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IQ Protocol: DeFi Framework for Subscription Based Services and risk-free collateral-less utility loans

Abstract

Subscriptions have become one of the popular ways to establish economic relations. Instead of purchasing individual items on a regular basis, people tend to pay in advance to have the right to consume some particular bandwidth from a service provider.

We propose a novel way to avoid some known pitfalls of the token issuance for service-based companies where consumption is measurable over time and volume.

Our targeted services are expected to work under a subscription model, and the volume of the services being delivered to the end-user depends on some initial (possibly renewable) agreement with the service provider. Examples of such services can be: File storage provider, IPFS Pinning Service, Internet Services Provider, Blockchain Monitoring Service, and many others: even traditionally off-chain services like Daily Delivery of Fresh Fruits.

We propose a generic way for implementing subscriptions on-chain, in a flexible and cheap way, while preserving all important workflows like cancel/refund policies, different time-frames, consumption rate limiting, overuse quota, discounts, etc. For that we introduce the notion of PowerTokens, which are interpreted not as means of payment, but rather as deterministic over-time "energy" generators. Here energy plays the role of being an accounting unit for service consumption (like gas units forEthereum).

According to our proposal, service providers serve their customers not on basis of how many PowerTokens they have, but rather on the basis of how much energy they have accumulated while holding their PowerTokens. Consumed energy is tracked purely off-chain with a proposed new type of state channels: DvP --- Delivery vs. Payment Channels. In this paper we show that DvP channels can be provably constructed and updated only on the basis of publicly observable state of the blockchain and don't involve any transactions on a blockchain. Thus they are more effective than traditional State Channels.

We also show how DvP channels allow consuming centralised services in a pure decentralised and anonymous way. Here users can receive services without registration and send any blockchain assets to the company, while both parties can deterministically infer the user's eligibility (including dynamic limits) for receiving services.

Our proposed token model makes it possible to organise a completely decentralised protocol for collateral-less borrowing of PowerTokens, which at the same time is risk-free for the loan side of the protocol.

1. Introduction

Tokenomics for off-chain services

Creating sustainable tokenomics for an off-chain service is a known challenge. By the term *"off-chain service"* we mean a service that has a well-defined utility, yet this utility is not directly verifiable on chain, because it often deals with off-chain data, which is impractical to oracalize (i.e., because of the private nature of the delivery of the result). The fever of 2017 ICOs showed many examples where even if the service is well defined, and the service is anticipated by users, it is extremely hard to create balanced tokenomics for it.

Chicken and egg problem

ICO/IEO/ILO [...] are traditionally used to attract funds in advance of a service offering. Then, the attracted funds are used to implement some vision that will make issued tokens meaningful (i.e., the offering will attach a utility to the token). However, according to most regulations [...], tokens sold from day-zero should be equipped with some well-defined utility up front, otherwise they could be treated as unregistered securities [...]. Therefore,token issuers are often locked into a chicken-egg problem: to attach a utility for sold tokens one needs to implement some basic functionality, and to cover the costs of the development of such functionality, one needs to sell tokens. Various approaches [...] have been proposed to allow for the gradual "bootstrapping"
of such services. However in most cases, the first and only utility of issued tokens are the ability to pay for services, often with a discount if other means of payment are implemented as well. This approach is often referred to as "AppCoins" [...]. Unfortunately the utility of AppCoins is unstable for the reasons we outline below.

Pitfalls of Tokens as AppCoins

Upon issuance, AppCoins are often distributed between several groups of holders with different expectations and strategies:

- *Utility users*: users, who are interested in the service itself. These users could be potential service consumers as well as service providers in cases where the service plays a marketplace facilitator role. Utility users are interested in ***stability*** of the token value, at least in terms of the service volume being attached to one token, because it allows one to predict spending/earning and plan a budget. *Utility users tend to perceive tokens as private company money and a* ***unit of accounting;***
- *Investors*: users, who are supporting service ideas, can help with co-marketing by spreading their inspiration among other potential investors and utility users. Investors are rationally interested in **growth** of the token value. *Investors tend to perceive tokens as company stock/shares.*
- *Traders/Speculators*: users, who are mostly indifferent to the service idea itself. Traders are primarily interested in tokens as a ***tradeable asset***. Traders are mostly interested in token ***volatility***. Traders can play a positive role in tokenomics by

connecting different exchanges into a single token circulation ecosystem via arbitrage. However sometimes aggressive traders participate in various price manipulations schemes like Pump & Dumps, that destabilize token value and can harm the two previously mentioned categories of holders.

The discrepancy between the interests of token holders often prevents tokens from reaching an equilibrium in the price finding process. This leads to high volatility of the token price. Thus tokens often fail to be a reasonable unit of accounting. In these circumstances, one of the worst steps that could be made by a company is to accept its coins for services using a floating rate between an AppCoin and some fiat currency. By doing this,the company would remove the anchors that direct why the token should have any particular price. In the long term it leads to the free fall of the token price [...].

We propose a possible solution to give each type of user what he/she wants: protect utility users from volatility, at the same time ensure earning for investors and give some volatility to traders via IQ Protocol.

Target Services

IQ Protocol tries to establish sustainable tokenomics for services where consumption is measurable over the time. These services are typically expected to work under a subscription model, and the volume of the services being delivered to the end-user depends on some initial (possibly renewable) agreement with the service provider.

Examples of such services can be:

- File storage provider
- IPFS Pinning Service
- Internet Services Provider
- Blockchain Monitoring Service

There are many other services that would benefit from the IQ Protocol, even traditionally off-chain services like a daily delivery of fresh fruits.

Main Idea of IQ Protocol

For every subscription based service we propose two steps in building sustainable tokenomics:

1) Assign a **Life-Time-Value** meaning to your tokens. From that moment forward, you are not asking users to pay for your services with your tokens. Instead, you are asking users to hold your tokens while they feel they need your service. Roughly speaking, the more tokens a user holds the bigger volume of the service he/she may consume. Volumes that correspond to a given amount of tokens being held are subject to change, which should be clearly stated in your terms and conditions. We recommend a natural ratio: the total supply of your tokens should be at least partially covered by your capacity as a service provider. Partial coverage is acceptable because a subset

of the tokens will always be locked in exchanges and used for trading rather for receiving utility.

2) Create a **Renting Pool** that works as follows: anyone that has Life-Time-Value tokens may securitize their tokens by providing the tokens as liquidity for the Renting pool and receive shares of the pool in form of *interest-bearing tokens*.

After doing so, anybody who wants to consume your services will have two options: either buy your original tokens that have life-time value, or rent your tokens from the renting pool. The main trick here is that the original tokens are not released from the renting pool. Instead, the original token pool mints an expirable version of the tokens. An expiration date is requested by the borrower, which affects the upfront interest payment. Expirable versions of tokens are implemented using multi-token standards FT/NFT like the ERC1155 [...] standard, where the tokenID corresponds to the expiration time. By any and all other means, the Expirable tokens are fungible. Until the Expirable tokens are expired they are treated as a permission to consume a particular volume of your services, and are recognized by service providers.

The fact that tokens automatically expire will remove the chance that borrowers cheat the system. Therefore there is no need to ask for collateral when borrowing in this system, and thus we will not ask for any collateral from borrowers. All the interest paid to the protocol is being distributed across the lenders.

Note however that interest from particular loans is not to be paid immediately to lenders. Interest is to be streamed into the pool using a modified money streaming algorithm [...] known as exponential streaming. This type of money streaming allows us to solve two problems:

- If the borrower realizes that he/she doesn't need a loan anymore for any reason (including not being satisfied with the service) he/she is able to prematurely burn the loan and get a refund. From that moment on, the tokens are returned to the pool, and the tokens become borrowable again.

- Exponential streaming corresponds to a compound interest calculation strategy that prescribes to move the majority of the interest into earlier dates, rather than uniformly distributing the interest over the applicable period. This prevents borrowers from cheating with floating interest rates, because if we were to use a linear interest streaming, the interest rate could change to provide for a better condition for the borrower and nothing would prevent him/her from burning the current loan and re-borrowing at a better interest rate. Otherwise he/she simply keeps the loan untouched. This introduces an asymmetry favoring the borrower, giving him/her more favorable conditions in comparison with lenders. Exponential streaming reduces average game-theoretic preferences back to zero (i.e., creating an honest game).

2. Assumptions

Target Ecosystem.

IQ Protocol is being described in terms and standards that are traditional to the Ethereum ecosystem. Namely we refer to ERC20, ERC1155, and other Ethereum standards for the tokens. These standards are almost automatically adopted by EVM-compatible blockchains like BSC, MoonBeam, Ethermint and others.Nevertheless, the definition of the protocol semantics is formulated in blockchain-agnostic way, which gives it the ability to implement corresponding logic in various L1 protocols.

Moreover, all algorithms used in this paper *do not assume* Turing Completeness of the underlying execution engine. While in some numerical algorithms we use formally unbound yet quickly converging loops, one can easily unwind them manually into $O(1)$-time bounded sequences of operations.
This fact allows IQ Protocol to be implemented in more restricted environments like Solana BPF.

Involved Parties

We assume the presence of two groups of roles:

Utility Roles:

- *Service Providers*: Selling their services under a subscription model that has a predictable cash flow that will allow them to cover expenses and earn some amount of margin.
- *Service Consumers*: Buying services from service providers under predictable prices.

Interest Roles:

- Enterprises: Attracting initial capital to establish a service providing business and earning money on top of it. Enterprises may own, maintain or orchestrate several different services.
- Investors/Liquidity Providers: Bringing their capital to an enterprise in a trust-less way to be able to participate in the enterprise's tokenomics and earn interest from it.

We will show how Service consumers could be interpreted as *"collateral-less borrowers"*, and how Liquidity Providers could be interpreted as *"risk-free lenders"*.

PART 2