Etica: A type1 civilization neutral protocol for medical research

Kevin Wadoud Osséni
Paris, France
www.eticaprotocol.org

Abstract. A purely neutral protocol for rewarding medical research would allow greater efficiency and the sharing of early stage medical discoveries without intellectual property. Open source research can make medical research more efficient and faster but its benefits are lost if intellectual property is still required to incentivize research. I propose a solution to the intellectual property dilemma by creating a neutral protocol that encourages multiple parts to take part in a decentralised medical research process without any intellectual property. The protocol is based on a privacy voting system in which token holders can submit proposals. The proposals are scientific articles oriented towards a specific disease. The protocol institutes a nash equilibrium for each disease to incentivize the publication of researches that could lead to medical treatments. Proposers and voters are rewarded or penalised depending on the outcome of the proposals' votes. For each proposal the approval choice is considered as the right choice if it gathered more votes than the protocol's threshold. This threshold is readjusted by the protocol every 5 weeks depending on the ratio of approved and rejected proposals. If the voters tend to approve too many proposals then the protocol's threshold is raised, if on the contrary the voters tend to reject too many proposals then it is decreased. Users have to vote upon proposals based on their inherent properties, they can't see other users' votes thanks to a two step voting system with privacy. The protocol impels off-chain communications between token holders about proposals usefullness. Organisations based on a specific disease or group of diseases are likely to emerge in order to provid token holders with relevant information and analysis of proposals through forums and dedicated website explorers. Etica aims to become the neutral protocol on top of which the next generation decentralised communities will organise themselves and gain expertise to discover medical treatments without intellectual property.

1. Introduction

Medical research industry relies almost exclusively on the idea of intellectual property. While the system works well enough, it still suffers from inherent weaknesses of the intellectual property based model. These weaknesses are well known and encourage drug price abuse through patent abuse. Since the current model rewards intellectual property and not the actual research, overpriced drugs are common place and people are forced to pay for them as patent exclusive rights are the downside of intellectual property. It is currently deemed as impossible to maintain financial incentives for research if we don't guaranty the right to intellectual property for medical discoveries.

What we need is a neutral protocol that would reward medical researches throughout the process of research and maintain incentives to share discoveries early while giving up intellectual property. In

this paper, I propose a solution to the intellectual property dilemma using a blockchain protocol to transform medical research's intellectual property system.

2. Proposals

The protocol aims to promote oriented research. So we need to define a proposal as the combination of its content (represented by an IPFS hash) and the disease for which it is proposed to. As a consequence each proposal is identified by the hash resulting from its {IPFS hash, diseasehash} combination.

Diseases uniqueness is handled by hashing the english name of the disease. It removes the risk of having multiple diseases entities referencing to the same disease which would recreate the work reproduction issue of the current system.

3. Staking System

To implement a voting system, we will need to use a staking system similar to Travis Moore's brainpower system[1].

Voting or submiting proposals requires staking Eticas (ETI) in exchange for Bosoms in first place. Staking ETI means locking them up for 28 days and getting Bosoms with a 1 to 1 ratio. Bosoms are then used to vote on proposals, submit proposals or create new diseases. When a token holder uses Bosoms he or she takes the risk of being slashed. The slash means the related stake duration will be increased in proportion to the slashing ratio of the proposal. In fact each proposal will have a slashing ratio that takes into account the gap between the victorious side and the loosing side. The more the victorious side has Bosoms over the losing side the higher the slashing ratio will be.

4. Voting System

The protocol is based on periods of 7 days. Each proposal belongs to a period and each period has its *curationreward* and *editorreward* to reward contributors with ETI. For each period the protocol will issue new ETI based on a yearly inflation rate of 2.618033988749894848204586834365%[2]. Meaning that this collectively accepted yearly inflation of 2.618033988749894848204586834365% will finance the reward system.

After being submitted a proposal can be voted upon by the community for 21 days.

Privacy

In order to prevent the user from voting based on the other users choice, the protocol should implement a voting system with privacy. But a completely private voting system would make the protocol obscur and we should not give up the possibility to analyse the proposals results. A two steps privacy voting system guarantees both the privacy required for the voting period and the transparency required for the revealing period. When a proposal is created users have 21 days to commit their votes and then 7 days to reveal their votes. Commiting a vote means sharing a hash of the vote parameters prior to revealing it during the revealing period.

Rewards

After 28 days have passed since its creation the proposal becomes claimable and users have to call a function to either be rewarded with ETI or be slashed.

If a token holder voted for a proposal on the victorious side the token holder gets ETI as reward. The amount of the reward will be a percentage of the period's *curationreward* based on the weight of his vote amount. Proposers of accepted proposals get a percentage of the period's *editorreward* based on the weight of their *proposal's approval votes amount*. The *curationreward and editorreward will respectively represent 38.196601125% and 61.803398875% of each period reward.*
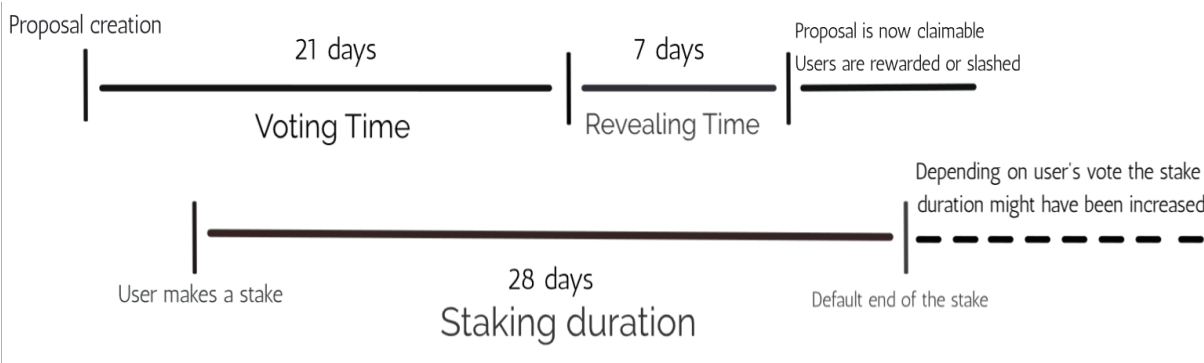
Slash

If a token holder votes for a proposal on the losing side the token holder gets slashed in proportion to the proposal's slashingratio[a]. Moreover If the proposal's slashingratio is superior to 90% the token holder also loses 33% ETI of his vote amount. The proposers lose 100% of their deposit if their proposal gets rejected with a slashingratio superior to 90%.

5. Protocol's threshold

A real challenge is to avoid the "manipulability" of the voting system. Meaning we want voters to express their real opinion about proposals and not their best interest opinion.

While the voting system should respect the majority criteria it is even more important that the system doesn't transform itself into a dictatorship of approvals where voters always vote yes for strategic reasons without taking time to analyze the proposals. On the other hand, score voting systems provid voters with more options to express their opinions but create manipulability issues [3].

Due to the manipulability of score voting systems we should prefer using a voting system that only offers 2 options: approve or disapprove. As it is, such a binary system is likely to evolve into a dictatorship of approvals as voters will tend to approve proposals by default since it would be the strategic choice because most proposals would be accepeted. It creates a viscious circle in which default voters are rewarded at the expanse of honest voters that only vote based on the intrinsic properties of proposals. The honest voters would be forced to start to default vote as well making the protocol completely irrelevant.

Consequently the protocol should implement a *ratio target* that represents the expected ratio between accepted and rejected proposals. For instance, a 70% *ratio target* would mean that the protocol demands 70% of proposals to be accepted and 30% to be rejected.

 i) Readjustment of protocol's *threshold* [b]:

If the actual ratio of accepted proposals over the last 5 periods is superior to the *protocol's ratio target* then the *protocol's threshold* variable is increased. On the other hand if the actual ratio of accepted proposals over the last 5 periods is inferior to the *protocol's ratio target* then the *protocol's threshold variable* is decreased.

Plus notice that in order to respect the majority criteria, despite being dynamic the *protocol's* threshold can't be inferior to 45%. It will always be between 45% and 99%. Meaning proposals will never be integrated into the system as accepted if they didn't get at least 45% of vote approvals. Under 50% *protocol's threshold* should almost never happen and could only happen if the system turns into a dictatorship of the disapproval votes.

6. Initial distribution

Etica relevancy highly depends on the way the initial supply is distributed. Indeed each ETI can be used to vote and we must avoid an initial distribution process that would give most of the supply to first token holders. For this reason drastic measures are required to prevent early token holders from distorting the voting system. In order to achieve this, two successive phases will rule Etica issuance, the Phase 2 will begin once we reach 21 Million Eticas until then we will be in Phase 1.

Phase 1)

The Phase 1 is expected to last about 10 years. The goal of the Phase 1 is to guarantee an equitable distribution of the first 21 Million Eticas while letting token holders start using the voting system. To that extinct Phase 1 will include mining.

Phase 1 is divided into 10 eras and each one should last about a year depending on the hashrate. Each era will issue 2 100 000 ETI and distribute them as mining rewards and protocol rewards among users. To avoid first miners from getting the whip hand over the voting system, the protocol reward will increase gradually.

Eras' percentage allocation of 2 100 000 ETI :

Era 1: 90% ETI to mining and 10% ETI to protocol reward

Era 2: 80% ETI to mining and 20% ETI to protocol reward

Era 3: 70% ETI to mining and 30% ETI to protocol reward

Era 4: 60% ETI to mining and 40% ETI to protocol reward

Era 5: 50% ETI to mining and 50% ETI to protocol reward

Era 6: 50% ETI to mining and 50% ETI to protocol reward

Era 7: 50% ETI to mining and 50% ETI to protocol reward

Era 8: 50% ETI to mining and 50% ETI to protocol reward

Era 9: 50% ETI to mining and 50% ETI to protocol reward

Era 10: 50% ETI to mining and 50% ETI to protocol reward

Eras' issuance in ETI amounts:

Era 1: 1 890 000 ETI to mining reward and 210 000 ETI as protocol reward

Era 2: 1 680 000 ETI as mining reward and 420 000 ETI as protocol reward

Era 3: 1 470 000 ETI as mining reward and 630 000 ETI as protocol reward

Era 4: 1 260 000 ETI as mining reward and 840 000 ETI as protocol reward

From Era 5 to Era 10: 1 050 000 ETI as mining reward and 1 050 000 ETI as protocol reward

This linear distribution of 2 100 000 ETI per year during 10 years should make Etica very decentralised and ready for the entrance in Phase 2. After Phase 1, 11 550 000 ETI will have been distributed through mining and 9 450 000 ETI will have been issued for the protocol reward system.

Phase2)

Phase 2 will start in about 10 years once we have reached 21 Million Eticas. The mining of Eticas will be stopped forever and the protocol will only issue new ETI to finance the protocol reward system at a yearly inflation rate of 2.6180339887498948482045868343656%.

Mining

0xBitcoin community deserves credit to be the first one to have implemented a mineable erc20 more than a year ago. The Mining part of the smart contract can be based on Infernal_toast's 0xBitcoin[4]. But some changes are required, we should use block.timestamp instead of block.number and make sure the *challengenumber* is specific to the Etica protocol in order to avoid merge mining.

7. From hashrate to Collective Intelligence

What makes the relevancy of the Bitcoin network is embodied by the hashrate which is the metric used to measure the level of security of the Bitcoin network. History has demonstrated that Bitcoin started with extreme fragility and became stronger and stronger as the Bitcoin hashrate went from 0 to significant levels.

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Image source : https://www.blockchain.com

What will make the relevancy of the etica protocol is its ability to use Collective Intelligence[5] to assess proposals. The more the average user gains expertise and knowledge the higher the standards will become for one proposal to be approved. The average amount of work required to make a proposal that gets approved can be one of the metrics used to measure etica relevancy.

8. Game theory

Malicious actors or group of actors could try to misappropriate the system to serve their own interests.

If a group of token holders succeed in getting a significant amount of ETI let's see what they could try to do in order to distort the system. Malevolent actions should not be advantageous nor undermine the integrity of the protocol.

Identified attacks :

Spaming the protocol with plenty of proposals :

Editor reward incentive: The users could try to spam the network with proposals in order to get more ETI through the *editorreward*. But the *editorreward* is proportionate to the proposal's approval votes amount and such spaming proposals are unlikely to gather many approval votes as they don't offer any value. On the contrary they are likely to be rejected and each proposal expose the spammer to a massive slash as well as a fee. In fact it is necessary to stake and deposit a fixed amount of ETI in order to make proposals. Moreover if the community doesn't pay attention to these proposals and

nobody votes for or against them, the proposals are rejected by default and the proposer would only have wasted gas and expose himself to potential slashs and fees.

Curation reward incentive: Users could try to spam the network with their own proposals in order to vote for them and get curation rewards. But voting on their spamming proposals won't enable them to gain more ETI than directly voting on other users real proposals. In fact the *curationreward* is not higher if they are voting on their own proposals.

Create a non-substantial proposal and massively vote for it:

Editor reward incentive: It is appealing to always try to submit proposals instead of only voting in order to also benefit from the *editorreward*. For this reason proposers are much more slashed than regular voters when their proposal is rejected. The protocol's proposers_increaser variable multiplies the duration of the slash if the user is the proposer. In addition if the slashing ratio of a rejected proposal is superior to 90% the proposer loses the entire amount of his deposit. A non-serious proposal is likely to be voted against by numerous voters and be rejected with a slashing ratio superior to 90%. As the protocol matures dedicated applictions can monitor the network and share information when a spamming proposal is found. Finally even if the community disregard it and doesn't reject such a proposal the weight of the proposal would almost only be made of the user's massive vote although making a serious proposal would allow this proposer to gain much more weight by adding other users' votes.

Curation reward incentive: The users could try to submit a proposal and massively vote for it to benefit from a significant *curationreward*. But there is no particular incentive to do such an attack for getting more curation reward. Indeed the curation reward will be the same regardless of the proposal and only depends on the amount put in the vote stake. It is better for a user to vote on actual proposals that other people are likely to also approve or disapprove without taking risk of being slashed by submitting its own proposal.

Wrong proposal attack:

Curation reward incentive: The user could try to intentionally create a wrong proposal and vote against it to be sure to vote on the victorious side and therefore gain ETI from *curationreward*. This would be an unstrategic decision as the user is sure to be slashed and he had better use its ETI to vote directly on victorious side of actual proposals without having to get slashed. Moreover the higher the *curationreward* he succceed in gaining the more severe the slash will be and could cost the entire ETI deposit if the proposal slashing ratio is supeior to 90%.

Editor reward incentive: No incentive as there is no editor reward for rejected proposals.

Exchanges influence:

Problem: Exchanges could gather high amount of ETI and use it to disrupt the system by staking and voting with huge amounts without paying attention to proposals' inner properties.

Solution: The use case of Etica is very specific and Eitca should benefit from it. In fact today people are willing to donate their hard earned money to finance research because they want to find cures. If their ETI are used to serve vested interests instead of rewarding actual research on diseases they

care about, token holders will certainly not let their ETI on exchanges. Nowadays NGOs health associations have no other option than to raise money and invest a part of it into a centralised research process. Instead of simply asking people for their money these organisations could propose expertise to vote upon proposals and showcase their knowledge by sharing educational information. They would proudly publish their votes and explain their choices. Such specialised entities could set the fundations for an open competition of transparent assistance in voting services and make people prefer entrust their ETI to such organisations rather than exchanges.

Dynamic threshold hijack:

When the protocol's threshold is very high, malicious voters could try to vote against the common sense by targeting very good proposals and have approval voters being slashed. But such a malicious voter won't make more ETI than if he voted for or against any other proposal as long as he voted on the victorious side. So the only motive of this strategy would be to arm legitimate approval voters by undertaking the risk of being slashed severly.

8. Going further :

Some Layer 2 smart contracts can be created to interact with the main contract and respond to specific needs. For instance a smart contract using multisig can be implemented to handle team work. Another smart contract could be implemented to let linkers have a possibility to identify a proposal from a disease and propose it for another disease where it could also be beneficial. This smart contract would organise a way to split the reward between the linker and the original proposer of proposal.

Breakthroughs :

Another challenge is weither or not this protocol can cope with breakthroughs as it is only financed by a fixed amount of ETI issued every week. Having a fixed supply means there is a link between time and reward issuance. It is like hard money devoted to research and there is no way to print more to reward breakthroughs. Should a breakthrough be discovered, it would gather a lot of attention and monopolize the reward system for a certain time. Meaning if the proposer's proposal is a significant breakthrough it could be split into several proposals and get most of the rewards during several weeks if a lot of voters exclusively vote for it. But the protocol encourages early sharing and if a proposer keeps its discovery too long, the protocol cannot reward him as he makes new discoveries. Moreover he takes the risk of someone else discovering and submitting before him.

Non-oriented research :

While the protocol was made to promote oriented research, publications of not diseases-oriented researches can be usefull and nothing prevents one from creating a general struct as a Disease.

9. Blockchain Implementation

Etica community should not tie its destiny with a specific blockchain. Unity of the community is one of the most important factors for success and simultaneous implementations accross multiple blockchains would only be a brake to its development. For now the Ethereum blockchain seems to be the best for its use case, but alternatives like Cardano should not be ignored. Should an outsider emerge and outcompete Ethereum, the Etica community could and should organize a transfer from Ethereum to this blockchain.

10. Calculations

Slashingratio formula [a]:

for accepted proposals :
Slahingratio = 100 – [(AgainstVotes * 100) / (totalVotes * ((100 – protocolThreshold) / 100))]
for rejected proposals :
Slahingratio = 100 – [(ForVotes * 100) / (totalVotes * (protocolThreshold / 100))]
<u>Legend</u>
protocolThreshold : Global variable that range from 45 to 99 (it sets the required percentage of approval votes for a proposal to be accepeted). *AgainstVotes* : Total weight of votes against proposal in Bosoms. *ForVotes* : Total weight of votes for proposal in Bosoms. *TotalVotes* : Total weight of proposal votes in Bosoms.

Dynamic *protocol's threshold* formula [b]:

Increase *protocol's threshold* (when the actual meanapproval of last 5 weeks is lower than the protocol_target):
new_approval_threshold = approval_threshold + (100 – approval_threshold) * [(meanapproval – protocol_target) / 10000];
This increases *protocol's threshold* by up to 27.5 % of (100 – approval_threshold).

Decrease *protocol's threshold* (when the actual meanapproval of last 5 weeks is higher than the protocol_target):
new_approval_threshold = approval_threshold - (approval_threshold - 45) * [(protocol_target - meanapproval) / 10000];
This decreases *protocol's threshold*_by up to 27.5 % of (approval_threshold - 45).

<u>Legend</u>
approval_threshold is the current *protocol's threshold,* meanapproval is the actual ratio of proposals approved over the last 5 weeks (it is expressed as integer, for instance 6500 for 65.00%), protocol_target is the expected approval ratio (7250 (72.5%)).

[1] : *Everipedia* staking system by Travis Moore

[2] : Since the protocol's reward system is financed with inflation we need to have a decent inflation, to that extinct I chose to use (golden number)² as yearly inflation rate. (golden number)² = $(1{,}618033988749894848204586834365)^2$ = 2.6180339887498948482045868343656%

[3] : Th*e strange "Majority Judgment"* by Jean-François Laslier,

https://hal.archives-ouvertes.fr/hal-01965227

[4] : *0xBitcoin*, https://github.com/0xbitcoin/white-paper

[5] : *Collective Intelligence*, https://en.wikipedia.org/wiki/Collective_intelligence