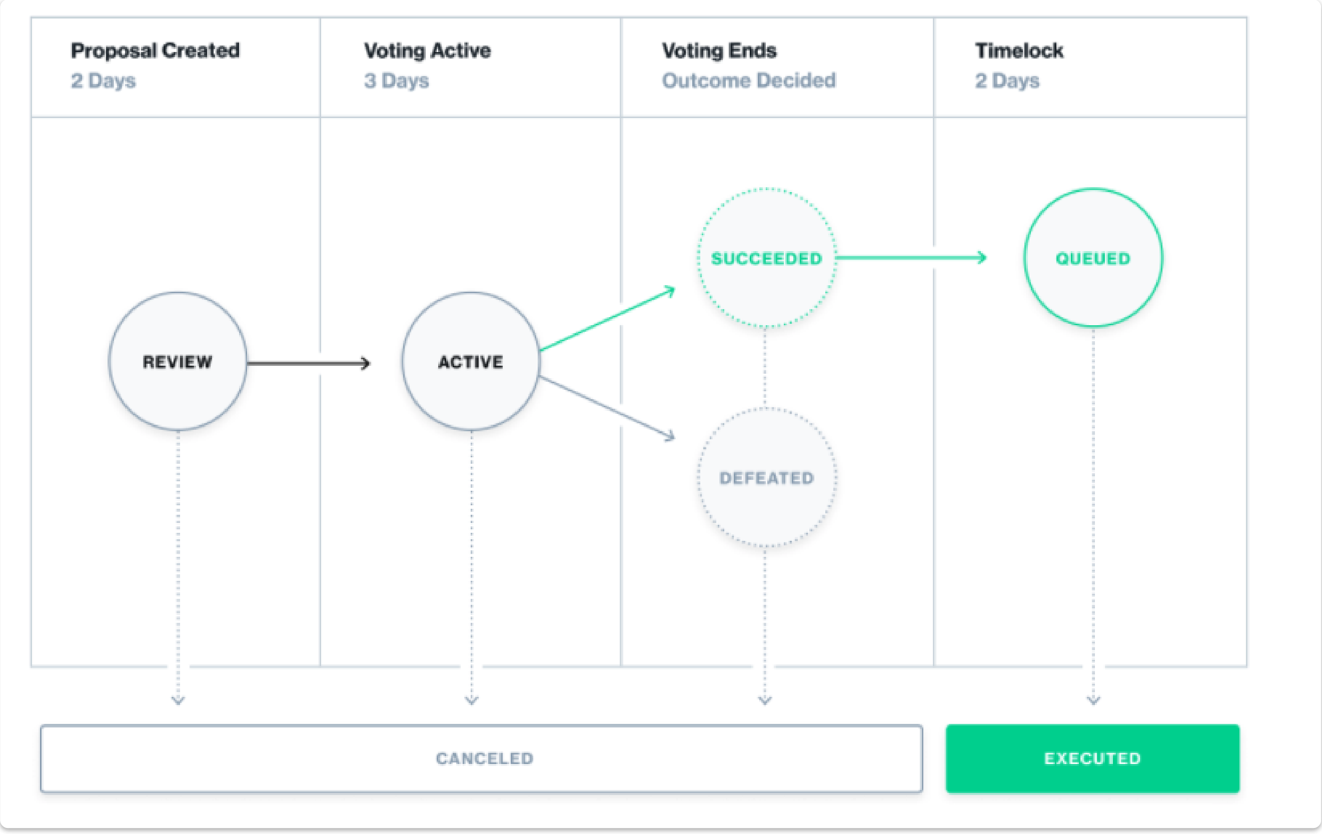
BRR-8: Allocation of network fees
Final Result: Burn 6.2%; Reward 67.32%; Rebate 26.48%
Ended 31 Oct 2020 BRR ID #10

DeFi and Governance

See article

Compound developers turned over the operation and ownership of the network to the community.
The Compound Governance DAO gave the community members control of the protocol’s reserve assets that are generated via fees from borrowers. These cash flows were at the time the highest revenues ever generated by an on-chain protocol.

Their mechanism is now



The Compound protocol is governed and upgraded by COMP token-holders, using three distinct components; the COMP token, governance module (Governor Bravo), and Timelock. Together, these contracts allow the community to propose, vote, and implement changes through the administrative functions of a cToken or the Comptroller. Proposals can modify system parameters, support new markets, or add entirely new functionality to the protocol.

COMP token-holders can delegate their voting rights to themselves, or an address of their choice. Addresses delegated at least 65,000 COMP can create governance proposals; any address can lock 100 COMP to create an Autonomous Proposal, which becomes a governance proposal after being delegated 65,000 COMP.

When a governance proposal is created, it enters a 2 day review period, after which voting weights are recorded and voting begins. Voting lasts for 3 days; if a majority, and at least 400,000 votes are cast for the proposal, it is queued in the Timelock, and can be implemented 2 days later. In total, any change to the protocol takes at least one week.

GOVERNANCE TOKEN VALUE

Protocols may try to claim to their token has no value

Yield Finance
"In further efforts to give up this protocol (mostly because we are lazy and don't want to do it), we have released YFI, a completely valueless 0 supply token. We re-iterate, it has 0 financial value. There is no pre-mine, there is no sale, no you cannot buy it, no, it won't be on Uniswap, no, there won't be an auction. We don't have any of it."

Within a week it was worth $3000 and was giving returns of 35,000%

YFI demonstrated that the promise of governance alone could bootstrap network adoption. The fair-launch model, and its use of initial token distribution to target the ideal future users, has since become prevalent.

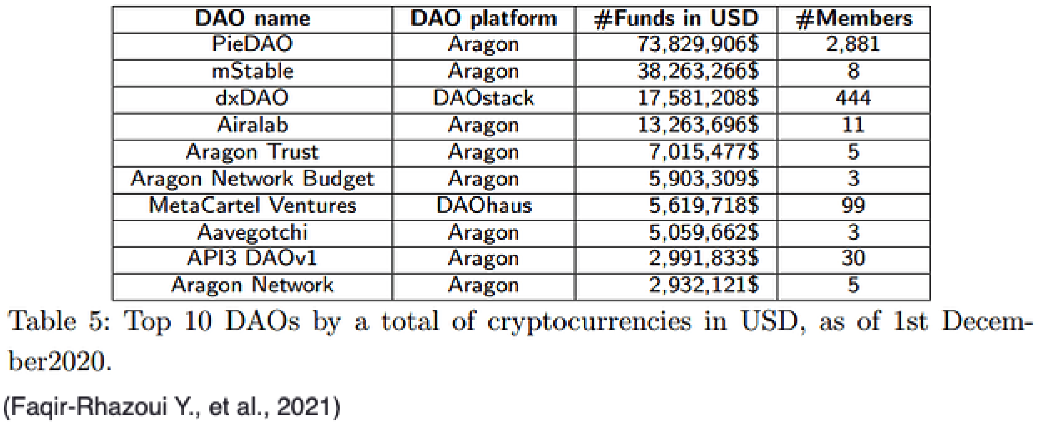
NFT DAOS

Some DAOs use their DAO governance token to manage their treasury, perform asset sales (including proceeds from fractionalization), and for asset curation.
DAO tokenholders have the right to vote on these issues and in many cases, the outcomes of these votes are directly executed on-chain algorithmically using DeFi protocols such as Fractional or Uniswap.

Gaming DAOs

Unlike in traditional gamer guilds play-to-earn mechanics found within games like Axie Infinity can encourage cooperative strategies and revenue sharing amongst participants. These mechanics make them more like DeFi DAOs — participation in the network earns rewards while also boosting the network's prospects — but to this point the governance of the networks are less tied to pure financial metrics and more tied to game performance and social metrics.

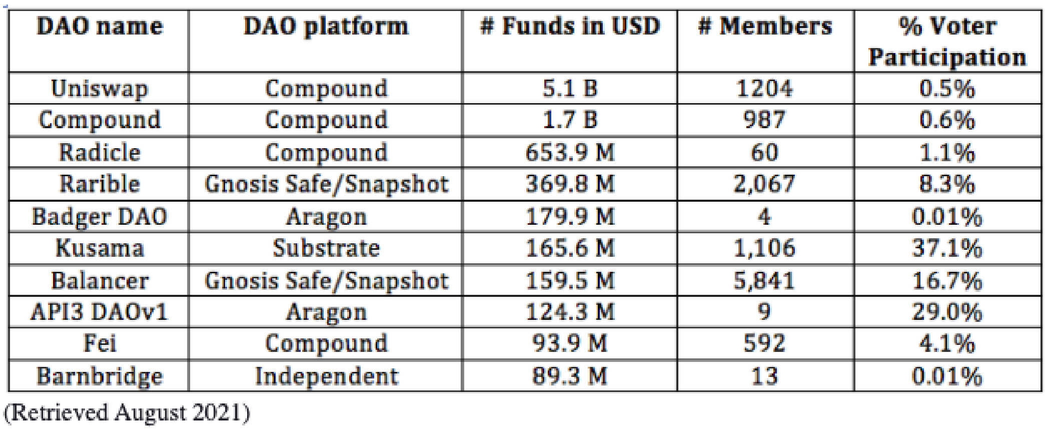
See also survey of DAOs



DAO name	DAO platform	#Funds in USD	#Members
PieDAO	Aragon	73,829,906$	2,881
mStable	Aragon	38,263,266$	8
dxDAO	DAOstack	17,581,208$	444
Airalab	Aragon	13,263,696$	11
Aragon Trust	Aragon	7,015,477$	5
Aragon Network Budget	Aragon	5,903,309$	3
MetaCartel Ventures	DAOhaus	5,619,718$	99
Aavegotchi	Aragon	5,059,662$	3
API3 DAOv1	Aragon	2,991,833$	30
Aragon Network	Aragon	2,932,121$	5

Table 5: Top 10 DAOs by a total of cryptocurrencies in USD, as of 1st December2020.

(Faqir-Rhazoui Y., et al., 2021)



DAO name	DAO platform	# Funds in USD	# Members	% Voter Participation
Uniswap	Compound	5.1 B	1204	0.5%
Compound	Compound	1.7 B	987	0.6%
Radicle	Compound	653.9 M	60	1.1%
Rarible	Gnosis Safe/Snapshot	369.8 M	2,067	8.3%
Badger DAO	Aragon	179.9 M	4	0.01%
Kusama	Substrate	165.6 M	1,106	37.1%
Balancer	Gnosis Safe/Snapshot	159.5 M	5,841	16.7%
API3 DAOv1	Aragon	124.3 M	9	29.0%
Fei	Compound	93.9 M	592	4.1%
Barnbridge	Independent	89.3 M	13	0.01%

(Retrieved August 2021)

Open Zeppelin Governance Contracts

Meta governance

See article.
It is commonly defined as holding one DAO's token in order to influence decisions in another DAO(s). The benefits of metagovernance are clear - DAO2DAO relationships are positive-sum incentive-alignment mechanisms that amplify the voices of individuals. According to the article there has been a change over time

1. Token holders believing they can participate in all governance decisions
2. Token holders realizing they can't participate in all governance decisions
3. Token holders delegating to individuals with perceived specialized expertise and bandwidth
4. Token holders and individual delegates realizing delegate models have been constructed ineffectively

While the trend of governance delegation to individuals had all the best of intentions, it is clear that it has fallen short of expectations. The combination of the time-commitment and depth required for participation, misaligned incentives and accountability mechanisms, and legal complexity has made it impossible for governance delegation to fulfill its promise.

Because of this underperformance, it is clear that the rising prevalence of metagovernance committees is the next logical experiment to drive meaningful progress within DAOs. Metagovernance committees are better positioned to create aligned incentives with stakeholders and have structures suited to provide scaled governance impact.