

UTU PROTOCOL

White Paper

V2

July 17, 2019

Executive Summary

See https://docs.google.com/document/d/1h-BOV_exEK1N7jreyDeZ2Z0i0LyaKhexCe8HnHxaKJg

Note on Methodology

This whitepaper version reflects our understanding of the economics and technology at the time of its publication. Even in the context of existing blockchains and decentralised applications, our proposed system/application exhibits several new functional, network and economic qualities. We thus cannot claim to have it all figured out up-front yet.

For this reason, we are committed to test our assumptions in the form of different levels of simulations, and ultimately MVPs, and adapt our concepts, models and economic parameters where necessary from what we learn over time. We're also committed to funding research projects with our established research partners -- such as the Agents, Interaction and Complexity Research Group at Electronics and Computer Science at the University of Southampton -- to improve the model, tokenomics, technology and other core properties such as the privacy of the proposed platform.

Given our ample experience in proceeding in such a (lean) way with our existing apps and services, we are very confident that this is the right approach for us to take.

Introduction

Who do you trust?

We could never have predicted how far that question would drive us. We've asked thousands of people all over the world who they trust, and it turns out, as people, we all tend to trust the same. 90+% of people answer this way:

I TRUST MYSELF.

I TRUST MY FAMILY.

I TRUST MY FRIENDS...WELL SOME OF THEM.

Yet our digital and sharing platforms ignore this reality of human nature when building their services. Instead they try to build trust around anonymous star ratings and reviews, yet none of the thousands of people we've ever asked about trust has ever mentioned anything about good star ratings on digital platforms as their driver of trust.

So we asked ourselves more questions?

- How can we as people acquire the services we need without sacrificing the security, comfort, and peace of mind that only comes from working with someone from within our personal networks of trust?
- Is it enough to know who someone is, or should we know who they are in relation to us?
- Why are social networks divorced from commerce when they carry so much weight on our sourcing for trusted services?
- Why are sharing platforms failing to penetrate more than ~15-20% of any given market?

And finally, can WE solve this by bringing the world a technology that does exactly this? And in so doing, can we bring a few billion more people into a sharing economy built on actual human trust?

Origin Story

UTU is the Swahili word for "Humanity."

Our story started as we tried to build and scale a mobility app in Kenya from 2015. We recognized that all existing mobility apps in the global marketplace ignored the key problem facing Kenyan consumers, namely trust.

Built in places like California and London, these platforms were built on the premise that drivers are commodities, to be replaced one by another, stripping them of their individuality and ignoring the human desire to work with people we trust. In fairness to these platforms, perhaps this is adequate in San Francisco and London. Then it hit us:

What about the several billion people that live in places nothing like San Francisco or London? What about Nairobi? What about the billions in cities that have more in common with Nairobi than London? What about the millions of marginalized people in almost every country for whom the world is not so open or safe. Can we build something for all of these communities?

At this moment we set about building a machine learning powered recommendations engine, modeled on the fundamentals of real interpersonal trust, to power the next generation of the sharing economy - a trust economy.

The results were transformational. Overwhelmingly people chose personally trusted service providers over others with higher star ratings, shorter wait times, and even lower prices, validating our core hypotheses

around the massive desire for better trust in our digital platforms. Our trust engine has proven its ability to drive all marketplace KPIs:

- 20% better conversion,
- 20% better satisfaction,
- Strong viral acquisition,
- Higher retention.

Our trust-powered approach to mobility struck a nerve across Africa and around the world as messages came flooding in from entrepreneurs and platform operators, all saying the same thing, “Your trust-powered approach to mobility: that’s exactly how it works in my country too. Can we license your technology?” We began offering our trust-powered mobility franchises to local entrepreneurs across the continent, democratizing the ability to launch a world-class mobility app in their city, leveraging our trust engine. In scaling our mobility platform across Africa, we’re building a robust ecosystem of interconnected service providers and consumers, transacting with each other on the basis of real human trust, and training our AI to constantly improve its ability to model trust and facilitate great transactions.

After many requests from platform operators in every other sharing economy sector and massive demand from consumers for the ability to source trusted services, UTU set about opening up our trust infrastructure as an API, available across multiple sectors and geographies. We recognized that our ecosystem of users, our deep expertise in distributed multi-agent system and R&D capacity, and unswerving commitment to building a trust economy put us in a unique position to use this ecosystem as a nucleus to launch a blockchain protocol, built around human trust. We’re combining Africa’s brightest talent with global researchers, investors, and partners to transform the sharing economy into a trust economy.

Vision - Transforming the sharing economy into a trust economy

In a trust economy, consumers and providers give way to a third key actor in each transaction, that of endorsers that give both buyer and seller confidence to execute a transaction together. Traditionally these middlemen have been either denigrated or compensated surreptitiously by the seller to drive him/her business. By openly and transparently valuing these endorsements for the security they deliver within a trust economy, we encourage the expansion of trusted endorsements to unlock the true scale and potential of sharing platforms globally whether traditional, centralized platforms or decentralized apps. By building the system around our interconnectedness we create optimal conditions for participants to behave honestly and strong disincentives and mitigation mechanism to fight the fraud, abuse, and manipulation that has plagued review platforms and star rating systems.

Guiding our platform are our two fundamental principles of trust:

Trust is a currency, a form of infrastructure - not a product. It must be delivered as such. Any consumer-facing platform or directory you’ve ever used to discern trust, or the quality/reliability of an

online service provider, whether Angie's list, Yelp, or any other, has productized trust forcing you to their platform to identify the service provider you want to hire which you may ultimately do through another platform or app. This multi-step user journey creates a trust gap that ultimately constrains adoption of services that expose you, your family, your home, health, assets, or business to risk. This is why UTU's core trust offerings are served up as infrastructure directly into platforms to inform their users' decisions in real-time when they're selecting from available service providers. This principle ultimately led us to also develop our blockchain protocol as basic infrastructure on top of which any platform can be built.

Trust is individual, relational, contextual, and evolving. It can't be prescribed, only described - Most companies have taken a data-centric approach to modeling trust, framing it in terms of quantifiable scores, ratings, and confidence intervals - far from the human experience of trust - driven by personal relationships and environmental conditions. Where other trust companies evaluate an individual's trustworthiness against a fixed, prescribed, monolithic standard, rather than evaluating every buyer and seller in relation to each other. Furthermore, they fail to adapt these models to reflect the complexity of the real world and the impact of external environmental factors on purchasing decisions in real-time. By evaluating trust first and foremost based on the presence/strength of our users/providers relationships, evaluating buyers and sellers in context of one another rather than in absolute terms, and adjusting for sector-relevant environmental factors, our trust engine models human trust better than any existing technology. This second principle further informs our decentralization effort as a sharing economy built around real-world trust needs no centralized trust broker to extract fees.

UTU Trust AI - and its use cases

In any online marketplace, [establishing trust](#) between parties who would like to engage in business with each other [is a prerequisite](#) for that business to actually happen. But the currently widely used trust and reputation mechanisms such as often anonymous star ratings and reviews are flawed and easily fakeable. Consider, for instance, the [fake restaurant that reached #1 on TripAdvisor London](#) and [widespread review fraud on Amazon](#).

This issue is even more prevalent in the developing world, such as in Kenya where our company UTU Technologies is based, and where we indeed came to realise the importance of this issue in the course of operating our first venture, a taxi app. For example, while most Uber users in New York City perceive Uber drivers as a commodity to go from a point A to a point B and therefore are willing to take any one of them because they trust Uber drivers in general, this is not generally true in African localities, where users traditionally even store the phone numbers of their known and trustworthy drivers.

Researching further into this area, we discovered that people often don't care very much about ratings of people they don't know. We asked thousands of people who they trust and who might influence their decision regarding choosing one service from another, and some 92% answered:

*I trust myself,
my family,
and (most of) my friends.*

So people generally trust people whom they know very well. That is why we founded UTU, to offer a different, social-relationship based approach to establishing trust, rather than scores, aggregated reviews and ratings in order to transform the sharing economy into a trust economy.

Concretely, UTU's AI-powered Trusted Recommendation Service will operate as follows:

- If a user provides us with their data, they will enjoy a recommendation system based on relationships with either passive or active feedback. Consider, for example, a platform connecting nannies with parents, where the user could see "Your friend Peter has booked this nanny 3 times in the last month". If this friend provided a feedback or endorsed this nanny with tokens, in this case the user will see an active recommendation "Your friend Peter endorsed this nanny with 10 tokens, she is particularly good with children's homework".
- If the user refuses to provide data to UTU, they will still get a recommendation system but based on similarities with passive feedback (thanks to publicly accessible data). For example, in the nanny app the user could see "This nanny has been booked 3 times in the last month by someone living in your area".

The latter approach enables UTU to provide useful recommendations to users even without knowing a lot of their data, and we believe that even if they are reluctant to provide more data at first, after a while they will see the value of having a relationship-based recommendation system and therefore accept to do so.

Moreover, UTU has the huge advantage of having its own channel to market – MARAMOJA, the aforementioned taxi app with tens of thousands of users across Africa – that is helping us tackling the data acquisition challenge. Indeed, having our own mobility app allows us to test and improve our AI infrastructure on MARAMOJA, and therefore come up with a high quality operational recommendation system to other platforms in various sectors. As for its users, we have a high potential to leverage existing data from the MARAMOJA app -- subject to users' consent, which we will seek -- which helps to mitigate this bootstrapping problem.

Trust is relational, but also contextual and it is constantly evolving. Its value is also positively correlated with risk: the riskier a transaction, the more valuable is trust in the transaction's other parties.

That is why we believe that UTU is particularly relevant in any transaction that is exposing the user's business, assets, home, family or health, and more generally that is exposing him to some sort of risk :

- Contextually Aware Identity and Data Sharing Services
- Local On-Demand Services
 - Mobility Services
 - Family Services
 - Home Services
 - Professional Services
 - Health & Beauty
- Remote Professional Services
 - Design
 - Development
 - Content
 - Marketing
 - Etc.
- News/Information Curation/Validation

- P2P E-Commerce
- Financial Services
 - P2P Lending
 - Risk analysis for limited data scenarios
 - Correlational Risk for B2C lending

UTU's potential market is therefore huge, and this list is not even exhaustive. We are constantly approached by entrepreneurs and companies with novel use cases that we would have never considered, such as a trust power dating app or reducing fake news.

But we are also fully aware of the fact that operating in various sectors comes along with different stakes and risks that requires UTU to constantly adapt.

That is why, to maximize our chances of success, we are prioritizing partnerships with platforms regarding several factors, such as:

- the level of emotional, physical and financial risk for the user in a transaction
- the frequency of use
- the geography scope
- the variance in quality
- the sensitivity of data and the ability to leverage existing data

Today, we discuss with many companies based all over the world for potential partnerships, and so far we are developing pilots with several startups and large companies:

- MARAMOJA (Africa) trusted personal mobility services.
- Jamborow (Nigeria/Tanzania) a pan-African platform that connects borrowers and lenders all over Africa.
- Telecom sector (partner to be announced) value-added services.
- Skuli (Kenya) a trusted transport service for school children.
- DropExpress (Jersey) a trusted logistics service.
- Graychain (Hong Kong) a crypto credit scoring platform.
- Netwookie (Kenya) that connects customers with various service providers such as motorbike drivers, plumbers, cooks...
- TradeXSocial (Bulgaria) a platform where you can mine cryptocurrency on any smart device and copy the most profitable crypto-traders multiplying your earnings without the prior need of relevant crypto knowledge.
- EasyCarros, (Brasil) a platform connecting car owners with mechanics, car washers, etc
- ConnectHealth (Kenya) it provides services to medical plans and their preferred healthcare providers based on an Electronic Data Interchange platform that enable them to perform eligibility and benefit verification before treatment and claims submission after treatment.
- Tip Me (global) direct tipping of factory workers.
- Dating (partner to be announced)
- Fake news (partner to be announced)
- Talent tech (partner to be announced)
- Afrimart (Africa) an ecommerce marketplace

For the MARAMOJA app, we have already shown that an early version of our recommendation service leads to 20% more conversion when a recommendation from a social relationship exists, 20% better satisfaction and higher retention. We believe that these metrics will increase as our AI system improves.

UTU Trusted Recommendation Service and Protocol

In previous sections, we outlined the need for trust in open economic systems, and our high-level vision of how to approach this challenge. In this section, we describe the basic properties of the system that we propose to implement to concretely tackle the trust issue.

On the highest level, this system is a composition of two main components:

1. our recommendation service, a classic (proprietary) web service, and
2. a decentralised and blockchain-based protocol to facilitate data provision.

In the following sections, we explain these two components, their basic functional requirements, and how they will work together.

Trusted Recommendation Service

As explained, “trust” in our understanding is mostly based on personal relationships where human actors are concerned (but can have additional transactional components) as well as on the type of interaction (e.g. requesting a certain kind of service) and its context.

UTU’s main goal therefore is to establish ourselves as a secure and decentralised platform to facilitate the analysis of personal relationships and other relevant data in order to provide a “trusted recommendation mechanism”, which can be used by mediators (e.g. a taxi app) or directly by individuals (e.g. taxi clients) to get trusted recommendations for peers to do business with (e.g. taxi drivers).

To provide good quality recommendations, this service needs to know who is related to whom but also who trusts whom to give recommendations for what kind of interaction/service and in what context. To learn this, it needs feedback data answering questions such as:

- Which options did the client consider?
- What situation was the client in?
- What did they finally choose?
- Were the service execution and delivery successful?
- Were they satisfied?
- What did they like/dislike in particular?

Therefore our trusted recommendation service (TR) can be formalised as a function

$$TR : C \times S \times 2^P \times 2^{Data_C} \times 2^{Data_P} \times 2^{Context} \mapsto O_{P,T}$$

with

- the set of clients C ,

- the set of services S ,
- the superset of service providers P ,
- the superset of data points $Data_C$ about clients, (such as profile data, social relationships, transaction histories, service provider endorsements and ratings etc.),
- the superset of data points $Data_P$ about providers (similar to data about clients),
- the superset of context data points $Context$ (situational data about the context of service requests),
- and mapping to a list of service providers O_{PT} ordered by their expected overall trustworthiness according to our service, but which includes detailed information about each provider's trust-relevant data points in relation to the input parameters, with the set of such data points denoted as T .

Assuming that we can in principle obtain enough data constituting the sets , and , we can run AI algorithms (such as deep learning, reinforcement learning, or other ML and clustering techniques) on it to improve the quality of our recommendation service.

For this purpose, we are working closely together with the first of the 3rd-party platforms to use our recommendation service to facilitate retrieving enough such feedback data from them to enable our recommendation engine to start learning the clients' recommendation preferences.

However, when we grow the number of other 3rd-party services using our service, we expect to not always be able to integrate with them this closely. Another way to obtain this data is from the clients directly. However, we expect clients to likely not always provide us with this data voluntarily and freely. Therefore, apart from the prospect of getting better future recommendations, we think it is necessary to create additional incentives for clients to provide feedback data directly. For this purpose, the next section introduces the Decentralised UTU Trust Protocol.

Decentralised UTU Trust Protocol

In order to incentivise clients to provide data which is usable for our trusted recommendation service, but potentially also to other services on the platform, we devise a non-transferable utility token to be built on a blockchain platform. We call this the UTU Trust Token or just UTU Trust Token or "token" in the following.

This token will be rewarded to clients who actively engage in the system in two ways:

1. Clients will be able to not only endorse service providers, but to put a stake of tokens on it. Successful endorsements, i.e. such ones which lead to a recommendation being shown to clients subsequently requesting the same service and who then in turn endorse the same provider themselves, shall be rewarded depending on the staked amounts.
2. Any other data provision shall be rewarded with tokens based on their usefulness to our recommendation service as well as other services:
 1. For data in known formats, for which automatic verification is possible, some amount of tokens shall be rewarded directly as a consequence of the provision.
 2. Otherwise, provided data is rewarded based on consumption by services and their giving feedback about the validity and usefulness of the data.

UTU Trust Tokens will be of value for clients in two ways:

1. Clients will be able to convert it to UTU Coin, a second token on our platform which is monetary in its nature, i.e. it is a fungible token which is freely tradable on cryptocurrency exchanges. “Conversion” here means that the converted UTU Trust Tokens are destroyed, and the corresponding UTU Coins are given out from a pool.

2. Some services, including UTU’s recommendation service, might require proof of existence or consumption of a certain amount of tokens in order to be consumed.

The motivation for the UTU Trust Token to be non-transferrable, and therefore not tradable on exchanges, is that we want to prevent people from “buying their way” into the system. Rather, we want them to take part properly, i.e. providing feedback data, endorse others etc.

The UTU Trust Token should also not incentivise people to idly hold tokens, as this yields no benefit to the ecosystem. It should therefore not be deflationary but slightly inflationary.

On the other hand, to mitigate people quickly “selling out of the system”, the conversion of UTU Trust Token to UTU Coin should be restricted over a given time span. We also want to control the overall amount of UTU Coins given out during any fixed period of time, in order to impose some limits over the development of the UTU Coin’s exchange rate to external currencies.

Given these limits, the question is how the exchange rate between UTU Trust Token and UTU Coin should be determined, and how many Tokens each client shall be allowed to convert at any one time. To address the first question, we propose to use an auction protocol similar to [the one used in the DutchX decentralised trading protocol](#). We discuss this in more detail in the “Token Economics” section.

Additionally to all of the above, a dual concern to trust is that of identity, posing challenges such as:

- How does a peer know the party they’re interacting with is really the same as the recommended one?
- How do we prevent Sybil attacks, i.e. individuals (or groups) creating many peers as pseudonyms and using them to game recommendations?

Another question is how can we enable people to securely store their data and make it useful for private or public services? Data may in principle be stored:

- On-chain, which is expensive and in which case it would require truly future-proof encryption which might be difficult to guarantee.
- Off-chain, in some external service. In this case, other questions arise, such as:
 - How can access be controlled securely via a smart contract?
 - How can continuing availability be ensured? Should we enforce some degree of redundancy?

However we don’t want anyone to own or just get unrestricted access to another individual’s data. In fact, we want users to be able to fully control who gets to access their data when, for what reason, in what context etc. They should be able to choose to do this fully or semi-automatically, controlled by smart contracts but also with the possibility to be notified or asked back. This could be implemented via oracles or interactive oracles (whereby we mean that an oracle requires some interactive confirmation from the user), respectively.

Another aspect of the data-provision is that users should be able to provide only minimal data required for each task. In some cases, it might be possible to employ technologies like zero-knowledge proofs or ring

signatures for certain services to function adequately. Our platform shall therefore enable the use of such technologies.

Lastly, all of the above constitutes some rather complicated economic system, whose rules might not be immediately understandable to the average user. We therefore need to develop front-end software with a user experience (UX) that enables novice users to easily start taking part in the system, making some pre-selections and decision on behalf of them which are beneficial. But at the same time such software should allow expert users to control the system as detailed as they like.

Summary

Taking all the above into consideration, we can summarise the requirements for our trusted and decentralised platform :

- Facilitate a service marketplace, where services might be requested by clients or other (composed) services.
- Implement the token-related constraints and incentives as outlined above.
- Generally give participants a means of providing their data to interested parties, with secure (encrypted) storage and full automatic or semi-automatic access control.
- Provide a means of verifying identity of participants and other structured data by other participants or parties, possibly with zero-knowledge proofs.
- Enforce the platforms guarantees, particularly with regard to data privacy and integrity, independently of any entities which might be interested in gaining control of such a platform, such as governments, big companies or other organisations, or coalitions thereof.
- Deliver all of this through a simple intuitive UI, digestible by the average person with no knowledge of decentralised applications, blockchain, or cryptocurrencies.

Note that UTU's recommendation service then is a special case of a service which might be consumed by other services (i.e. as part of a composed service) or directly by clients. It would reward the provision of feedback data (to facilitate ML and other AI algorithms to improve the trust/recommendation model), and payment of tokens for providing recommendations.

Having outlined our platform's general requirements, the next section looks into the economics of such a system in more detail, and determines the system's parameters which allow to implement the required incentives more concretely.

Token Economics

Overview

	UTU COIN	UTU Trust Token
Nature	Deflationary monetary coin with limited supply	Utility token slightly inflationary

Supply	1 billion	Infinite
Acquisition	Purchasable on exchanges Conversion from UTU Trust Token	Rewards for data provision, successful endorsements, interest on staked tokens, ecosystem service provision/consumption
Usage	Conversion into fiat Payment for ecosystem services (consumers) Payment for trust engine (platforms) Payment to access users' data (platform, third parties)	Endorsing (stake tokens) on trusted service providers Endorsing negatively on untrusted service providers Convert into UTU Coins
Conversion	Convertible to other crypto/fiat anywhere æ coins will be traded	Only convertible into UTU Coin with supply constraints

Stakeholder analysis

STAKEHOLDER	WHAT VALUE THEY MIGHT PROVIDE	WHAT THEY MIGHT GET
Buyers	Their data, seller endorsements, network effect, demand for currency	Access to trusted services, tokens for sharing data, clout-increasing recommendations, coin/token
Service providers	Their data, buyer endorsements, network effect, outlet for currency	Access to trusted consumers, increased brand value around trustworthiness
Platforms	Buyer/Seller Data at scale, 10% of each transaction, outlet for currency	Better KPIs, Better user trust, more brand goodwill
Connectors & Endorsers	Their data, buyer/seller	Tokens, social capital

	endorsements, network effect	
Investors	Cash, Connections to Other Platforms, Partners, Franchises	Return on Investment as coin appreciates
UTU & CO	System Development, Trust Analysis, Ecosystem growth	Transaction Fees
Partners	Beneficial components in our ecosystem, Channel partnerships	UTU Coin, Access to market

UTU Coin

UTU Coin will be accepted as a form of payment within the UTU ecosystem of applications, by third party platforms and DAPPS. It will be required to use our trusted recommendation service, and to pay users who demand it for accessing their data.

Therefore, the reward scheme for UTU Trust Tokens and their possible conversion to UTU Coin has some similarities to a traditional coin mining process for the users: instead of running a Proof of Work algorithm, users can monetise their active participation in the system.

We target the UTU Coin to be slightly deflationary, as to provide value for its holders. However, being freely tradable, its value will be determined by the market.

UTU's own services will accept fee payment in UTU Coin, and we will encourage other services on the platform to accept it. This might be implemented via discounts on the fees to use our recommendation service, or even as a requirement for the same.

One might obtain UTU Coin in these ways:

1. by actively taking part by providing data and endorse services and then converting some of the awarded UTU Trust Tokens to UTU Coin (see following sections),
2. selling access to one's data to UTU's recommendation as well as other interested parties, like 3rd-party services on the platform,
3. taking part in token generation/distribution events and
4. by trading on exchanges for other coins, tokens, or fiat money.

To make UTU Coin deflationary, the total available amount over all time has to be bounded, similar to Bitcoin.

Therefore, the conversion of UTU Trust Tokens to UTU Coin has to yield a diminishing amount of UTU Coin over time. This will be implemented in such a way that the converted UTU Trust Tokens are eliminated from the system, and some amount of UTU Coin is awarded to the converting client from a pool.

To establish a market price for the conversion, we will employ an auction protocol, similar to the one used in the [DutchX decentralised trading protocol](#). For this purpose, a predetermined amount of UTU shall be available for conversion in each fixed time period, depending on ecosystem parameters such as the total amount of UTU Coin currently available among all nodes and the current exchange rates of UTU Coin to

other currencies on exchanges. The available amount will be provided to the conversion/auction smart contract function via an oracle (which might also be queued by third parties). The auction runtime will likely be some integer fraction of a day to a few days, like 6, 24 or 48 hours, such that an adequate number of bids can be expected, but no unfair (dis-)advantages e.g. because of timezone differences arise.

Therefore, the reward scheme for UTU Trust Tokens and their possible conversion to UTU Coin has some similarities to a traditional coin mining process for the users: instead of running a Proof of Work algorithm, users can monetise their active participation in the system.

UTU Trust Token

Remember that the UTU Trust Token's (UTT) purpose is to model participation in the platform with endorsements, and shall not be freely tradable. Therefore UTU Trust Token cannot be implemented as an ERC20 token, but rather will have a custom smart contract implementation.

Particularly, it will have no ERC20-like transfer functions (transfer, approve, transferFrom).

As explained elsewhere, the total amount of UTU Trust Token will be unbounded over all time. This is because the token is awarded (and generated at the same time) for staked successful service endorsements, as explained in the next section, and therefore models clients' active participation in the system, which hopefully only grows over time and indefinitely.

However, as is detailed in the following sections, the amount of tokens awarded depends on some system-defined rates, which will be used to control the increase (or decrease) of existing tokens in the system in a way that leads to favourable overall system behaviour. We will run simulations to determine suitable initial rates and their update functions based on objective system criteria such the current total amount of tokens, the number of available services and clients etc.

Endorsement rewards are for now the only events when UTU Trust Token are generated, but more might be added later, should more rewardable action be made available in the platform.

UTU Trust Token might also be destroyed, e.g. in the case of system services charging fees, though these fees still need to be determined.

Endorsements

Providing trusted recommendations for services or peers is one of the main purposes of the platform. Therefore, users should be incentivised to share their true belief in which services they recommend for specific purposes.

The platform will enable this by providing an endorsement smart contract that users can invoke to make a staked endorsement of services. When other users are then recommended (via UTU's personal relationship-based trusted recommendation service) those services later on and on their part use and endorse them, the previously-endorsing clients whose recommendation was shown will be rewarded.

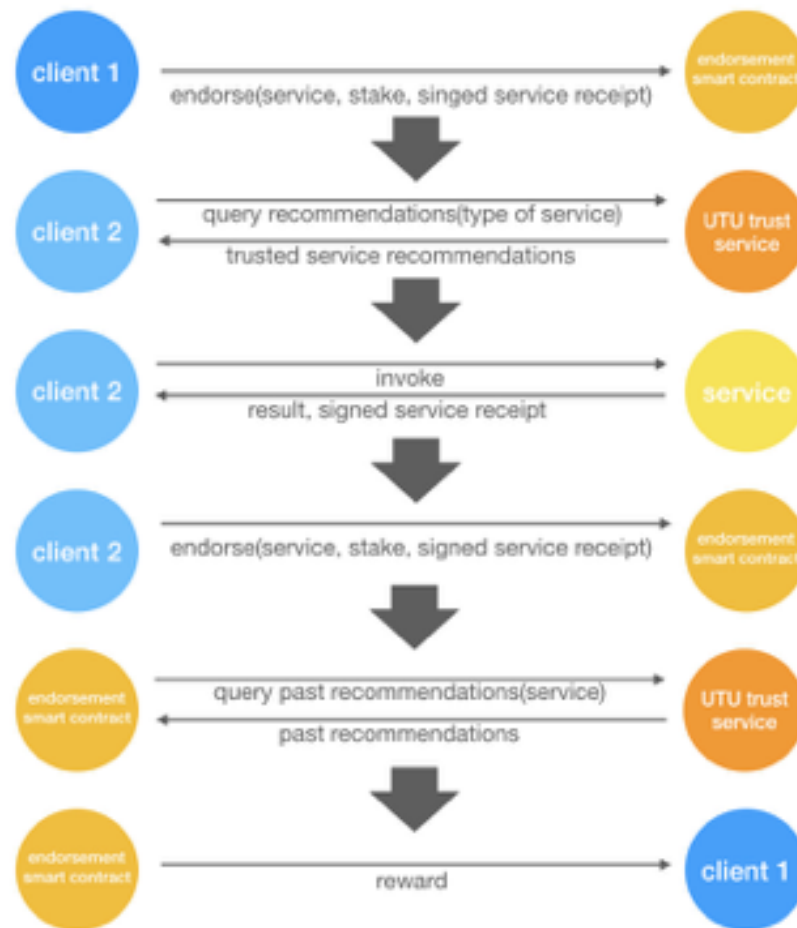
A user can make repeated endorsements for the same service, where each newly staked amount is added to the existing stake. However we might introduce a minimum time period between each such endorsement, likely dependent on the overall service consumption rate.

They can also withdraw any amount of stake at any time as long as the resulting staked amount is ≥ 0 . An endorsement with 0 staked amount may also be removed completely.

Note that when we speak of “services” in this context, we mean both on-chain services realised and smart contracts, or hybrid services which have on-chain components (smart contracts, wallets) and off-chain components (such as REST or SOAP interfaces). In the latter case, the off-chain interfaces of the services can also be utilised from smart contracts via Oracles and vice-versa. In all cases, services have on-chain addresses which can be used to pay fees in the form UTU Trust Token to.

In order for the smart contract to link service endorsements to previous endorsements and recommendations, and also to avoid ‘blind’ endorsements, clients have to provide “service receipts” to make endorsements. These receipts are returned by platform-conformant services as part of their response, and must be signed with the private key of the service’s operator. A corresponding public key must have been previously registered with the endorsement smart contract.

An application of this endorsement protocol with two clients is approximately depicted in the following figure, without giving all details (e.g. service fee payment):



Rewards

When a client c is offered providers for a requested service, UTU’s recommendation service might show $k_{sp} \geq 0$ recommendations for each service provider sp . If the client then chooses sp , the originators – via their

endorsements — of the shown recommendations for sp shall split the total reward according to their respective stakes.

We denote the set of endorsers whose endorsements lead to their recommendations being shown to a client c as $E_{c,sp}$.

But to incentivise successful endorsements — i.e. those that lead to many follow-up endorsements — even more, we also reward the originators of possible recommendations that led the clients in $E_{c,sp}$ to endorse sp in the first place. I.e. for each e in $E_{c,sp}$, there is a set $E_{e,sp}$ of previous endorsers for e . The split between e 's and $E_{e,sp}$'s share of the reward shall be 90% : 10%, and the previous endorsers in $E_{e,sp}$'s shall split $E_{e,sp}$'s share according to their respective stakes.

The total amount of the reward for clients whose endorsements leading to a recommendation being shown to another client who then also endorses the service is computed as a function of

- the new endorser's newly staked amount $s_n > 0$,
- a discounting rate D_n on s_n , which is a system-wide defined constant,
- the previous endorsers' total stake s_p , where all previous endorsers are different from each other and the new one,
- a discounting rate D_p on s_p , which is a system-wide defined constant,
- the total staked amount s_{total} on the service over all clients, including s_n and s_p , and
- a maximum bound on the reward R_{max} , which is a system-wide defined function of the considered service's fee (in UTU Coin).

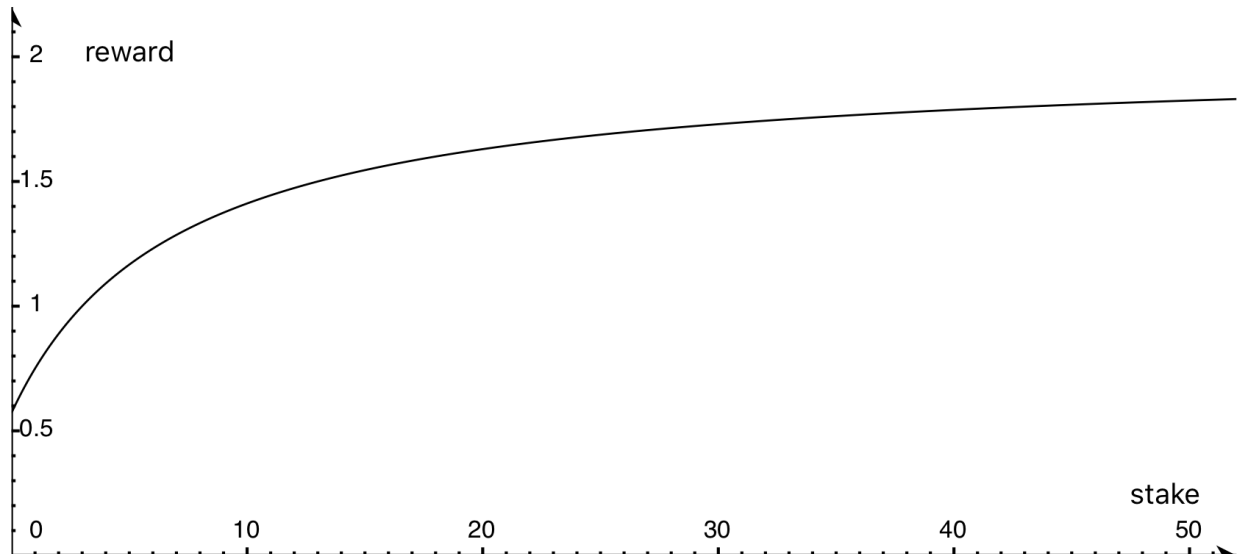
Formally,

$$reward := R_{max} \cdot \frac{D_n s_n + D_p s_p}{s_{total}}$$

Therein, D_n , D_p and R_{max} will probably be made available to the smart contract via oracles. We shall determine appropriate amounts or formulas by further analysis and running simulations of the platform, applying the [token engineering](#) approach.

The tokens for this reward will be added to the previous endorsers' addresses, according to their share as defined above, in the form of newly generated tokens.

Here is an example plot of the total reward as a function of the new endorser's stake (i.e. s_n in the above notation) with fixed $R_{max} = 2$, $D_n = 1$, $D_p = 1$, $s_p = 2$, and the amount of all other previous endorsements = 5, which means $s_{total} = 5 + 2 + \text{new stake}$:



Let's assume that the requesting client chooses the service after being shown recommendations by 2 clients A and B and then endorses staking 3 tokens. Let's further assume that A and B also had endorsed the service with 0.5 token each, and that B in turn had used the service after seeing recommendations by previous endorsers C and D, who also had endorsed with 0.5 token each.

Then the total reward is

$$reward := 2 \cdot \frac{1 \cdot 3 + 1 \cdot 2}{5 + 2 + 3} = 1$$

According to the splitting scheme described above, this means that A and B each get allocated 0.5 tokens each. However while A can then keep that amount, B has to split it with previous endorsers C and D, who would then split the amount of $10\% \cdot 0.5$ among themselves, in this case getting 0.025 tokens each.

Note that over time, a successful service will accumulate more and more endorsements by different clients, which means that s_{total} will grow over time, and therefore the rewards for existing endorsements will diminish on average. This means that we reward initial discovery higher than loyalty and commerce, which makes sense because the stated main purpose of our system is discovery of trusted service providers. This can be countered to some extent by clients by increasing their stake at times.

However, the division by the total amount of tokens, including the newly staked ones, leads to diminishing returns for higher token amounts. This serves two purposes:

1. We want to incentivise clients to endorse new, now well known services, rather than profiting only from "safe bets" on already well-known and endorsed services.
2. While users with large amounts of tokens ("token whales") should of course benefit from their wealth, the playing field should not be too unlevelled for new users.

But using this mechanism with diminishing returns is not safe against Sybil attacks, where an attacker might e.g. create multiple virtual clients to split their endorsements between them, rather than making one larger endorsement. However, since an endorser is only rewarded if their recommendation of the service was shown to another client and which then lead to the service's consumption (including paying the fee for it), only one of the attacker's virtual clients would be rewarded at any one following service

endorsement. Additionally, the non-genuine virtual clients would not be known by other clients, except the attacker invests some serious effort into making them look legitimate, including creating social connections etc. Therefore, this strategy is very unlikely to be profitable for the attacker. Even so, we're going to investigate this more formally in future versions of this paper.

Finally, note that the bounding by $R_{\max}$ is necessary to prevent making endorsement rewards more worthwhile than it costs to consume a service with some margin. Otherwise it would be profitable to collude with another client to endorse "useless" services, profiting purely on the rewarded endorsements.

However, note that the staked token amounts are not modified when receiving rewards, therefore future endorsements of the same service might be rewarded again accordingly. We do not bound the total reward that a client might thus receive over time, meaning that highly influential endorsers will keep being compensated for their efforts.

Penalties

But clients may not only profit for endorsements, but might also be punished by them, if other clients deem the service not recommendable. I.e. similar to endorsing a service, clients may disapprove services.

This is to enable them to let their acquaintances know of particular problems with a service (provider), and therefore will require them to provide a narrative.

Therefore, UTU's recommendation service will take disapprovals — particularly those of socially related people — into account when showing recommendations, which therefore might also be negative, i.e. warnings.

Instead of a stake, the "disapprove" function of the endorsement smart contract just takes a fee, which has a minimum amount but can otherwise be chosen by the disapproving client.

This is to allow only "one-off" disapprovals, rather than staked disapprovals over time. Disapprovals therefore do not generate any profit for the disapproving client, and in fact are costly because of the fee, which cannot be refunded. This disincentivises the use of disapprovals to "sabotage" services maliciously.

If only the minimum fee is paid, this has no effect on the previously endorsing clients, but the disapproval is persisted in the system and might be used for determining service recommendations.

However, if more than the minimum fee is paid, then the client previously endorsing the service and whose recommendation was shown will be penalised. This is implemented through a penalty which is subtracted from the previously endorsing client's stake as long as the remaining stake stays ≥ 0 . Note that a smaller stake might reduce the chance of a recommendation being shown to subsequent requesters.

The total amount of the penalty for an endorsing clients whose endorsements led to recommendations being shown to another client who then disapproves the service is computed as a function of

- the minimum disapproval fee $D_{\min}$, which is a system-wide defined constant,
- the paid disapproval fee $d_n \geq D_{\min}$,
- the previous endorsers' total stake s_p , where the previous endorsers are all different from each other and the new one,
- a discounting rate $P_p \leq 1$ on s_p , which is system-wide defined constant, and
- the total staked amount s_{total} on the service over all clients, including s_p .

Formally,

$$penalty := P_p s_p \cdot \frac{d_n - D_{min}}{d_n + s_{total}}$$

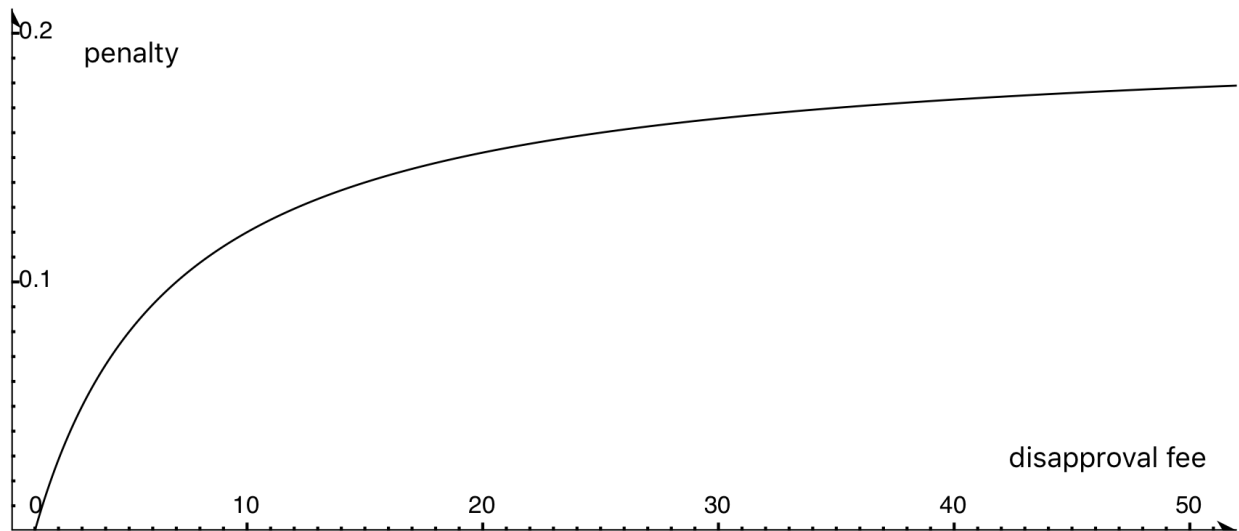
Note that this limits the max. applied penalty for an endorser to $P_p \cdot s_p$.

Similarly to the system-wide defined values in the reward section, the exact values for P_p and D_{min} shall be determined by simulation. However, we expect to set P_p at about 50% of R_{max} . Ensuring that penalties to be smaller than R_{max} ensures that disapproving services will not have an overrated effect compared to endorsements, thereby also further reducing the effectiveness of sabotaging.

The total penalty is split among endorsers in the sets $E_{c,sp}$ and $E_{e,sp}$ the same way as a reward would have been split (see previous section).

Therefore, if a service is repeatedly disapproved and/or with high amounts, existing endorsements will diminish.

Here is an example plot of the penalty as a function of the disapproval fee (i.e. p_n in the above notation) with fixed $P_p = 0.1$, $s_p = 2$, $D_{min} = 1$, and the amount of all previous endorsements = 5, which means $s_{total} = 5 + \text{disapproval fee}$:



Therefore, the maximum amount that previously endorsing client can lose of their 2 token endorsement is 0.2, and the disapproving client has to pay a substantial fee to make the penalty come close this value. I.e. clients would only do this if they feel very strongly about their disapproval, which is what we want to prevent penalising clients for making endorsements for anything less than that.

Data Provision

As described earlier, UTU's trust recommendation service uses data on personal relationship, user profile, and other context data to serve meaningful recommendations. And we expect that also other services in the system will benefit from clients providing such data. On the other hand, we want to clients to fully own their own data, i.e. give them full access control.

For this purpose we will provide smart contracts for clients to specify

- where and how a particular set of data can be accessed (we specify a set of supported protocols in the Technology section),
- who can access it at what price, and
- possibly additional constraints.

Interested consumers of this data, may they be UTU, other platform or service providers, or other entities might then query the smart contract to check whether they're allowed to access a particular set of data, and if so, request the facilitation to and pay for access.

The smart contract would then reward the client according to the service's feedback. Why would a service provider want to make the mentioned callback and provide feedback on the data?

- If it found the data useful, having the client rewarded will hopefully increase client satisfaction and retention. Furthermore, the rewards are supplied by the system, and therefore making this call doesn't cost the service provider anything (except possibly Æternity's smart contract execution fees in the future).
- If did not find the data useful, it can either provide this feedback or not call back at all, leading to the client not be rewarded. Therefore, the client will find it unprofitable to provide useless data.

This mechanism ensures that clients are incentivised to provide useful data for services because make a profit from this. Service providers who need this data to improve the quality and therefore profitability of their services will find this mechanism useful as long as their increased utility (however they measure it) exceeds any fees they need to pay for being a part of the platform.

Additionally to this per-use reward scheme, we will consider rewarding provision of certain standardised data sets directly, such as uploads of data exports from social media platforms — which are now almost universally available to users thanks to GDPR and similar regulations. But without additional validation mechanisms, this would enable users to be rewarded for uploading useless or fake data. We will therefore explore using such mechanisms, possibly something similar to [Ocean Protocol's data curation](#).

We further envision allowing clients to give data access right according to their trusted relationships. For example, a client might want to give a service access to its data if their good friend also gave them access. We shall investigate whether a client trusted by their friends in this way shall be additionally rewarded, and how. This would likely further incentivise reasonable data-sharing behaviour by clients.

Monetary Policy

We believe that UTU coins and tokens designed as described above will provide the best token economics system for UTU technology for the following reasons:

Incentive Compatibility

We have not formally analysed our mechanism to see whether it is incentive compatible, but we have reasons to believe that it is or can be made so with reasonable effort:

- UTU coins (UTU) allow us to monetize UTU Trust Tokens (UTT) as they are convertible into fiat and at the same time avoid conflating money and trust directly and mitigating one's ability to "buy" trust (since coin are not convertible into tokens).

- Endorsements and disapprovals are rewarded/priced in such a way to disincentivise gaming of the system.
- In particular, disapprovals always result in a loss of tokens, and the maximum reward for a positive endorsement is always inferior in value to the transaction fee, which prevent Sybil attacks.

Stability

The supply of UTU coins is capped at 1 billion.

40% of UTU coins will be available through a planned Token Generating Event (details to be announced soon). These tokens vest 40% at TGE, 30% after 3 months, and the final 30% after 6 months.

30% are held by the team and partners, that will be locked-in at first. Vesting for team token starts 2 months after the TGE, then monthly over 24 months. Team tokens will be unlocked

Another 30% are reserved for the future growth of the ecosystem by constituting a Coin pool for the conversion of Tokens into Coins.

The number of coins that can be exchanged from tokens on a daily basis will be constraint regarding this formula:

$$E_{max} = X \cdot \frac{O_{eco}}{T_t \cdot N_u}$$

with X a system wide defined constant, O_{eco} the pool of coin, T_t the total amount of UTU Trust Token (UTT) in the UTU ecosystem, and N_u the number of registered user in UTU.

Since T_t and N_u will increase as the ecosystem grows, and O_{eco} naturally diminishes as more and more tokens are exchanges against coins, E_{max} is therefore naturally diminishing and will limit more and more the exchange from tokens. (that will result as a token inflation and coin deflation).

There are incentives to hold and use UTU coin (UTU). Users will have the possibility to pay service providers with it, and third parties that wants to access user's data will have to pay for this and the user in UTU coin, and in the long run all platforms will have to pay transaction fees in coin. The fees will also be used to replenish the UTU pool that is available for UTT -> UTU conversion.

On a high (macro-economic) level (without considering concrete reference values or units), the value of an asset is defined as the ratio of total demand and supply:

$$C_v = \frac{D_t}{O_t}$$

where

- C_v is the UTU coin value,
- D_t is the total demand, and
- O_t is the total offer amount.

The demand D_t can be further broken down to

$$D_t = D_c + D_u + D_p + D_d + D_o$$

where

- D_c is the total demand from crypto-currency traders,
- D_p is the platform demand, such as for the conversion from UTU Trust Token,
- D_u is the demand for UTU's recommendation service; with U_f being the average fee for the consumption of UTU's service and U_n the number of consumptions, $D_u = U_f \cdot U_n$
- D_d is demand from service providers (UTU or 3rd parties) to access users' data; with A_f being the average fee for data access and A_n the number of accesses, $D_d = A_f \cdot A_n$.
- D_o is all other demand, e.g. UTU or other service providers on the platform paying for client promotions, or paying for consumption of each other's services.

On the offer side, we have

$$O_t = O_c + O_{team} + O_{eco}$$

where

- O_c is the amount initially available (through TGE, other rounds, airdrops etc.) on crypto exchanges, (up to) 40% of the total amount: $O_c = 0.4 \cdot O_t$
- O_{team} : 30% of the total amount allowed for UTU team and advisors ($O_{team}=0$ at first because they're not tradable until vested)
- O_{eco} : 30% reserved for the future growth of the ecosystem by constituting a coin pool for the conversion of Tokens into Coins. A predefined amount O_{eco_f} of this will be available for conversion for each fixed time frame.

Therefore, initially in each conversion time frame,

$$C_v = \frac{D_c + D_u + D_p + D_d + D_o}{0.4 \cdot O_t + O_{eco_f}}$$

Since D_u , D_p , D_d , and D_o will generally increase as the ecosystem grows, the only variable that could harm the coin deflationary nature is a great drop of D_c that outweighs the growth of all the other partial demands.

Efficient Conversion

Although there shall be an infinite supply of UTU Trust Tokens, which will be inflationary as the number of users and endorsements grow, UTU coin will remain slightly deflationary and always available at the optimum rate because the exchange of tokens to coins will be done through a multi-winner dutch auction, similar to the one used in the [DutchX decentralised trading protocol](#), of a fixed supply of UTU coin on a daily basis.

This auction mechanism has several advantages, please refer to the linked documentation. In particular, it is incentive compatible, and ensures that we can determine a true market rate for the Token/Coin conversion. However, we need to set some parameters, whose initial values we will again we will determine through simulation:

- The repeating period for conversion; currently we assume to run the auction once per day (however if a previous auction runs longer than 24 hours, that would shift the next auction to the next day).
- A possible minimum price (in tokens).
- The number of coins to be available for conversion in each auction.

This results in a conversion rate that is not determined through a fixed and obtuse formula but every day by the market. We believe this will provide the optimal conversion rate and prevent disconnections between the speculative and the real value of UTU Coin.

Technology

Building for Æternity

Given the above consideration, we chose to implement the UTU protocol on top of the Æternity blockchain. All of the requirements outlined above are explicitly targeted by Æternity.

Particularly, we believe that their approach to scalability via state channels fits very well with our envisioned ecosystem of relationship-based recommendations. That is, we expect to have many repeated transactions among the same groups of clients and services, and therefore will be able to leverage state channels efficiently.

Further, Æternity takes the approach of developing an ML-like language with restricted mutable state, which also supports oracles as “first class citizens”. See the specification.

User Interfaces

1. UTU API /SDK Clients. We are building an API and SDKs to let sharing economy platforms serve their users with our trust recommendations, directly in their apps. This is the primary revenue stream for UTU Technologies.
2. Browser and mobile keyboard plugins. These will be the main User Interfaces for consumers using our ecosystem from web or mobile. The user will manage their privacy and their UTU Coins and Tokens from here. These apps will regularly feed data into the user’s encrypted data store on-chain and earn the user UTU Trust Tokens as they transact on traditional platforms. These consumer-facing products will both help us acquire user data to improve our trust modeling capabilities but also demonstrated demand for our services to the major sharing platforms, which in turn drives the value of our ecosystem. Since our trust infrastructure is highly dependant on our ability to securely acquire and store user data, it is essential for us to avoid any business model that would compromise this priority.
3. Voice. Looking forward to a future dominated by voice interaction, we have partnered with Volareo, an open, crypto-friendly, voice interactive speaker fluent in multiple global languages to deliver seamless discovery and access to UTU Protocol-supported platforms and services.

Architecture

The UTU platform will consist of the following layers:

- Blockchain platform
- Smart contracts:
 - UTU Coin
 - UTU Trust Token
 - Data Access
 - Token/Coin Conversion
- UTU trust recommendation service
- Third party services and smart contracts
- Clients

The underlying blockchain platform will be built on an appropriate consensus mechanism. While we were initially favouring proof of work, the recent occurrences of numerous 51% attacks and high centralisation in the mining hardware market made us reconsider this decision.

<ARCHITECTURE DIAGRAM>

Smart Contracts

In this section we describe how we're planning to implement the UTU Coin as well as the UTU Trust Token, such that it fulfils its purposes as outlined in other parts of this paper. To summarise what we want UTU Trust Token to do:

1. Be rewarded for successful staked endorsements of services or peers.
2. Be paid for disapprovals of services or peers.
3. Be convertible to UTU Coin using a dutch auction mechanism.
4. Be rewarded for successful data provision to service platforms/providers/others.

In the following sections, we outline how each of these features shall be implemented in the blockchain platform.

The UTU Coin Contract

The UTU Coin will be implemented as a smart contract according to the ERC20 standard. While Æternity supports ERC20-like tokens via smart contracts, native tokens will be supported in the future. This will facilitate fewer/lower transaction fees, as smart contract gas doesn't have to be paid. We will therefore use the native æternity token mechanism once available and if applicable.

Since UTU Coin might be obtained (in a limited way) by taking part in the Token/Coin conversion mechanism (see section “Efficient Conversion” above), the UTU Coin contract will offer a function for the auction contract (see below) to transfer Coins from the coin pool to the auction winners. This function can only be invoked by the auction contract.

The UTU Trust Token Contract

The UTU Trust Token smart contract will provide functions and state management to facilitate the following:

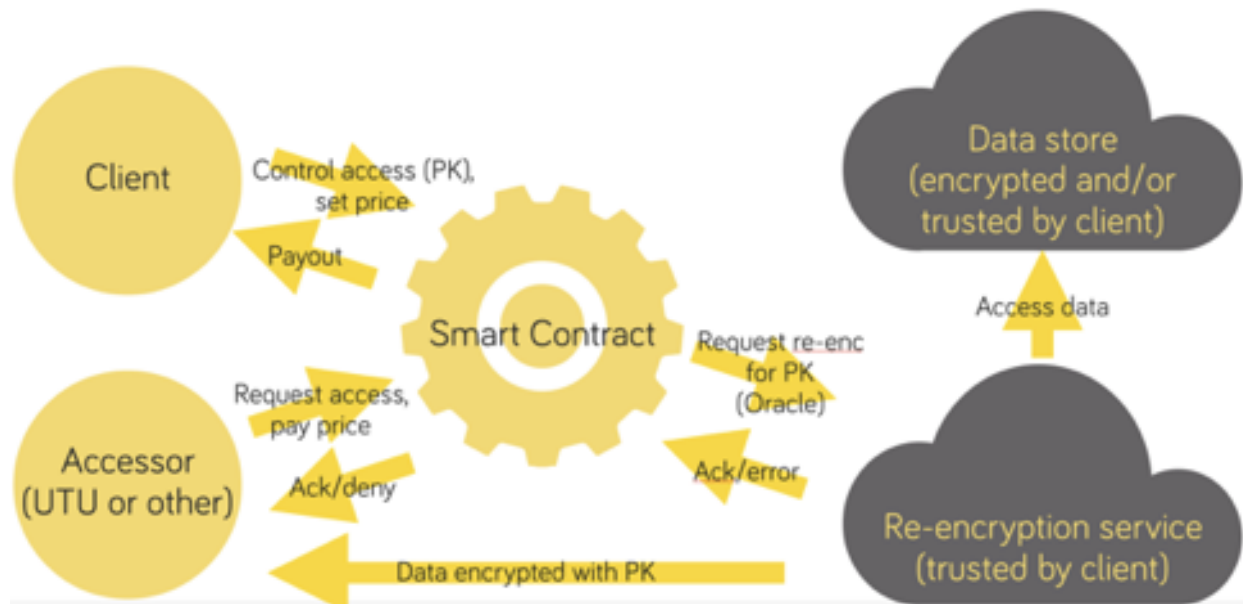
1. Manage the token account balances of all participating peers.
2. Add or remove token stakes to/from endorsements. When an endorsement’s stake is increased (including staking an initial amount on a new endorsement), the contract will initiate a query to the UTU Oracle (see below) to determine previous relevant endorsers, and reward them according to the mechanism described in section “Rewards” above.
3. Make disapprovals. The contract will initiate a query to the UTU Oracle (see below) to determine previous relevant endorsers, and penalise them according to the mechanism described in section “Penalties” above.
4. Give feedback about data usage, and if positive, reward the providing peer according to the mechanism described in section “Data Provision” above.
5. Destroy tokens. Since UTU Trust Tokens might be converted to Coin (in a limited way) by taking part in the Token/Coin conversion mechanism (see section “Efficient Conversion” above), the UTU Trust Token contract will offer a function for the auction contract (see below) to destroy bid Tokens of auction winners. This function can only be invoked by the auction contract (and possibly other UTU-protocol-level contracts in the future, should the need arise).

The Data Provision Contract

The UTU Trust Token smart contract will provide functions and state management to facilitate the following:

1. Allow clients to set access control and price for possible future consumers of each data set. The client would also provide information on how the data may be accessed (if allowed), by providing a reference to a re-encryption service they trust, but for which an Oracle must be available and whose own access protocol would need to be supported by the future consumers. For this purpose, we will provide support for the [DEDIS Calypso](#) and/or similar systems.
2. Allow interested consumers of this data to query whether they’re allowed to access a particular set of data, and if so, request the facilitation to and pay for access. They would then be provided the necessary access information, which they would need to invoke on their own to actually obtain the data. If access was granted, the smart contract would further invoke the data usage feedback method on the UTU Trust Token Contract, as well as transfer paid Coins to the providing client.

This general mechanism is depicted in the following diagram (invocation of data usage feedback method on the UTU Trust Token Contract is excluded):



We further envision allowing clients to give specialised data access right according to their trusted relationships. For example, a client might want to give a service access to its data if their good friend also gave them access. However, for this case we need to devise a way for those services how to get the necessary credentials to access the respective URL. One way to make this work is to have the client provide a proxy, which is fully controlled by the client and can access their data provision URLs with the client's own keys, and which the service might access instead of accessing the data directly. We will work out more details of this approach in a future version of this paper.

The Token/Coin Conversion Contract

As mentioned before, we will use an auction protocol similar to the one used in the [DutchX decentralised trading protocol](#) (we might use Gnosis' open source [contract implementation](#) as guidance for the implementation).

The UTU Ecosystem

Token Sale & Use of Funds - TO BE ANNOUNCED SOON!

Governance

As a protocol built around trust, we believe that trust starts with us. To this end, we commit to radically transparent governance both in terms of product development and use of funds. In a crypto ecosystem fraught with scams, we believe this to be a fundamental first step to restoring and building trust for the next generation of economic transactions.

It is essential to note that governance is very much a human problem that most likely cannot be "solved" purely by technical means. UTU will build its governance model on top of the tools provided by æternity blockchain to enable participants to govern themselves effectively. We will implement this system via delegated voting, weighted by the amount of tokens (UTT) and coins (UTU) the account holds. The exact

required amount of each will be determined by simulation. The goal is to let trust ecosystem participants -- measured by UTT -- weigh in higher here, but also to give some voting power to UTU holders. There are a few motivations for this:

- We don't want to penalize converting UTT to UTU too much.
- We want to also empower/reward UTU buyers (through TGE or trades) somewhat.
- It will create additional incentive to hold UTU.

Contributions and source of funds

To provide radical governance at token issuance and in terms of use of funds, UTU is engaging Mithqal, a Singapore-based blockchain specialist boutique as an independent 3rd party administrator. Mithqal will facilitate:

- compliant verifications of founding UTU backers;
- escrow initial token allocation under fixed mandate (revert-to-burn);
- collect, pool and exchange contributions to UTU Trust Tokens via batched transfer mechanism to contributors as mandated conversion rate;
- escrow and administer a part or the whole pool of UTU Trust Tokens beyond the initial allocation;
- and - at the discretion of UTU - administer and track use of funds collected from backers' contributions and release them upon the approval of the board of directors / advisors according to project milestone completion.

Mithqal will issue an independent report at the completion of each liquidity event of tokens or funds, which will be publicly available on the UTU website / platform.

This radical transparency approach will ensure the contributions are used for the purpose discussed in this white paper and places additional trust in the UTU ecosystem.

Development Plans

UTU Protocol core software

- Support the designed token dynamics, including token storage and smart contracts business logic.
- Support for free, non-fungible, fungible, and programmable pricing schemes
- Individual identity / KYC, individual reputation, data identity, data reputation
- Support for intellectual property claims & licensing, Integrate metadata storage, w/ privacy considerations (e.g. zero knowledge proofs)
- Integrate storage (on-premise, cloud, decentralized), w/ privacy considerations
- Integrate compute (on-premise, cloud, decentralized) , w/ privacy considerations
- Short time scale governance / consensus (e.g. is a transaction valid)
- Long time scale governance (e.g. how to update protocol)
- Well-defined http API and drivers (JS, Py, etc)
- Other system and deployment tools as needed

Management & analytics of UTU Protocol network

- Dashboard for management & analytics of individual nod
- Dashboard for analytics on overall network
- Dashboard for voting in long time scale governance

Marketplace template software (to be open-sourced for others)

- GUIs for making goods and services available in UTU Protocol
- GUIs for managing data, settings, token and coin balances
- GUIs for discovering and accessing goods and services
- Voice User Interfaces for discovering and accessing services
- Data compliance frameworks (e.g. GDPR)
- Data quality frameworks
- Well-defined http API and drivers (JS, Py, etc)

Software & support to support the ecosystem and catalyze the community

- Hooks into other platforms, protocols, and networks

Enable and grow the two-sided marketplace

RoadMap

Q3 2019

- 1st implementation of smart contracts for simulation and testing
- Prototype and implement feedback mechanisms
- 1st implementations of web apps for testing
- Initialise research projects on trust and tokenomics with R&D Partners

Q4 2019

- Prototype and implement auction/conversion mechanisms
- Release Trust for Mobility Smart contract MVP versions
- Complete implementation of MVPs of applications
- Gather feedback from early testers
- First research projects with R&D Partners started
- Evaluation and adaptation of tokenomic parameters based on simulations and tests

Q1 2020

- Release all app and smart contract MVPs on testnet, call for public testing participation
- First results from research projects with R&D Partners
- Evaluation and adaptation of tokenomic parameters based on research and more tests
- Integrations with more 3rd party services in more sectors
- Continuous improvements of smart contracts and applications based on learnings

Q2 2020

- Completion of first production versions of all apps and smart contracts
- More results from research projects with R&D Partners
- Initialising follow-up research projects with R&D Partners
- Evaluation and adaptation of tokenomic parameters based on research and more tests
- Integrations with more 3rd party services in more sectors

Q3 2020

- Completion of first round of research projects with R&D Partners, preparing publications
- Evaluation and adaptation of tokenomic parameters based on research and more tests
- Finishing touches and release of all major components for production
- Integrations with more 3rd party services in more sectors
- Continuous improvements of smart contracts and applications based on learnings

- Starting follow-up research projects with R&D Partners

Team

Leadership



JASON EISEN - Founder & CEO of UTU. He founded UTU on a belief in the power of trust and social relationships to ease friction in the modern sharing economy. Before founding UTU, Jason led strategy, design, and development of large-scale projects across multiple sectors throughout East Africa and Latin America since 2007. In this time, he helped secure more than \$3B in funding and funding opportunities for his employers and clients. Jason began his career in strategy consulting and government relations, crafting and delivering advocacy campaigns for a range of US and international clients. Jason holds a Bachelor's Degree in International Relations, Spanish/Latin American Studies, and Applied Physics from The American University in Washington, DC.



DR. BASTIAN BLANKENBURG - Dr. Bastian Blankenburg serves as a Founder & CTO, bringing academic experience in trust and industry experience in transportation technology. He holds a Ph.D. in computer science from Saarland University, Saarbrücken, Germany. His thesis: "Coalition Formation among Rational Agents in Uncertain and Untrustworthy Environments" contributed to the field of distributed AI utilizing multi-agent systems. In Industry, he has served as both a Senior Software and Project Engineer for IVU Traffic Technologies, leading software architecture, development, product management, consulting, and training for public transport operators throughout Europe and the Middle East. He previously spent several years at the German Research Center for Artificial Intelligence, exploring negotiations in multi-agent systems.



DR. ALEX MWAI - Alex serves as UTU's Head of Data Science - he is a passionate data scientist with more than ten years' experience applying techniques in machine learning and Artificial Intelligence (AI) to data of varying complexity so as to extract insights and tell compelling stories. Before founding the consulting firm Tenth Dimension, Alex previously spent more than eight years studying petabytes of particle- collision data produced at leading nuclear science facilities, with the aim of understanding the transitions of matter into energy. More recently, he was the head of data science and analytics at a leading human resource company in East Africa where he led a team in building and deploying AI- backed tools for talent matching. As the head of data science at UTU, Alex is focused in helping build cutting edge trust infrastructure for the service industry. Alex holds a PhD in High Energy Nuclear Physics from Stony Brook University in New York and has published multiple papers in prominent journals.



RONALD MAHONDO - Ronald serves as UTU's Director of Mobility, bringing more than 10 years experience in the private sector with several years in senior leadership roles across Africa where he has grown businesses to top-notch industry leadership positions. He has held senior leadership positions in Oil and Gas and Technology industries where he had annual budget responsibilities of up to USD10M CAPEX, USD100M OPEX.



AXEL STELK - Axel serves as UTU's CFO bringing 9+ years of experience in financial management, gained amongst others at PwC and Morgan Stanley in London, where he worked on debt, equity and M&A transactions. After this, Axel co-founded a Fintech startup in Nairobi where he served for 3 years as CFO. In 2018, Axel began working as fractional CFO with a number of high-growth technology companies, as well as a freelance consultant for venture capital funds. Axel graduated summa cum laude from Warwick Business School, and subsequently completed his CPA, as well as CFA Level 2 exams..



BRIAN MUHIA - Brian serves as UTU's Lead Machine Learning Engineer - Brian has a background in consulting, systems programming and search technology at leading health informatics company Savannah Informatics. He brings his expertise as a Linux guru and software engineer with strong mathematical and machine learning skills, in the fields of natural language processing and image recognition. At UTU, he works on designing personalized service recommendation engines based on social link, as well as system architecture and API design. Brian previously developed and maintained a crypto currency exchange for BitFinance. Brian is an

Afrimakers Fellow and Mentor. He holds
Bsc in Mathematics and Computer Science
from Jomo Kenyatta University of
Agriculture and Technology

Research & Development Affiliates

PROF. SARVAPALI (GOPAL) RAMCHURN - Professor in the Agents, Interaction, and Complexity Group (AIC), in the department of Electronics and Computer Science, at the University of Southampton. Prof. Ramchurn also serves the director of the newly created Centre for Machine Intelligence and recently won the AXA Research Award for his work on Responsible AI. His research centers around the development of autonomous agents and multi-agent systems and their application to Cyber Physical Systems (CPS) such as smart energy systems, the Internet of Things (IoT), and disaster response. My research combines a number of techniques from Machine Learning, AI, Game Theory, and HCI.

DR. JIE ZHANG - Lecturer at the Electronics and Computer Science department at the University of Southampton. He previously served as a research associate at the University of Oxford and was a postdoc at Aarhus University. He received his Ph.D. from the City University of Hong Kong and visited the EconCS group at Harvard University. His expertise spans algorithmic game theory, including fixed point theory and its application in equilibrium computation and fair division; Mechanism design, including matching, scheduling, facility location; Internet economics, including prediction markets, resource allocation, Fisher markets; FinTech, including blockchain and its application, Sharing Economy, & IOT.

Advisors

TAK LO - Tak Lo is the Founder of Zeroth.AI, Hong Kong-based investor and accelerator of Artificial Intelligence/Machine Learning startups. Tak was previously Director at Techstars. He had spent over 6 years across the European and NYC startup communities, having angel invested, founded, and mentored over 50 early stage startups. He was also a Venture Partner at Mind Fund. He is a regular speaker at General Assembly, Pioneers, TwilioCon, and others. Tak holds an MBA from London Business School and an Economics degree from the University of Chicago.

SHERMAN LEE - Sherman is the founder of Raven Protocol where he works on bringing the power of AI development to the masses via decentralization. As a Partner at Zeroth.AI, he focuses on building AI and blockchain companies. He previously founded Rocco.AI and GoodAudience.com. He has worked in the machine learning space since 2008 and helped scale Yahoo's content platform to 600M users. His writing has appeared on Forbes, Huffington Post, and Business Insider.

RODOLFO ROSINI - Rodolfo has taken multiple startups from inception to market, recruited top management teams, raised VC funding for multiple companies and had a successful exit. He brings expertise in building new technology products, blue ocean strategy, product/market fit, market positioning and product portfolio development. He has deep domain knowledge in artificial intelligence, infosecurity, and encryption.

SPENCER YANG - Spencer Yang is the founding partner of #Chain (hashtagchain.com). In 2017, he led the Asian market for UnikoinGold in a successful cryptocurrency token sale project that raised over 120K ETH. He spent the next 6 months building an early stage cryptocurrency wallet startup in Beijing with the founder of f2pool, the world's largest cryptocurrency mining pool. He has invested in multiple cryptocurrency projects and advises companies such as CryptoKitties and CoinMarketCap on growth in Asia. He previously co-founded KeyReply, an AI chat automation company (acquired) that was part of the AngelPad (#1 accelerator ranked by MIT) and Blue Startups accelerator programs, greatly benefitting from the mentorship and advice that these accelerators provided.

NIKOLA STOJANOW - Nikola is the CEO of aeternity Ventures and the the Chief Business Development Officer of aeternity. He has extensive experience working in business development roles in Germany, Eastern Europe, MENA, Asia, and the Pacific. He has developed and consulted on numerous international projects for almost a decade. A passionate believer in the unlimited possibilities of blockchain technologies, Nikola joined aeternity nearly two years ago when the company was in its early development stage. Today he also serves as a Business Development Advisor for Adex, the decentralized ad serving network, and as a Strategic Advisor for Lockchain, the blockchain-based hotel booking and vacation rental marketplace.

MATT PAKIPOS - Matt is a serial entrepreneur, investor, and former Director of Engineering at Facebook and Google as well as Director of Architecture at NVIDIA. Matt founded and served as CTO of PeakStream (acquired by Google, '07). He is the author of more than 60 U.S. patents on processor architecture, compilers, system software, and mobile applications.

RUSSELL NEWTON - Rus is Co-Founder and Head of Research at Global Advisors, a blockchain-focussed venture firm, which through its subsidiary CoinShares also offers investment products centred on digital assets. He has expertise in professional asset management in crypto-currencies and decades of investment experience.

AKSHAY SHAH - Akshay Shah is a Director at Sumaria Group, a private dynamic business group focused on starting, scaling and selling businesses in different sectors in East Africa. Akshay's education background is in Business & IT from USA, and thereafter he has spent over 25 years in East Africa bringing a focus on strategy, technology, innovation and geographic diversification to the various businesses in the group. Akshay is a founding member of EO Kenya, an EXCO member of YPO Nairobi, a Board member of Endeavor Kenya, and an advisor on the Boards of Rafiki Ventures & Utu Technologies.

ARTEM SHUSTER - Artem leads co-marketing and partnerships for a diverse region of Russia, Israel, Middle East and Africa at PayPal, a Fortune 500 company. Being obsessed with consumer understanding and cracking pain-points, Artem has more than 10 years of experience in different fields of marketing – research, trade marketing, brand management across different brands, industries and geographies. Artem holds a Master's degree from Moscow State University with honors.

Partners

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