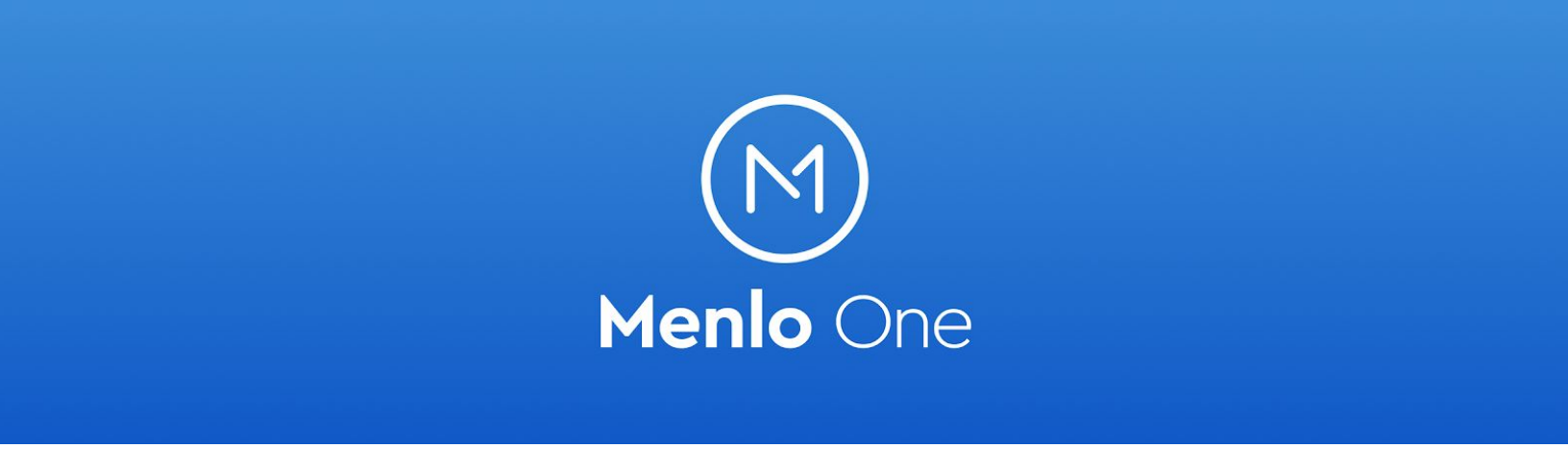


satoshi@menlo.one | www.menlo.one

Menlo One TownHall

The Framework for Decentralized, Incentivised Communication Systems

Matthew Nolan
satoshi@menlo.one www.menlo.one
White Paper version: 4.0.0
July 2, 2018

1. Abstract

We begin by presenting a decentralized protocol for incentivized online communication and exploring use cases and the need for such a system. We then describe a protocol through which parties are able to engage in token incentivised communication. We then outline technical considerations and the research into implementing such a system. Finally, we present a solution for such a system for communication leveraging decentralized networks like Ethereum and IPFS, that make up the Menlo One core protocol.

TownHall is an open source framework for building decentralized, monetized communication systems. It's the building block for creating applications which enable users to comment, exchange tokens, and reward one another in tokens for the value of content. TownHall creates the proper incentive structures to encourage users to share valuable information.

We're releasing this feature as an open source framework for the community of developers building decentralized technology. TownHall is designed to be valuable for developers who want to create decentralized and monetized communication tools.

The source code, installation instructions, and other documentation can be found here: https://github.com/MenloOne/townhall

2. Introducing Menlo TownHall

Menlo TownHall is a protocol to facilitate a decentralized, token incentivized communication system. This system rewards participants who provide high value information to an online conversation or discussion. Each participant contributes tokens to the system. The community then signals which messages have the highest value or are most relevant. Those who have the highest value contribution are rewarded with a payout from the system.

3. Use Cases

Our intended primary use case for this system is to help investors make better informed decisions in regards to the quality of an ICO by incentivising experts with deep domain knowledge to share their insight. For example, this system could be used to pay a blockchain developer who's hourly billing rate is in the thousands to contribute to an discussion about the quality of a blockchain company offering an ICO. Thus, providing information arbitrage opportunities previously unavailable for retail investors. Though, this is not limited to blockchain use cases- as all industry verticals can benefit from sharing their knowledge by using TownHall on relevant platforms.

There is an infinite number of possible applications that could be built with Menlo TownHall including the following hypothetical use cases:

- A monetized version of Stack Overflow which rewards users to solve complex software problems.
- A monetized version of Quora where high value contributors are rewarded for providing expert advice
- An online community like Reddit where users with the best posts are rewarded.
- A task management system like Trello where users race to complete tasks for a payout.
- An online logo design community where a customer puts up a bounty for a logo, and the best logo gets a payout.
- A system like WikiLeaks which incentivises users to leak sensitive information.
- A decentralized group or **guild** who are incentivised by startups to review their product.

4. Legal Considerations

Anyone contemplating purchasing Menlo Tokens should read and understand the important considerations set forth below before purchasing Menlo Tokens.

Development Failure or Abortion
Due to the technological complexity and difficulties that may be uncertain, unforeseeable and/or insurmountable, the development of the Menlo One protocol or certain components of the protocol could fail or abort at any time for any reason (including insufficiency of funds). Depending on when the development failure or abortion may occur, these events could result in an inability to use some or all of Menlo One which could have an adverse impact on the utility of ONE

Limited Information Disclosure
Various technical specifications and paraONEers of the Menlo One may be updated and changed both before and after the sale of ONE. While this Whitepaper contains key information regarding Menlo One and Menlo, Inc, it is subject to any adjustments or updates as deemed necessary in Menlo, Inc.'s sole discretion. Menlo, Inc. is not obliged to regularly update the Whitepaper regarding the development of the Menlo One (including its progress and meeting expected milestones) and has no obligation to provide timely and full access to all information relating to Menlo One that may be generated by Menlo, Inc. from time to time.

Changing Regulatory Environment
Cryptographic tokens similar to ONE are being, or may be, scrutinized by the regulatory authorities of various jurisdictions. Menlo, Inc. may receive queries, notices, warnings, requests or rulings from one or more regulatory authorities from time to time, or may even be ordered to suspend or discontinue any action in connection with Menlo One or the ONE. The development, marketing, promotion, use or otherwise of the Menlo One or ONE may be seriously affected, hindered or terminated as a result. Since regulatory policies in any particular jurisdiction are subject to change, any favorable regulatory position regarding Menlo One and ONE in any jurisdiction may be revoked or altered at any time. ONE could be defined from time to time as virtual commodities, digital assets or securities or currency in various jurisdictions and therefore could be prohibited from being traded or held in certain jurisdictions pursuant to local regulatory requirements.

Intended Use of Menlo Tokens; Not Marketed or Sold as Securities
ONE are not intended to hold value outside of their use within the TownHall software. Purchasers of ONE do not receive any ownership interest, voting rights, management rights, property interest, or any interest in revenue or profit sharing. The intended use of ONE is to incentivize participation in the TownHall ecosystem, encourage users to make positive value-add contributions to the ecosystem, and to support the token curated registry system. Because we do not believe Menlo Tokens are securities, Menlo Tokens have not been registered for sale pursuant to the Securities Act of 1933 or under the securities laws of any state. Neither the Securities and Exchange Commission nor any state securities regulator has reviewed the terms of the ONE sale. It is possible that either a federal or state securities regulator might determine that the sale of ONE is subject to the securities laws, despite our view that ONE are not securities. Purchasers of ONE tokens may be adversely affected by any such determination that ONE are securities and subject to compliance with securities laws.

Advances in Cryptography
Advances in cryptography, such as code cracking or technical advances such as the development of quantum computers, could present risks to all cryptography-based systems, including the Ethereum Virtual Machine and Menlo One. This could result in the theft, loss, disappearance, destruction or devaluation of ONE. It is impossible to predict the future of cryptography or the future of security innovations that could offset the risks posed from such advances.

Open Source Seller
Menlo One is an open source project initiated by Menlo, Inc. and intended to be supported by the community

interested in improving trust the transparency and security of the token sale process. Although Menlo, Inc. may be influential in any community that develops around the Menlo One, it cannot fully control the development, marketing, operation or otherwise of Menlo One. Anybody may develop a patch or upgrade the source code of the Menlo One without obtaining prior authorization of any person. As a result, Menlo One could be influenced by third parties that do not have the best interests of ONE purchasers in mind. Alternatively, little or no community could develop around Menlo One, in which case, Menlo One would not benefit from the advantages other open source projects enjoy.

Flaws in Source Code

Menlo, Inc. cannot guarantee that the source code of Menlo One is or will remain without flaws. At any point in time, the source code for Menlo One may contain flaws, errors, defects, vulnerabilities and bugs (collectively, "**Flaws**"), which may disable some functionality for Users, expose Users' information or otherwise adversely impact Menlo One. Such Flaws could compromise the usability and/or security of Menlo One and consequently adversely impact the value of ONE. Open source codes rely on transparency to promote community-sourced identification and solution of problems within the code. Menlo, Inc. shall work closely and continuously with the community supporting Menlo One to improve, optimize and perfect the source code of Menlo One, but Menlo, Inc. provides no assurances that any such community will develop or that Menlo, Inc. will be able to address identified Flaws in Menlo One source code in a manner sufficient to mitigate such Flaws.

Update of Source Code

The source code of Menlo One will be updated, amended, altered or modified from time to time by Menlo, Inc. and/or the community using Menlo One. Menlo, Inc. is unable to foresee or guarantee the precise result of any such updates, amendments, alterations or modifications. As a result, any update, amendment, alteration or modification could lead to an unexpected or unintended outcome that adversely affects Menlo One's operation or the utility of the ONE.

Private Keys

The loss or destruction of a private key required to access ONE may be irreversible. Only the possessor of both the unique public and private keys can control the ONE through a local or online wallet. Purchasers are responsible for safeguarding the private keys contained in Purchasers' wallets. To the extent such private key of Purchaser is lost, missing, divulged, destroyed or otherwise compromised, neither Menlo, Inc. nor anyone else will be able to help Purchaser access or retrieve the related ONE.

Popularity

The value of ONE hinges heavily on the popular adoption by users of Menlo One. Menlo One is not expected to be popular, prevalent or widely used immediately following the sale of ONE. For a variety of reasons, Menlo One may never develop a significant place in the token sale community in the United States or elsewhere. Further, despite the efforts of Menlo, Inc. to promote the purchase and use of ONE for the purpose of developing Menlo One, a significant number of ONE may wind up being held by speculators, which may artificially increase the price of ONE. The lack of users and commercial utilization may result in increasing volatility of ONE price and consequently compromise Menlo One's long-term development.

Liquidity

ONE are not a currency issued by any individual, entity, central bank or national, supra-national or quasi-national organization, nor is it backed by any hard assets or other credit. The circulation and trading of ONE on the market depends on the consensus on its value between relevant market participants. Neither Menlo, Inc. nor any other person is obliged to redeem or purchase any ONE from a purchaser or any other ONE holder. Menlo, Inc. does not guarantee the liquidity or market price of ONE to any extent. Purchasers of ONE who wish to sell their ONE must locate one (1) or more willing buyers to purchase at a mutually agreed price, which process could be costly and time-consuming. At any given time, no crypto-currency exchange or other public market may have ONE listed thereon for trading. Menlo, Inc. does not intend to take any steps to cause ONE to be listed on any crypto-currency or other exchange.

Competition

Menlo One is based on open-source computer software such that nobody claims copyright of the source code. As a

result, anyone can legally copy, replicate, reproduce, engineer, modify, upgrade, improve, recode, reprogram or otherwise utilize the source code and/or the underlying platform of Menlo One in an attempt to develop a competing platform or software. Such circumstances are out of Menlo, Inc.'s control and may consequently compromise the utility of Menlo One and the ONE. In addition, third parties, some of whom may have substantially greater resources than Menlo, Inc., may develop separate and unrelated competing protocols. Menlo, Inc. will in no case be capable of eliminating, preventing, restricting or minimizing such competing efforts that aim to compete with Menlo One.

5. System Architecture Requirements

The following principles are being taken into consideration when building Menlo TownHall; our framework for building decentralized, incentivized communication systems.

Privacy Preserving
All participants should have the option of using the system pseudo-anonymously as users may be posting unpopular opinions or revealing unflattering information about a company or product.

Disintermediated
All participants must be able to contribute without intermediaries of any kind including administrators of permissioned systems. The system must be able to work without the efforts of a single central service provider.

Censorship Resistant
The system should be censorship resistant as users may be posting unpopular opinions or revealing unflattering information about a company or product.

Elegant
The system must have an elegant design which is effective for communication, yet simple enough for users to deploy without the need for special hardware or having to recruit large groups of participants to ensure security.

Fast
The system has to be fast enough for asynchronous posting to forums, but does not have to have the speed of real time chat.

Affordable
The system should not have a cost most users find prohibitive, and should be accessible to users who can already afford the cost of an internet enabled device.

Open Source
In order to provide the security guarantees to achieve the other considerations, the entire system must be completely open source.

The balance of security, speed, and cost required excludes most traditional web technology from being a viable option for this system. There are a number of decentralized database

products which cover many of the requirements including BigchainDB, Hashgraph, and RChain. Steemit bears many similarities in terms of feature set, however none of them meet all the requirements.

However the InterPlanetary File System (IPFS) has been successfully leveraged by several projects as a database. The most notable of which would be OpenBazaar which started using IPFS as their backend in July of 2016 [105]. There was a lot of research done by the Akasha project which aimed to build a decentralized social media network [106]. Perhaps the most robust use of IPFS as a database would be the OrbitDB project [107]. The downside of IPFS is that it lacks the byzantine fault tolerant security guarantees necessary to ensure complete censorship resistance.

6. Protocol Design

In order to achieve byzantine fault tolerance while affordably storing messages, The TownHall protocol leverages both the Ethereum network and the InterPlanetary File System (IPFS), establishing communication between the two decentralized networks, offsetting the inherent limitations of each.

IPFS is extremely cost effective for the storage of the data, but lacks the security guarantees of a network like Ethereum. To offset one with the other, TownHall stores message data on IPFS, and the content hash on Ethereum. While the message itself is not saved to Ethereum, a record of it is.

7. Key Technologies Used by TownHall

a) The Ethereum Network

Ethereum is an open-source, public, blockchain-based distributed computing platform and operating system featuring smart contract (scripting) functionality. Smart contracts are applications that run exactly as programmed without any possibility of downtime, censorship, fraud or third-party interference. These apps run on a custom built blockchain, an enormously powerful shared global infrastructure that can move value around and represent the ownership of property. It supports a modified version of Nakamoto consensus via transaction based state transitions. [102]

TownHall leverages Ethereum in multiple ways. 1. As a trustless payment system to reward users for valuable messages. 2. As a trustless voting system in which users signal which messages are deemed valuable. 3. An immutable storage of data which include a ledger of rewards, voting, and the content addressable hash of the message itself.

Although there are many decentralized networks which support smart contracts, Ethereum is in our opinion the best possible choice for our system for a number of reasons: 1. Ethereum is

extremely dependable. Since its launch in 2015 there have been no major system failures. 2. The user base and size of the ecosystem make it ideal for rapid user adoption of TownHall and other Menlo products. There are many products which promise a better, faster version of Ethereum, but these two factors make it the ideal network upon which to build the Menlo ecosystem.

Though, there are inherent drawbacks to the Ethereum network which prevent us from relying on it solely as a decentralized communication system. The primary drawback being that storing even a small message on Ethereum would be cost prohibitive for most users. It costs 20k of Ethereum's "gas" to store a 256 bit word [103]. Depending on the cost of Ether, storing just a kilobyte could cost the user over $1 US dollar. Thus TownHall leverages IPFS for the storage of the message itself, and depends on Ethereum only to store the content addressable hash of the data. It's safe to assume that the dollar cost of storing a 46 character long hash will remain affordable for most users of TownHall for the foreseeable future.

b) The InterPlanetary File System (IPFS)

IPFS is a protocol and network designed to create a content-addressable, peer-to-peer ONEhod of storing and sharing hypermedia in a distributed file system. It seeks to connect all computing devices with the same system of files. In some ways, IPFS is similar to the World Wide Web, but IPFS could be seen as a single BitTorrent swarm, exchanging objects within one Git repository. In other words, IPFS provides a high-throughput, content-addressed block storage model, with content-addressed hyperlinks. This forms a generalized Merkle directed acyclic graph (DAG). IPFS combines a distributed hash table, an incentivized block exchange, and a self-certifying namespace. IPFS has no single point of failure, and nodes do not need to trust each other, except for every node they are connected to. [101]

IPFS is leveraged by TownHall for the storage of data. Messages are sent to the network by a local node, and are downloaded by other peers using TownHall by referring to their content addressable hash which is stored on the Ethereum public network. In this way, TownHall uses Ethereum as a hash table, referencing the hash of a message as a key to the value stored on IPFS.

c) The TownHallJS Application

TownHall is written entirely in JavaScript (ECMAScript 6) and is designed to be run on the end users computer. It interacts with Ethereum via a web3 provider such as ONEaMask, and IPFS. To better understand how TownHall interacts with the other technologies, we could view the roles of each of these technologies from the perspective of the classic Model-View-Controller architecture. Our JavaScript application is the View layer. Both TownHallJS and the smart contracts on Ethereum serve as the Controller as they are are tightly coupled pieces of application logic which need one other to function. Both Ethereum and IPFS share the role of

the Model. TownHall establishes a proprietary protocol for communicating between both networks.

8. TownHall In Detail

a) Overview

TownHall is written entirely in JavaScript (ECMAScript 6) and is designed to be run on the end users computer. It heavily uses the React JS framework, webpack, and dependencies including IPFS, web3, Truffle, and others. The interface which is included in TownHall is intentionally designed to be "barebones", and it's our intention for it to be customized by end-user developers to fit their needs, with our expectation that many of the use cases we earlier presented can be created using the framework. It is required to deploy the included smart contracts to Ethereum in order to get the application running.

Once the application initializes, it reads messages, votes, and other data stored on Ethereum at the address specified in the config file. A web3 provider and connection to IPFS is required at this step. Once the data is downloaded locally, it's displayed for the user in the GUI.

b) Authentication & User Data

End users essentially authenticate with their private key for any actions which require a write to the system such as posting, voting, commenting, etc. All user data is associated with their key. This includes messages associations, vote count, messages payout, etc. Of course payout in the Menlo One Token is also made to the users address.

This key pair authentication design pattern is becoming common place within decentralized systems, and while we think the pros outweigh the cons, it’s not without its flaws. The clear advantage to this is the ability to authenticate without relying on an intermediary, the disadvantage is the end-user losing their private key or their private key being compromised. A major reason why the ERC20 standard makes sense for for Menlo Token (ONE) is how easy the token is to transfer. If a user suspects their key has been compromised, they can transfer their ONE to a fresh account. Many ERC20 compatible wallets also support the easy creation of an easy to backup mnemonic phrase. If handled responsibly, using a key pair for authentication makes a lot of sense. Though we recommend developers using Townhall to include information for their end-users on how to responsibly store and use their keys.

9. Menlo One TownHall Key Components

a) Menlo Token (ONE)

Description: Menlo Token (ONE) is an open source ERC20 compatible token on the Ethereum public blockchain. The token serves several purposes in the system including: 1. Staking how strongly a user feels about a topic and 2. How users reward one another on TownHall.

ONE is a critical piece of software designed to work flawlessly with the TownHall framework and is sold so developers have a fully functional product with which to build on. TownHall and other Menlo One products have interoperability with other ERC20 tokens and ONE should not be purchased with the hope that future Menlo One products will use ONE exclusively.

b) TownHallJS

Description: An open source Javascript application. It interacts with and orchestrates the other following components. TownHallJS is responsible for interfacing with the user, formatting data for IPFS, sending data to IPFS, and interfacing with Ethereum smart contracts.

c) Graph Smart Contract

Description: An open source smart contract which lives on the Ethereum public network which indexes data stored by TownHallJS. Menlo Token is required to store entries on or interact with this smart contract. The graph contract contains the links between message nodes. It creates and organizes the graph, linked list/tree of messages under topics. It contains a mapping of IPFS hash to in-contract index for message object. This graph is then used by clients to generate a view of the discussion board.

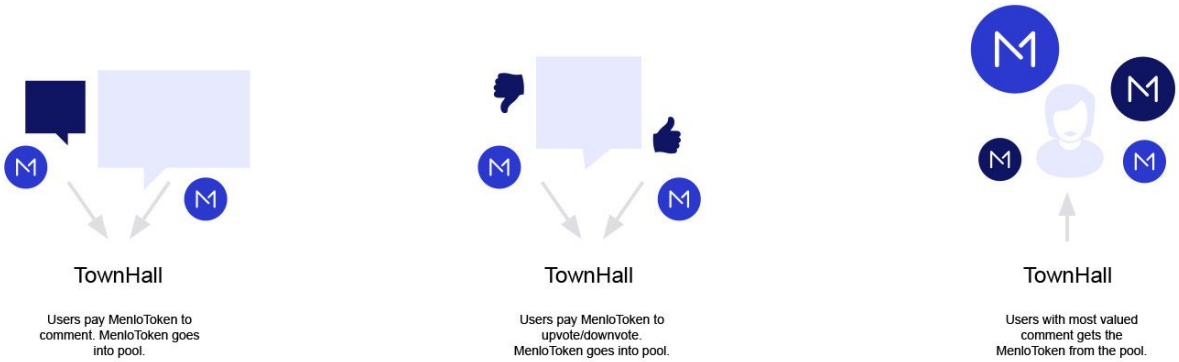
d) Voting and Payout Contract

Description: This contract to is used for voting on messages. If a user has one of the top 5 most upvoted message in a 24 hour period, this contract is used the pay the user from fees received from the Graph Contract. A ONEhod has to be called by the user to claim rewarded tokens. If a user does not claim the tokens within 24 hours, they are rolled back into the pool. Payout amounts calculations are triggered by first claimant in epoch.

All upvotes and downvotes must have tokens associated with them as tokens are used to stake how strongly the voter felt. All upserts related to forum messages are done with a JSON object which contains signatures and hashes. This payout structure will be used to reward the Top 5 Messages in a 24-hour period: 1st: 40%, 2nd: 25%, 3rd: 20%, 4th: 10%, 5th: 5%.

10. Token Economics Within TownHall

ONE is used by the ecosystem for posting, voting, and rewards. Below is a diagram of the economic flow within the ecosystem.



11. Menlo One Token Usage

ONE are "utility tokens" which are a necessary component of the TownHall software framework. They are used for value exchange in the form of communication, and to incentivize participants of all related software to provide value.They are not intended to hold any value outside of their use within our software framework. They are not intended for speculation and hold no claim to intellectual or other property or cash flows. They grant no right to participation in the company nor any claim in decision making over company assets or strategy. There is no promise of value beyond usage value, nor any claim on assets or revenue associated with ONE.

12. User Journeys

User Journey 1: Creating a new message

1. A user wishes to create a new topic.
2. Their comment is given an IPFS content-addressable hash locally.
3. The hash is then sent with a fee and a parent message to the Graph Contract.
4. A fixed fee of Menlo Tokens and Ether(gas) is required by the Graph Smart Contract.
5. Once the user sees their message ONEadata in the Graph Contract, the user sends the message to Menlo's IPFS instance. After IPFS acknowledges the message, it's visible to other subscribers on Menlo Core.
6. Other users have the ability to "upvote" or "downvote" the message, which may be a topic or a post, based on how much value users feel it provides to the conversation.

7. Every 24 hours, the Top 5 messages of that day are determined. Users with popular messages can redeem their reward calling a ONEhod on the Voting and Payout Contract.

User Journey 2: Upvoting a message on the message board

1. A user sees a message they like, and call the upvote ONEhod.
2. A ONEhod in the Voting and Payout Contract is called. A small amount of ONE is required to call the ONEhod.
3. The ONE is held in the Voting and Payout Contract, and will go into the reward pool. The fees from downvotes also go into the reward pool.

User Journey 3: Redeeming ONE for a topic

1. A user wishes to collect the ONE owed to them for creating a popular message.
2. They see one of their messages is in Today's Top 5, then they call a ONEhod in the Voting and Payout Contract.
3. That ONEhod checks that the ETH address calling it is the same as the address of a poster in the Top 5, if so, it pays them accordingly.

13. TownHall Release History

TownHall 1.0 was completed and released in April 2018, and is available at: https://github.com/MenloOne/townhall

TownHall is an open source project and there will be ongoing released and improvements from both the Menlo One team, and the developer community. We encourage anyone interested to contribute to the project.

14. References

101. https://github.com/ipfs/ipfs/blob/master/papers/ipfs-cap2pfs/ipfs-p2p-file-system.pdf
102. https://www.ethereum.org/
103. http://gavwood.com/paper.pdf
104. https://ipld.io/
105. https://medium.com/openbazaarproject/openbazaar-2-0-p2p-trade-takes-the-next-step-4d75b7f23ec8
106. https://akasha.world/
107. https://github.com/orbitdb/orbit-db
108. https://opensource.guide/leadership-and-governance/

15. License

TownHall and all its components including Menlo Token are published under an Apache License.

Apache License
Copyright (c) 2018 Menlo Inc.

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

20. Legal

For More Information Please Contact Us
satoshi@menlo.one | www.menlo.one