Master Thesis

Melon Protocol: Data Analysis of an On-Chain Asset Management Platform

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Abstract

This paper explores the usage of Melon, an Ethereum-based platform for on-chain asset management. Guided by the architecture of the Decentralized Finance (DeFi) stack proposed by Schär (2020), it is explained how Melon extends across all five DeFi layers. Exploring the usage of the platform shows that network activity such as investing and trading is low, despite perceived growth in number of users. Analyzing the transactions of Melon user addresses on the Ethereum Blockchain discovers that many platform users are interconnected. Based on these findings, it is concluded that the platform is mainly used for testing purposes yet. Nevertheless, DeFi including Melon has promising features and the potential to revolutionize the existing asset management industry with unprecedented transparency and drastically reducing barriers to entry and operating costs through increased efficiency.

Keywords: Melon Protocol, Blockchain, Ethereum, On-Chain Asset Management, Decentralized Finance.

Contents

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Plagiatserklärung

Ich bezeuge mit meiner Unterschrift, dass meine Angaben über die bei der Abfassung meiner Arbeit benutzten Hilfsmittel sowie über die mir zuteil gewordene Hilfe in jeder Hinsicht der Wahrheit entsprechen und vollständig sind. Ich habe das Merkblatt zu Plagiat und Betrug vom 22. Februar 2011 gelesen und bin mir der Konsequenzen eines solchen Handelns bewusst.

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API Application Programming Interface

AML Anti Money Laundering

AvF Avantgarde Finance

DAO Decentralized Autonomous Organization

DeFi Decentralized Finance

DEX Decentralized Exchange

ETH Ether

ENS Ethereum Name Service

FM Fund Manager

GAV Gross Asset Value

KYC Know Your Customer

MAMA Multichain Asset Managers Association

MC Melon Council

ME Melon Engine

MEB Melon Exposed Businesses

MLN Melon Token

MP Melon Protocol

MT Melon Terminal

MTC Melon Technical Council

NAV Net Asset Value

NYSE New York Stock Exchange

USD US Dollar

1 Introduction

Blockchain Technology, Smart Contracts, and Decentralized Finance (DeFi) have gained a lot of traction throughout the last decade. According to Schär (2020), DeFi does not rely on intermediaries and centralized institutions, in contrast to the traditional financial sector. Instead, intermediaries and institutions are replaced with smart contracts, small applications that are stored on a Blockchain, providing deterministic execution and transparency in regards to state changes. These advantages outweigh the fact that smart contracts are less efficient than centralized computing. To date, DeFi applications include, e.g. decentralized exchanges (DEXs), decentralized lending platforms, liquidity pools, and derivatives and lastly on-chain investment vehicles. According to Schär (2020), the dominant smart contract platform for such protocols is the Ethereum Blockchain.

Melon[1] is an Ethereum-based platform for decentralized on-chain asset management. Via this platform, people and entities can manage their wealth and the wealth of others via "customized on-chain investment vehicles[2]" (see *Melon Protocol Website* (n.d.)). In general, such investment vehicles[3] typically include a variety of assets, allowing wealth managers and investors to leverage diversification. According to El Isa (2017), the "secret to great portfolio management is good diversification and uncorrelated returns", following Harry Markowitz, Nobel Prize winner in Economic Sciences.

The first section describes the history of Melon and its governance structure. Consequently, the technical set-up of Melon is explained based on the five layers of the DeFi stack, proposed by Schär (2020). The tech-

[1] The term *Melon* is further specified throughout the text.

[2] "Funds, also known as 'pooled investment vehicles' or 'collective investment vehicles', are portfolios of assets chosen by a portfolio manager but made available for outsiders to invest in (hence the 'pooled' or 'collective' nature of the investment vehicle, since the capital available to the portfolio manager to invest with is provided by numerous investors)" (*Melon Protocol Website* (n.d.)).

[3] Throughout the paper, the term *fund* is widely used instead of (pooled/collective) investment vehicles.

nical set-up induces some economic implications which are presented in the third section, alongside other on-chain management protocols. Subsequently, a two-fold analysis of the usage of the platform is presented. The first part includes general network metrics of individual funds, assets and DEXs. In the second part, connections between network participants are analyzed and connected Melon users clustered accordingly. The last section concludes the main points of the first sections and discusses them alongside the results of the Data Analysis.

2 Melon

2.1 History & Governance

Founded in 2016, Melonport AG[4] released the first version of the Melon Protocol (MP), Melons technical backend, in February 2019. Subsequently, Melonport AG was discontinued as per plan in order to decentralize the governance of Melon. Ever since Melon has been governed and maintained by a Decentralized Autonomous Organization (DAO)[5] which has been set up on the Aragon platform[6]. The Melon DAO is also referred to as Melon Council (MC) and consists of a Melon Technical Council (MTC) and elected Melon Exposed Businesses (MEB) representatives (see Zenk and El Isa (2018)). The MC has appointed Avantgarde Finance (AvF) the lead developer of Melon in September 2019[7]. AvF has since implemented the first upgrade of the MP (Version 1.1.0) and a user interface called the Melon Terminal (MT), developed using IPFS[8]. Furthermore, the Melon project is accessible open-source via Github[9], a platform for version control and collaboration. With this, Melon users and interested persons are invited to participate in bug bounty programs

[4] see *Melonport* (n.d.)
[5] see MC (2019*b*)
[6] see *Aragon Website* (n.d.)
[7] see MC (2019*a*)
[8] see *IPFS Website* (n.d.)
[9] see *Github: Melon Project* (n.d.)

and to submit funding proposals for projects building on top of Melon. Several projects are (going to be) built on Melon, which is further addressed in section 2.2.5. Additionally, Melon is implicitly related[10] to the Multichain Asset Managers Association (MAMA), which works with regulators in order to lobby for a legislation regulating and facilitating on-chain asset management moving forward.

A three-year roadmap[11] developed by AvF and approved by the MC currently defines the short and mid-term goals of Melon (see Figure 12 in Appendix I). These goals intend to serve the long term mission of the MC which includes to foster innovation, increase network attractiveness, maximize user adoption, and to preserve integrity. In practice this contains, e.g. protocol upgrades, resource allocation, and setting network parameters[12].

As of June 2020, close to 300 funds have been created using the MP as shown in Figure[13] 1 and assets in the value of more than 3500 Ether (ETH) / 800 thousand US Dollars (USD) are being managed[14].

[10]Mona El Isa is the (co)founder of Melonport AG, AvF, and Board Member of MAMA; Melonport AG co-founded MAMA (see *Melon Protocol Website* (n.d.)).

[11]see AvF (2019)

[12]see *Melon Protocol Website* (n.d.)

[13]All Figures except Figure 12 are own illustrations. Data is retrieved from the Melon Application Programming Interface (API) unless otherwise stated. The data retrieval process and the use of APIs is explained in section 4 Data Analysis.

[14]see Figure 14 in Appendix II

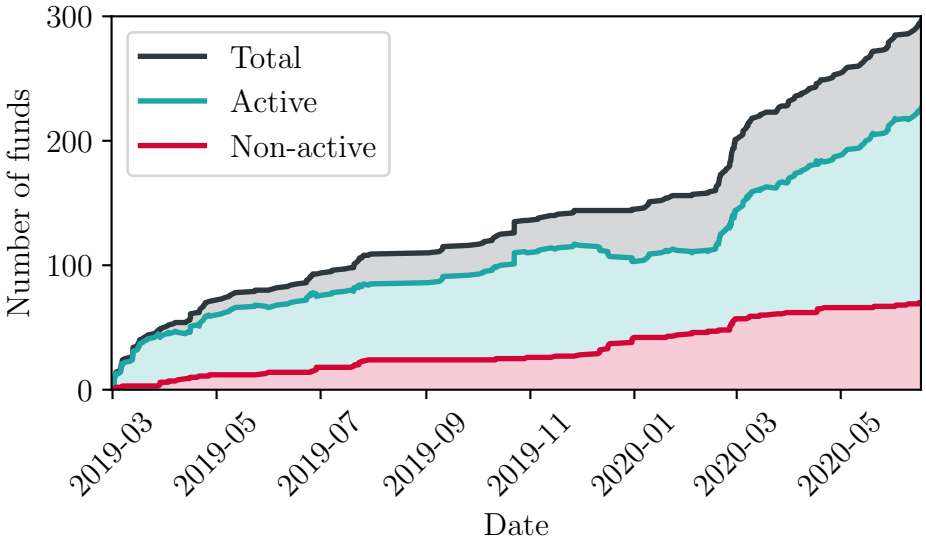

Figure 1: Evolution of Fund Counts

2.2 Technical Overview

This subsection outlines the technical set-up of the Melon Protocol[15]. The set-up is explained alongside a general model of the DeFi stack, proposed by Schär (2020), displayed in Figure 2. Melon extends itself across all five layers which are discussed in the following subsections, with emphasis on the Protocol Layer.

[15]This subsection is based on information from *Melon Documentation Reference* (n.d.). It is not intended to provide a complete overview, details are included or left out as deemed necessary.

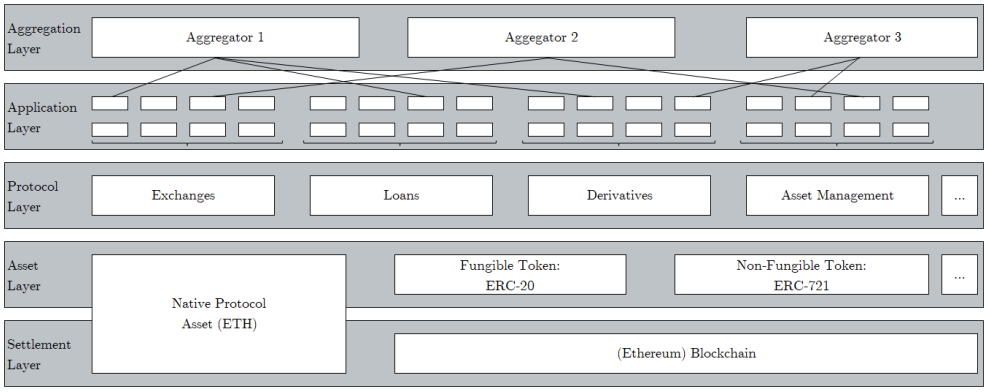

Figure 2: DeFi Stack. Own illustration based on Schär (2020).

2.2.1 Settlement Layer

The basis of the DeFi stack and also of the Melon protocol is the *Settlement Layer* and with that the Ethereum Blockchain (for details refer to Buterin (2013) and Wood (2015)). Blockchain technology[16] enables maintaining an immutable, transparent, and distributed ledger with equal access rights. Unique identifiers for Blockchain users are 42-digit so called public keys. These pseudonyms induce privacy to a certain degree. Authenticity and integrity are achieved through a consensus protocol, which obsoletes the need for intermediaries or trusted third parties. In comparison to other public Blockchains, such as the Bitcoin Blockchain (Nakamoto (2008)), Ethereum has the largest developer base and its programming language *Solidity* is Turing complete (see Schär (2020)). Another building part of the Settlement Layer is the native Ethereum currency ETH which extends across the first two layers of the DeFi stack.

[16]For a detailed introduction to Blockchain technology refer to, e.g. Berentsen and Schär (2017) (German) or Berentsen and Schär (2018) (English).

2.2.2 Asset Layer

As shown in Figure 2, the *Asset Layer* consists of ETH and other Blockchain based tokens. Tokens are typically deployed in the form of smart contracts, which are deterministically executed by the Ethereum Blockchain in the Settlement Layer. These smart contracts usually adhere to consistent rulesets called token standards, which enable mass adoption and interoperability between tokens. ERC-20 (see Vogelsteller and Buterin (2015)) is the most popular standard (see Roth et al. (2019)) and as of now, the tradable asset universe of the MP consists of ERC-20 tokens only. Smart contracts ceteris paribus smart contract based tokens can be nicely integrated into the following layers.

2.2.3 Protocol Layer: The Melon Protocol

Whereas a smart contract based token typically consists of one smart contract, the *Protocol Layer* usually refers to sets of (sophisticatedly interacting) smart contracts. Such protocols include, e.g. decentralized exchanges, lending platforms, liquidity pools, derivates and asset management protocols, all being able to integrate ETH and token contracts. It is important to distinguish between the MP, a set of smart contracts building the technical backbone of Melon in terms of an asset management platform, and the user interface (MT), which is discussed in section 2.2.4. The MP consists of environment and fund related contracts, explained subsequently.

Environment Contracts The environment contracts listed below define the overall structure of the MP:

- Melon Engine
- Exchange Adapters
- Registry

- Pricesource
- Version
- Fund Factory and Seven Spoke Factories:
  - Participation Factory
  - Shares Factory
  - Vault Factory
  - Accounting Factory
  - Trading Factory
  - Policy Manager Factory
  - Fee Manager Factory

Each environment contract is subsequently shortly described. *Melon Engine* The Melon Engine contract is the link to the Melon token (MLN) which, jointly with ETH, powers the platform and all of its functions. Additionally, by applying a so called buy-and-burn model, the Melon Engine (ME) intends to link the price (purchasing power) of the MLN to the usage of the network. In simplified terms, the ME adjusts the supply of MLN by burning tokens at times in order to incentivize network usage and benefit token holders at the same time. This token model[17] deserves a separate analysis alongside other token models, also referred to as *Tokenomics* (see, e.g. Mougayar (2017)). This is not in the scope of this paper.

Exchange Adpaters For every linked DEX an Exchange Adapter contract exists, serving as a bridge between Melon funds and the respective DEX.

Registry The Registry contract keeps track and manages the integration of DEXs and asset tokens. DEXs and asset tokens can be added, removed, or modified if required.

[17] For details, refer to El Isa (2018*a*), El Isa (2018*b*), and Zenk (2018).

Pricesource The Pricesource contract is a critical component of the MP: it provides the entire system with up-to-date asset prices. Currently, prices are provided by the Kyber DEX[18]. Considering the linkage to Kyber, this smart contract has some similarity with the exchange adapters although serving a different purpose.

Version The Version contract is directly linked to all factory contracts described in the next paragraph. The factory contracts can differ between the different versions of the MP but are the same across all funds within one version. So far, there have been two major versions: Version 1.0.5 deployed by Melonport AG and Version 1.1.0 developed by AvF, and approved and deployed by the MC. It is important to state that funds deployed on preceded versions do not have to be shut down, however they cannot access new features that are part of protocol updates.

Fund Factory The fund factory contract generally refers to the process of creating the scaffolding of a new fund. Every fund consists of a hub contract and seven spoke contracts, which all have individual factory contracts as listed above. This process is explained in more detail in the subsequent paragraphs.

Fund Contracts Every single fund is made up of a unique set of smart contracts which are deployed on the Ethereum Blockchain whenever a fund is created via the MP. Every single fund consists of one hub contract and seven spoke contracts, as visualized in Figure 3.

[18] see *Kyber Network Website* (n.d.)

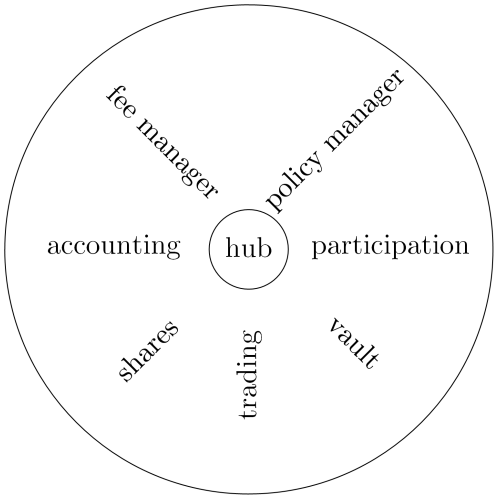

Figure 3: Fund Set-up: Hub & Spoke. Own illustation based on *Melon Documentation Reference* (n.d.).

The hub contract creates a smart contract for each spoke and stores the addresses of all spokes. Besides the seven spokes, each fund registers the current version, registry, price source, engine, and MLN contract addresses, which are shared amongst funds. Together with the seven spokes, a total of twelve addresses are linked to every fund. Spokes all serve a separate business logic domain and are uniquely linked to one hub. When necessary, spokes can also interact with each other. For each spoke, the main features are shortly explained.

Participation The Participation contract deals with the entire set of functions related to investing into a fund and redeeming at a later point in time. This includes the creation and destruction of fund shares (see *Shares*), fee calculations (see *Fees*), and the transfers of tokens at investment or redemption.

Shares Share tokens define the ownership of assets that are managed by a fund, as addressed in paragraph *Participation*. For example, if an investor invests 1 ETH in a fund that is already managing 9 ETH, the

investor is going to receive one share token. Previous investors already own nine share tokens. Independently of the fund performance, the investor will be entitled to 10 % of all assets in the fund moving forward, not taking into account potential fees. In theory such share tokens could be transferred (traded) which is not possible to date.

Vault A fund's Vault serves as a custodian storing its assets which can be withdrawn at redemption. It is critical to understand that despite the manager having the full authority to manage the invested amount, the control of the assets remains with the investor at all times through this shared custody contract.

Accounting The Accounting contract is in charge of fee, gross-asset-value (GAV), net-asset-value (NAVs), and share calculations. These functions are not directly interacted with by the fund manager or investors, however the other spokes heavily rely on this important business logic domain.

Fee Manager The Fee Manager contract of every fund charges fees against a fund's assets for predefined ratios in the form of *Management Fees* and *Performance Fees*. Fund performance is measured and paid out after completion of a predefined measurement period in case the fund has performed positively. Management fee is paid at the time of investing into a fund in anticipation for the management services. Instead of reducing the Assets under Management (AuM) in order to compensate the manager, new share tokens are created. The manager can decide to hold or redeem these shares in order to pay his expenses. An analysis of the fee structure across all Melon funds and some implications thereof are presented in the Data Analysis subsection 4.1.2.

Trading The fund-specific Trading smart contract makes use of the interfaces to the various DEXs, already described in the context of the infrastructure contracts. Before registering a trade with an exchange for a specific asset, this contract checks whether the trade adheres to predefined rules, further outlined in the next paragraph.

Policy The Policy manager smart contract defines risk management and compliance rules, that can - but do not have to - be specified by the fund managers. Every listed policy is a specific smart contract which can be subscribed by the fund managers. The following policies are already implemented:

- User Whitelist (users who can invest into a fund)
- Max. Concentration (of one asset within a fund)
- Max. Positions (of assets within a fund)
- Asset Whitelist (assets which can be invested in)
- Asset Blacklist (assets which cannot be invested in)
- Price Tolerance (to ensure fund managers cannot trade too far off market prices)

Many other policies are still being developed, such as limiting the turnover in regards to number or volume of trades. For more details in regards to the ones being developed and existing risk management policies and compliance rules, refer to *Melon Documentation Reference* (n.d.).

Generally, this module is likely to have great significance for regulators and regulatory frameworks currently being developed as addressed in section 2.1, e.g. for the use of *Know Your Customer* (KYC) or *Anti Money Laundering* (AML) practices. Risk management and risk engineering are topics which, similarly to the token economics of Melon, deserve to be analyzed in more detail. Again, this is not in the scope of this paper.

Functions across Fund Lifecycle This section intends to summarize the technical overview of the Protocol Layer by sketching the potential lifecycle of a fund. On fund creation, the fund manager defines the following parameters[19]:

[19]Items marked with * are mandatory input parameters.

- Compliance rules regarding investor participation (user whitelist)
- Risk engineering rules regarding investments guidelines (all other policies listed above)
- Management fee, performance fee, performance fee period*
- DEXs to be used*
- Asset tokens eligible for investment and redemption*
- Fund name*

When setting up the fund, the fund manager has to define the name of the fund, asset tokens eligible for investment and redemption, DEXs to be used for trading, management and performance fees as well as the performance fee period. Additionally, the fund manager can define an investor whitelist and the risk engineering rules defined above. As soon as the set-up is completed, investors can request to invest into the fund using the respective eligible asset token. In case the fund manager approves the investment, the investor receives proportionate shares of the fund. The fund manager in turn receives proportionate shares according to the pre-defined management fee. The fund manager can use all invested asset tokens in order to submit make- or take-orders to DEXs. Depending on the performance of a fund, the fund manager can potentially receive additional shares after the pre-defined performance period has passed. In case of a positive fund performance, proportionate shares are created according to the pre-defined performance fee. The fund manager can shut down the fund at any time. Subsequently, investor redemptions are still allowed. Fund managers can only create one fund per protocol version. However, a person or entity can own multiple Ethereum addresses and thus create multiple funds. This topic is further addressed in section 4.2.

2.2.4 Application Layer: The Melon Terminal

The *Application Layer* is building on top of the Protocol Layer and typically refers to a user interface or frontend based on a backend such as

the MP. Melon's user interface, the MT, operates on top of IPFS and has been developed by AvF. The MT allows users to explore existing funds as well as to interact with the various functions, described in the preceding paragraphs. Considering that the MT connects various protocols (the MP as well as the various DEXs) one could argue that the MT is already part of the Aggregation Layer, which is defined in the next section. The exact classification of the MT does not change the main message of this section.

2.2.5 Aggregation Layer

The *Aggregation Layer* combines various applications from the Application Layer. Considering the MT an application within the Application Layer, projects building on top of Melon can be considered examples for aggregators. Various projects are building on Melon: Ash is a mobile app gamifying investment for retail investors. Gorilla Funds intends providing a *Fund Explorer* for investors and a *Frontend Fund Builder* for fund managers, with the goal of improving the user experience and to "bring Melon funds to the world" Sievers (2020). For more details, refer to *Melon Protocol Website* (n.d.).
Summarizing section 2.2, the Melon ecosystem extends over all five layers of the DeFi stack. This section has emphasized the Protocol Layer and the MP, consisting of various interlinked smart contracts, namely environment and fund contracts. The latter in turn include one hub and seven spoke contracts. The technical analysis induces some economic implications, which are discussed in the next section.

3 On-Chain Fund Management

3.1 Economic Implications

Before addressing on-chain fund management, the traditional asset management industry needs to be explored. According to *Melon Protocol*

Website (n.d.), the current system is inefficient, complicated, expensive, labor intensive, not secure, lacking in transparency, and slow. A lot of this is due to the regulations that are in place, mainly to ensure protection of investors. In order to satisfy all regulations, financial intermediaries, such as auditors, custodians, administrators, transfer agents, clearing and settlement services, and others are required. Basically, the cost of intermediaries is passed on to investors. In addition, these high operating costs present a high barrier to entry, preventing new talent from entering the industry and competing, *Melon Protocol Website* (n.d.) argues. Various studies and reports, e.g. Mirsky et al. (2013) and Alexander et al. (2017) confirm the tremendous cost of operating funds.

DeFi and on-chain fund management in comparison do not require financial intermediaries. Instead, they are replaced with the consensus protocol of a Blockchain and smart contracts, as addressed in sections 1 and 2.2.3. The MP and especially the seven spokes of a fund perform functions "across the entire value-chain of an investment fund" according to *Melon Protocol Website* (n.d.), such as back office, custodian, fund administrator and transfer agent. As a result, the MP operates in a secure, transparent, efficient, instantaneous and drastically less costly way with no barriers to entry, neither for fund managers nor investors.

Melon shares these advantages with many other DeFi applications, e.g. DEXs in comparison to traditional exchanges, such as the New York Stock Exchange (NYSE). Nevertheless, the DeFi stack also imposes several risks. Besides (currently) unclear regulatory matters[20], such as KYC, AML, or taxation of profits, there is also a technological risk involved. According to Schär (2020), the technological risk increases with every layer in the DeFi stack, as each layer builds on all underlying layers. If there is a programming error, e.g. in the ERC-20 contract, this can be exploited on the Asset Layer itself but also on subsequent layers. The Ethereum Blockchain and the ERC-20 tokens have been in use and stress tested for quite some time and projects such as Melon are thoroughly

[20]For more information refer to, e.g. *MAMA Website* (n.d.).

checked and audited[21] by various independent organizations in order to mitigate risk as much as possible. Nevertheless, these risks are retained considering the ever changing and evolving nature of the DeFi stack and require thorough consideration especially when integrating other projects across layers and protocols.

3.2 Other Protocols

Melon is not the only project, intending to leverage the benefits of DeFi in the asset management world. The SetProtocol focuses on semi-automated trading algorithms and copying trading strategies from the world's leading traders[22] (similar things can be done with Melon[23]). BeToken has implemented the idea of a fund collectively managed by all investors[24], giving the most successful managers the most influence in regards to investment decisions (which can in theory also be done by Melon using smart contracts). The choice of analyzing Melon can be considered subjective, the University of Basel has an implicit relation to Melon[25]. This does not intend to be a holistic overview of other on-chain management protocols. The reader is encouraged to engage in own research if interested.

4 Data Analysis

The main scope of this paper is to analyze the usage of the Melon protocol after it has been live for a little more than 15 months. This analysis can potentially be of use to current network participants, such as fund managers and investors, prospective participants, and also the MC, which may take actions depending on the outcome of this analysis.

[21] see Zenk (2019)
[22] see Bend and Weickmann (2019)
[23] see Koen (2020)
[24] see Liu and Palayer (2018)
[25] Prof. Dr. Fabian Schär is an advisor of MAMA (see *MAMA Website* (n.d.)). MAMA's relation to Melon has been addressed in section 2.1

The first part of the analysis is descriptive in nature and shows how the protocol has been used thus far. Three overarching topics are analyzed: the existing fund universe, the tradable asset universe, and the usage of the various DEXs. Following the findings from these three sections, an in-detail analysis of the network participants has been conducted, which is presented in section 4.2.

All Melon related data has been accessed[26] via the Melon Application Programming Interface (API) from TheGraph[27]. The CoinGecko API[28] has been used to access historical prices for the USDETH exchange rate (all prices on the MT are in ETH). The analysis of network participants has used the Etherscan API[29] as well as the source code of every address' Etherscan page (see examples in Appendix VI). Additionally, the results of this analysis have been cross-checked with the Ethereum Name Service (ENS) API from TheGraph[30].

4.1 Platform Usage

4.1.1 Data Retrieval and Analysis 1

All transactions of the MP can be publicly observed on the Ethereum Blockchain. This transparency aspect has already been discussed in, e.g. section 3.1. TheGraph has published an API which accesses all MP related data from the Ethereum Blockchain. The API is docked with a Python[31] script named *Fund Master*[32], which queries, saves and analyzes all required data points. Data is queried for various categories and saved in respective data frames. Furthermore, some data points require conversions (e.g. unix epoch timestamp into date) and new data

[26] All data has been updated between June 15 and June 18, 2020. Minor differences may occur due to changes within this timeframe. Such differences do not impact the informative value of this analysis.
[27] see *TheGraph: Melon API* (n.d.)
[28] see *CoinGecko API* (n.d.)
[29] see *Etherscan API* (n.d.)
[30] see *TheGraph: ENS API* (n.d.)
[31] For more information refer to https://www.python.org/.
[32] All scripts are available at github.com/patriceglaser/Melon.

points need to be calculated (e.g. summing up the value of AuM for a specific fund). The data points per se are not manipulated or manually adjusted, thus all calculations can be replicated at any time. The results are summarized in the consequent section 4.1.2.

4.1.2 Descriptive Results

Funds This section provides selected descriptive statistics about the currently existing funds. Figure 1 in section 2.1 shows the evolution of number of active and inactive funds on the network. Both numbers have been growing for the most part, except for a short period in the end of 2019, where the number of active funds decreased. Following this decrease, the MP has been upgraded to Version 1.1.0 which led to an increase in the number of (newly deployed, active) funds. Figure 14 in Appendix II shows how the overall value of AuM has evolved. As stated in section 2.1, more than 3500 ETH / 800 thousand USD are currently being managed via the MP. It is important to realize that these assets are not equally distributed amongst funds, instead two funds manage most of the assets, as shown in Figure 4.

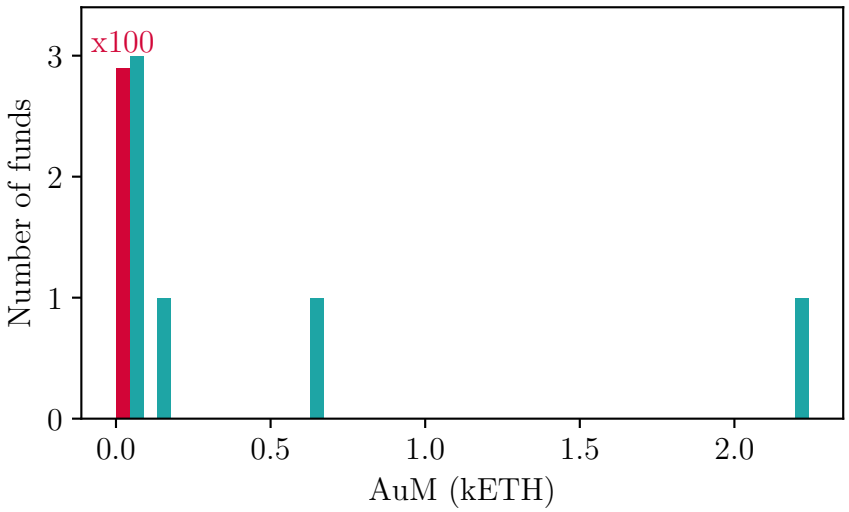

Figure 4: AuM Distribution across Funds

Fund Lifecycle An exemplary fund lifecycle has been addressed in section 2.2.3. This section analyzes the actual lifecycles of the fund universe. Table 1 shows that a lot of investments and trades take place shortly after fund inception followed by long periods of inactivity[33]. The two rows differentiate between active (Y) and non-active funds (N). Columns 1-2 are the average age respectively the average age at shutdown (both in days) across all funds. Column 3 shows how long the funds have not experienced any action (trade or investment), and column 4 describes how long a fund has not traded[34] (both in days). Additionally, 46% of trades and 61% of investments across all funds have occurred within a week after fund inception. In line with the AuM distribution, some funds, especially

[33]Columns 1-2 are averages across all funds. Columns 3-4 are the average across funds which have occurred an investment or trade. Including funds with no investment or trade would further increase these numbers.

[34]For non-active funds, columns *No Action* and *No Trade* consider the time span from the last action or trade until the shutdown date of the fund.

Active	Age	Shut Down After	No Action	No Trade
Y	190.9		166.0	147.2
N		122.9	107.2	110.6

Table 1: Fund Lifecycle

the two large funds (Rhino Fund, The Vision Fund 2.0), behave contrarily to the presented numbers. If these averages were weighted with the AuM of funds, the statistics would change drastically. This is addressed in the Discussion section.

Fee Distribution Similarly to the fund lifecycle, the fee structure of funds has been addressed theoretically in 2.2.3. Fees are paid in the form of performance and management fees. Figure 5 shows the distribution of management fees across funds.

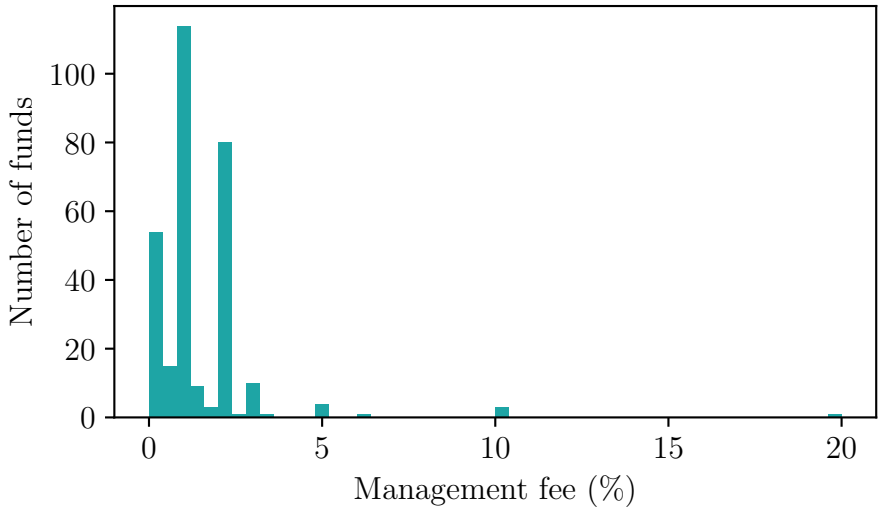

Figure 5: Management Fee Distribution across Funds

Without further addressing the performance fee[35], one may critically question the justification of a management fee, considering the low activity of funds presented in the previous paragraph. It could be argued that more active funds, such as the Rhino fund, deserve a differentiated analysis. Again, this is further addressed in the Discussion section.

Other Concluding the analysis of the fund universe, some general fund metrics are presented in Table 2. Based on the different column properties, the rows show general descriptive statistics such as average, minimum, and maximum across all funds (rows 1-3). Consequently, these values are differentiated for various subsets of funds (a = active; na = non-active; f = funded, i.e. AuM>0) (rows 4-7). Finally, these values are weighted with the AuM per fund (rows 8-10). Considering the distribution of AuM across funds, rows 8-10 basically display the weighted average of the two largest funds. The columns are number of Trades, Investments, Assets, External Investments (i.e. when the investor is not the fund manager), and AuM in ETH. The main findings of this Ta-

	Trades	Investments	Assets	Ext. Investments	AuM (in ETH)
ø	3,3	1,7	1,8	0,6	12,1
min	0	0	0	0	0
max	64	47	12	47	2203,9
ø a	3,3	1,9	2,1	0,7	15,8
ø na	3,1	1,3	1,1	0,4	0
ø a f	4,5	2,5	3,1	1,1	23,6
ø na f	3,7	1,7	2,7	0,6	0,1
w ø	34,2	31,7	5,8	30,9	1506,4
w ø a	34,2	31,7	5,8	30,9	1507,5
w ø na	15,4	2	5,7	1	1

Table 2: Fund Metrics

ble have already been addressed in previous sections: despite a growing number of funds, the number of investments and trades implicate little network activity (Columns 1-5 and Rows 1-7). Few (large) funds dif-

[35]The distribution of performance fees across funds is attached in Figure 13 in Appendix II.

fer from this conclusion (Columns 1-5 and Rows 8-10). All findings are further addressed in the Discussion section.

Asset Universe The tradable asset universe consists of 16[36] ERC-20 tokens (as of June 2020)[37]. In order to analyze these assets, they have been grouped into one of three categories proposed by Schär (2020)[38]: The value of non-collateralized assets is entirely trust based, similar to

No collateral	Off-chain collateral	On-chain collateral
ANT	DGX	DAI
BAT	USDC	SAI
ENG*	USDT*	WETH
KNC	WBTC	
LINK		
MANA		
MKR		
MLN		
OMG*		
REN		
REP		
RLC		
ZRX		

Table 3: Asset Categorization

fiat currencies such as the USD which have no intrinsic value. The value of off-chain collateralized assets is secured, e.g. with a commodity in a vault (DGX token). The value of on-chain collateralized assets is secured through storage of the collateral in a smart contract, e.g. WETH is collateralized with ETH. As shown in Table 3, most ERC-20 tokens that are part of the tradable asset universe are non-collateralized.

Section 3.1 and paragraph *Policy* in section 2.2.3 have addressed the importance of diversifying as a risk mitigation measure in the context of fund management. Therefore, this section analyzes if and how di-

[36] Assets marked with * are no longer tradable on the MP.

[37] For details about the individual assets refer to *Melon Protocol Website* (n.d.).

[38] There are other proposals for categorizing assets, e.g. Mougayar (2017). The reader is encouraged to engage in own research.

versification can be achieved using the MP and its tradable asset universe and how it is practically achieved by the fund managers. Table 4 presents a correlation matrix of selected asset prices. For layout reasons, the ones that are not included are attached in Table 9 in Appendix III. As shown in the correlation matrix in Table 4, the collateralized to-

	ETH	ANT	LINK	MANA	DAI	REN	USDC	WBTC	RLC
ETH	1.0								
ANT	0.8	1.0							
LINK	0.9	0.8	1.0						
MANA	0.9	0.6	0.8	1.0					
DAI	-0.0	-0.0	-0.1	-0.1	1.0				
REN	0.7	0.7	0.7	0.5	-0.1	1.0			
USDC	0.1	0.2	0.2	0.2	1.0	0.1	1.0		
WBTC	0.7	0.8	0.9	0.9	0.0	0.8	0.1	1.0	
RLC	0.9	0.6	0.7	0.9	-0.0	0.4	0.2	0.7	1.0

Table 4: Correlation Matrix Asset Prices 1

kens (USDC, DAI) have evolved independently from the USDETH price. All non-collateralized tokens as well as WBTC highly correlate with the USDETH price, considering 0.5 being a medium and 0.8 being a strong positive linear correlation. Even though the tradable asset universe seems to offer 16 tokens with plenty opportunities to diversify and mitigate risk, it actually does not offer that many. Roughly grouping these tokens, two categories remain: collateralized tokens (USD pegged) as well as all other (correlated) tokens. Concluding, the means for diversification are very limited as of now, considering the small number of tradable assets in general and especially the correlation of assets within the existing asset universe. In fact, close to 80% of total AuM are represented by two assets, Wrapped Ether (48%) and Wrapped Bitcoin (30%), which confirms that diversification is limitedly being practiced by the fund managers.

Exchanges As of June 2020, the tradable asset universe can be traded on five DEXs. Taking into account that the DEXs have been integrated at different points in time, the weighted statistics show that Uniswap is

most frequently used[39] as shown in Figure 6.

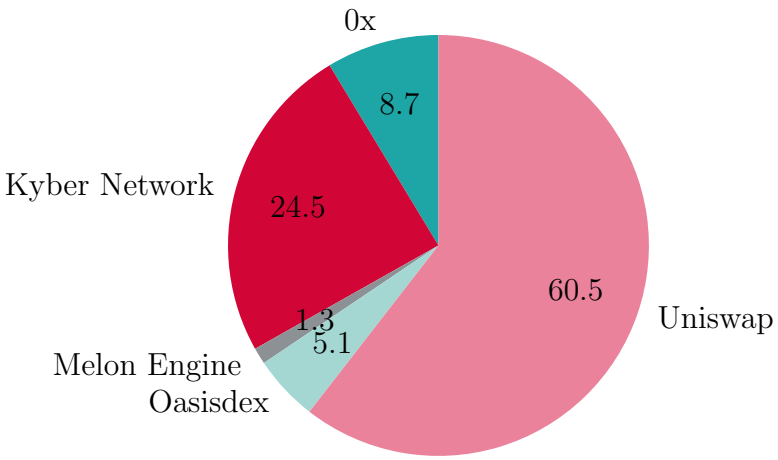

Figure 6: Relative Number of Trades per DEX Weighted with Time Elapsed since Integration of DEX

Having multiple DEXs linked to the MP can mitigate risk in the case of potential issues with individual DEXs. In addition, the overall liquidity than can be accessed by fund managers is increased. The integration of DEXs on a smart contract level is exemplary for both, the tremendous opportunities but also the risks of DeFi. DEXs in general deserve a separate in-depth analysis and comparison which is not further addressed in this paper. For more information on the main features of the different DEXs, refer to, e.g. Schär (2020).

[39]It is not considered that, e.g. Kyber has integrated Uniswap reserves, thus trades considered to be conducted via Kyber actually make use of Uniswap's reserves. The presented statistics are pulled from the Melon API.

4.2 Platform Participants: Cluster Analysis

Section 4.1 has shown that despite a growth in number of funds, general network activity is relatively low with few exceptions. Potential reasons are the (management) fee structure, and especially the limited and for the most part correlated asset universe. This section analyzes the actual network participants in more detail, intending to come up with additional indicators/explanations for the low network activity. The methodology for this analysis is described in the following section.

4.2.1 Data Retrieval and Analysis 2

As stated previously all transactions of network participants (investors and fund managers) can be publicly observed on the Ethereum Blockchain. The participants' unique identifiers are 42-digit public keys (Ethereum address) providing pseudonymity and making it very difficult to analyze individual addresses. Nevertheless, holistically analyzing the participants can be interesting in two ways: it can be analyzed *what* they are doing on the Ethereum Blockchain (besides using Melon) and with *whom* they interact. For example, by showing that most participants use many other (DeFi) protocols besides Melon, it could be assumed that most users are early adopters or DeFi/Blockchain enthusiasts. By showing, that most participants only use Melon, it could be assumed that they are somewhat related to Melon, e.g. for testing purposes. The *what* analysis is not covered in this paper.

Instead, with *whom* Melon users interact is analyzed in more detail, trying to discover connections or patterns between network participants and ideally being able to group them into various clusters. The methodology for this cluster analysis is explained moving forward. There are other approaches to clustering Ethereum addresses based on different features, however nothing has seemed appropriate to apply to this analysis. Again, the reader is encouraged to engage in own research if interested. Some suggestions include Price (2018), Day and Medvedev (2018), Braendgaard (2018), and O'Leary (2018).

Python Script	Data Source	Data Input	Data Output
1. Etherscan Scraper	Etherscan API	Address array No of transactions	JSON 1
2. Etherscan Excluder	Sourcecode Etherscan	JSON 1	JSON 2
3. Etherscan Analyzer	-	JSON 2	JSON 3
4. Fund Master	CoinGecko API ENS API Melon API	JSON3	All presented metrics

Figure 7: Data Retrieval and Analysis

Similarly to the Melon API, the Etherscan API is docked with a Python script, which queries, saves, and analyzes the data points. In this case, the analysis has shown to be more complex, thus multiple Python scripts are used. The data retrieval and analysis process is shown in Figure 7.

The first script named *Etherscan Scraper* queries a specified number of Ethereum Blockchain transactions for an address array (all fund managers[40].) from the MP in order to potentially uncover a direct transaction respectively connection between Fund Manager A and Fund Manager B. In order to be able to analyze indirect transactions, e.g. Fund Manager A to Ethereum address E to Fund Manager B, transactions for all fund managers plus two levels[41] are queried. This is displayed in Table 5:

The queried transaction data includes transaction hashes, transaction

[40]For generating a list of fund managers, the Melon API has been used

[41]E.g., if Fund Manager A has a direct transaction to Ethereum address E, all transactions for A and E are queried. If E has a direct transaction to Ethereum address F, all transactions for F are queried as well.

From	To	To	To	Connection
Man. A	Man. B			Level 0
Man. A	Eth. Address E	Man. B		Level 1
Man. A	Eth. Address E	Eth. Address F	Man. B	Level 2

Table 5: Direct and Indirect Connections: Level 0-2

senders, and transaction receivers[42]. In order to try and discover direct and indirect relations between fund managers, another script is used.

The third script *Etherscan Analyzer* analyzes direct and indirect relations between fund managers. Before being able to do so, the need to exclude certain addresses has evolved due to an erroneous inflation of indirect relations between fund managers. This inflation is caused by heavily used protocols such as centralized exchanges, DEXs, and token addresses. Whenever two Fund Managers have used, e.g. the same DEX, an indirect connection is mistakenly assumed. What makes this challenging is the fact, that the Ethereum Blockchain does not differentiate between wallet addresses[43], protocol addresses, or token addresses, i.e. they are all 42-digit addresses. This is where the second script comes into play: In order to exclude non-wallet addresses, the *Etherscan Excluder* accesses the source code of each queried address (except fund managers) and checks for one of the following three features:

- Public Name Tag
- Contract Addresses
- Token Tracker Page

Heavily used protocols typically have public name tags[44] and are created through the interplay of smart contracts. Tokens are labeled with a to-

[42]Due to the large amount of data that needs to be queried, this step has not been repeated since June 6, 2020. All funds deployed after this date (except for funds that are deployed by a fund manager who has deployed a fund previously with the same Ethereum address), are not considered in this analysis. As of June 18, 2020, this includes 15 out of 300 funds.

[43]*Wallet* in its literal sense, owned by an individual or entity,

[44]see *Etherscan Label Cloud* (n.d.)

ken tracker page. As shown in Appendix VI, labeled protocols, contract addresses, and token pages can be identified and thus differentiated[45], all remaining addresses are considered wallet addresses moving forward. This pragmatic approach certainly induces some mistakes, especially in the context of contract addresses, considering that an individual person or entity could choose to manage his/her/its wallet(s) with (a) smart contract(s) and then would mistakenly be removed. However, it is assumed that this approach rather deflates the amount of connections instead of (wrongly) inflating them, which is more desirable in regards to interpreting the results. Whenever a queried address has one of the three above mentioned features, it is added to a blacklist and all transactions including blacklisted addresses are deleted. In summary, the Etherscan Excluder cleans the first output file JSON 1 by deleting all transactions including blacklisted addresses and saves it as JSON 2.

The Etherscan analyzer discovers the connections between fund managers across multiple levels and merges them into clusters respectively. The cluster logic is described in more detail in section 4.2.2. The result of the analysis is saved in ouput file JSON 3.

The fourth and last script called Fund Master has already been described in section 4.1.1. The descriptive statistics gained from the Melon API are now extended with cluster information gained from Etherscan Scraper, Excluder, and Analyzer. More specifically, JSON 3 is used to add cluster information to the fund metrics. JSON 2 is used to graphically represent the clusters discovered by the Etherscan Analyzer. Additionally, the clustered addresses have been checked for domain names bought via ENS, trying to discover information that links addresses to people or entities. The results are presented in section 4.2.2.

[45] Considering that tokens are usually deployed using smart contracts, excluding token tracker pages may be redundant.

4.2.2 Results

Level 0 On Level 0, managers who have (a) direct transaction(s) between one another are added into a cluster. A possible interpretation is that the manager addresses belong to one person or entity (i.e. Manager A or Company A has two Ethereum addresses). In case Fund Manager B additionally has a transaction with Fund Manger C, Fund Manager C is added to the cluster, even though he does not have a direct transaction to Fund Manager A[46]. An example for the cluster logic is presented in Table 6. Applying this logic to all fund managers, 24 clusters with a number of

From	To	Cluster
Manager A	Manager B	
Manager B	Manager C	[Manager A, B, C, D]
Manager C	Manager D	

Table 6: Logic of Clustering: Level 0

members ranging between 2 and 12 have been identified, totally including 95 fund managers. The four largest clusters are displayed[47] in Figure 8. Every address is presented as a node connected to other nodes with edges whenever an Ethereum transaction from node A to node B has been detected. A translation list from Node IDs to Ethereum Addresses as well as a complete list of Level 0 Clusters can be found in Tables 10 and 11 in Appendix IV.

[46]This is exactly what happened with the *University of Basel* Cluster: MAMA (Multichain Asset Manager Association) funded ten teams within a class at the University of Basel to set up test funds. Even though all ten fund manager addresses did not have a direct transaction with each other, they all had one with the MAMA address which led to them all being grouped into one cluster (Cluster ID 0 in all Levels 0-2 (see Tables 11, 12, and 13 in Appendix IV)).

[47]All cluster figures have been created using networkx. For more details refer to *Network X Documentation* (n.d.).

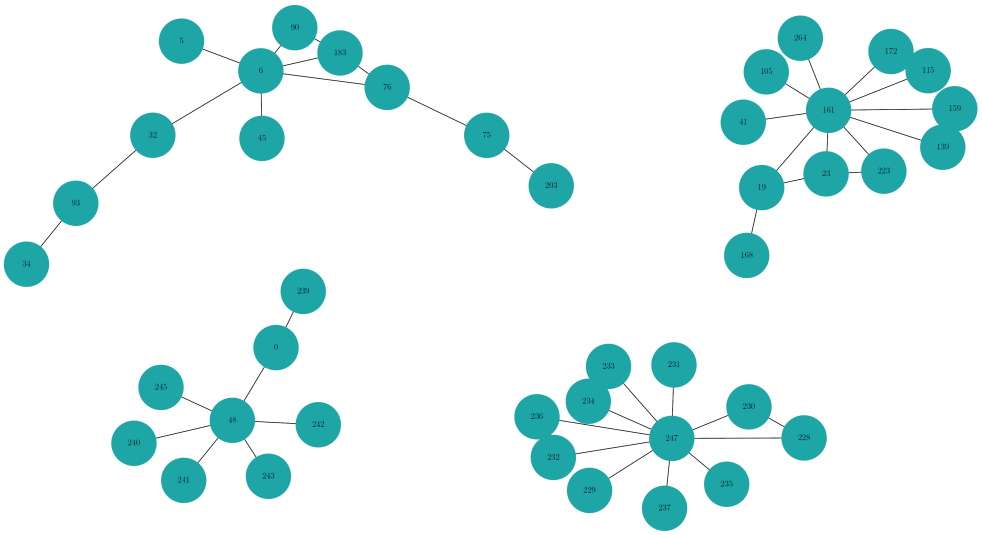

Figure 8: Four Largest Clusters Level 0. Node ID in black. Data Sources: Etherscan, Etherscan API, Melon API

Analyzing these clusters in more detail, Figures 8 and 9 show that the clusters are held together by few addresses in the centre of the cluster, connecting to multiple addresses. These results are further discussed in the Discussion section.

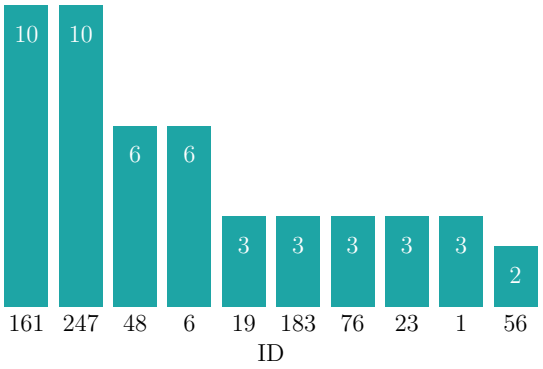

Figure 9: Top 10 Connected Nodes Level 0. Node ID in black, number of connections in white. Data Sources: Etherscan, Etherscan API, Melon API

Level 1 On Level 1, managers who have (an) indirect transaction(s) with one intermediate address between one another are added into a cluster. Again, a possible interpretation is that the addresses belong to one person or entity (i.e. Manager A or Company A has three Ethereum addresses) or that two fund managers are funded by a similar source, i.e. a person or entity[48].

The cluster logic is similar to Level 0 as presented in Table 7. In addition, Level 1 clusters are merged with Level 0 clusters[49]. Applying this logic to all fund managers, 18 clusters with a number of members ranging between 2 and 59 have been identified, totally including 115 fund managers. The

[48]Similar to the *University of Basel* example with the difference that the funding address is not a fund manager but an external Ethereum address.

[49]This may seem redundant, however, in case of the *University of Basel* example, MAMA is connected to all other cluster members, which in turn are not interconnected at all. In the Level 1 Analysis, which intends to discover connections across one external Ethereum address (which is not added to list of cluster members), MAMA is interpreted as a connecting address between other cluster members and therefore not added to the cluster. This issue can be solved with merging Level 0 and Level 1 clusters

From	To	Cluster
Manager A	Eth. address E	
Manager B	Eth. address E	[Manager A, B, C]
Manager C	Eth. address E	

Table 7: Logic of Clustering: Level 1

largest cluster is displayed in Figure 10, a complete list of Level 1 Clusters can be found in Table 12 in Appendix IV.

Analyzing this cluster in more detail, Figures 10 and 11 show that this cluster is held together by few addresses, connecting to many addresses. Fund managers are marked in mint, external addresses in grey. The results are further discussed in the Discussion section.

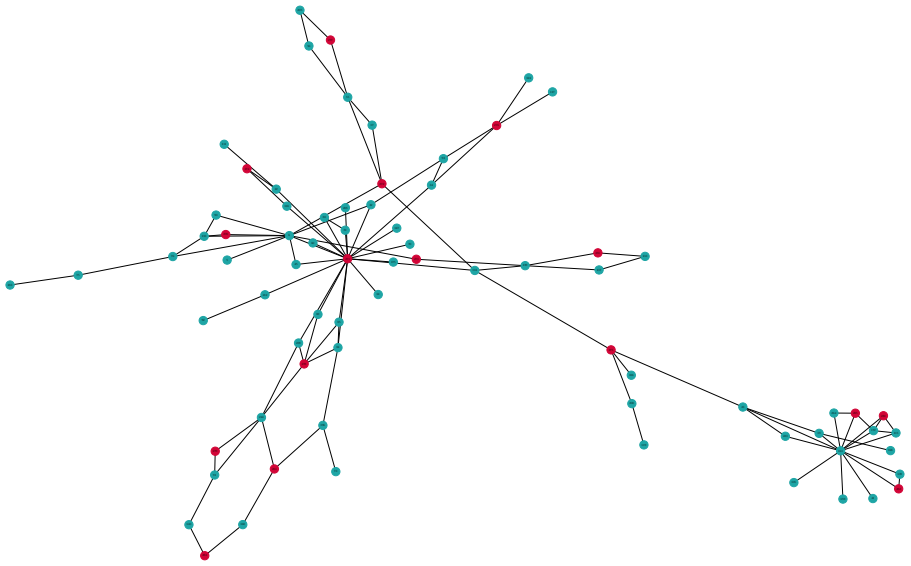

Figure 10: Largest Cluster Level 1. Node ID in black. Data Sources: Etherscan, Etherscan API, Melon API

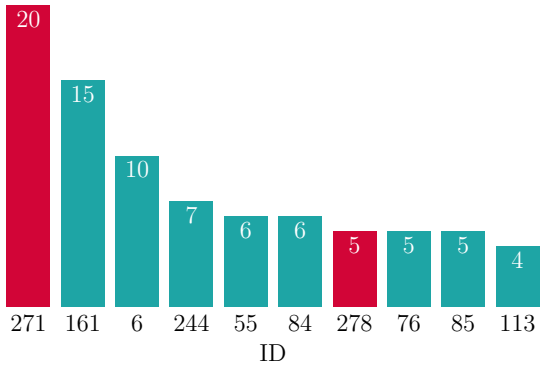

Figure 11: Top 10 Connected Nodes Level 1. Node ID in black, number of connections in white. Data Sources: Etherscan, Etherscan API, Melon API

Level 2 On Level 2, managers who have (an) indirect transaction(s) with two intermediate addresses between one another are added into a cluster. Interpreting such connections is more ambiguous than on the two previous levels, however such connections still indicate a likelihood of connected addresses being linked in "real-life", representing one person or entity, or being funded by similar sources.

The cluster logic is similar to Level 0 and 1 as presented in Table 8. Level 2 clusters are merged with Level 0 and Level 1 clusters for the reasons addressed in footnote 47. Applying this logic to all fund managers, 14

From	To	Cluster
Manager A	Eth. address E	
Manager B	Eth. address F	
Eth. address E	Eth. address F	[Manager A, B, C]
Eth. address F	Eth. address G	
Manager C	Eth. address G	

Table 8: Logic of Clustering: Level 2

clusters with a number of members ranging between 2 and 101 have been identified, totally including 151 fund managers. The largest cluster is displayed in Appendix IV in Figure 15 alongside Figure 16, displaying the mostly connected nodes. A complete list of Level 2 Clusters can also be found in Appendix IV in Table 13.

As already discussed, analyzing these connections is more ambiguous. Nevertheless, they suggest that the connection between fund managers is even higher than what is shown on previous levels, especially Figures 10 and 11 in paragraph Level 1.

Lastly, as addressed in 4.2.1, all clustered addresses are checked for domain names bought via ENS. For this, all Level 2 cluster members are used, which per definition include Level 0 and Level 1 cluster members. The goal is to identify domain names, providing indices for addresses being linked to people or entities. Ideally, the addresses at the centre of clusters, which are likely to be a funding source or similar, can be identified. Domain names that are looked for include, e.g. AvG, Melon, MT, MC, MP, and others. Even though 47 of the nodes possess 402 domains, none of the domain names matched the search criteria. The domain names are attached in Appendix V in Table 14.

Concluding this second part of the Data Analysis, the cluster analysis shows that network participants are closely connected to each other which is not visible at first sight or by querying the MP or MT. Many funds are likely to belong to few persons or entities, and/or many funds are funded by similar sources. Consequently, the presented fund metrics in section 4.1.2 need to be reinterpreted considering these new findings. Paired with the infancy of the MP, one possible interpretation is that the platform is (still) mainly used for testing. This is further addressed in the next section.

5 Discussion

The technical overview has shown that Melon is smoothly integrated into the five-layered DeFi stack. Melon has been live for 15 months and the numbers of funds as well as AuM have experienced growth for the most part. The new user interface (MT) intends to facilitate the user experience and interaction with the MP, with the goal of further fostering network growth. Projects building on top of Melon may induce network effects and also contribute to network growth.

The number of investments and trades, as well as the life-cycle analysis of the funds implicate little network activity. From an MC, token holder and Melon user perspective, this is not ideal considering that the value of the token is related to the usage of the network.

In the Introduction section, the importance of diversifying in order to gain uncorrelated returns has been emphasized as essential to portfolio management. The lack of diversity in the tradable asset universe could thus represent one of the reasons for the little activity. Haeems (2020) confirms this by stating that the biggest challenge for DeFi is the lack of investible assets on-chain: He assumes that assets, such as commodities, currencies, equities, derivatives, and others are soon going to be tokenized. El Isa (2017) also names projects dealing with the tokenization of art, music, intellectual property, and real estate, amongst others. El Isa (2020) concludes that the "future of assets or the future of finance is going to be a tokenized future", with every asset known today as well as new assets having a "tokenized form of some kind". Increasing the size and diversity of the tradable asset universe is likely to incentivize more trading activity. More active trading in turn would also justify the (management) fee structure and investors may be willing to pay such fees moving forward. Overall increased network activity in turn would likely benefit token holders and network users through the price of MLN. AvF's 3-year plan in Appendix I shows that the integration of additional assets is on the list of priorities.

The social network analysis of the Melon users has shown that they are

highly connected to each other. Level 0 has shown many direct relations between fund managers. Some of the relations were not surprising, because the fund names implicated a connection (e.g., *University of Basel* funds). Others however, did not show indices by just querying the MP or MT. The relation induces a high likelihood of addresses being jointly managed by few persons or entities or funds are being funded by one single source (e.g., *University of Basel* funds, funded by MAMA). Level 1 may be the most important finding of this data analysis. Despite Level 0 exposing more clusters than expected, Level 1 was able to even further cluster the fund managers, showing that up to 59 fund manager addresses are interlinked within one cluster (115 in total for Level 1). Level 2 suggests an even stronger link between fund managers with the biggest cluster including 101 fund managers. As already addressed, connections across two other addresses leave (a little) more room for interpretation. Nevertheless, Level 2 indicates that the actual concentration of fund managers is even higher than what is shown in Level 1.

One plausible explanation is that the MP is still mainly used for testing purposes. Considering the infancy of the platform and adding the fact that on-chain asset management is currently not well defined in regulations, this seems to be plausible. Exceptions such as the Rhino Fund, with high activity and value of AuM confirm the rule and suggest that few DeFi enthusiasts enjoy using the MP and its features. It is assumed that less active funds have been or are being used for testing purposes and active funds are managed by DeFi enthusiasts.

Despite improvement potential in network activity, Melon provides a solid technical set-up and an innovative decentralized Governance structure. Risks, such as the interdependency of DeFi layers building on top of each other need to be continuously assessed and mitigated as far as possible. Legislation, clearly defining the rules for on-chain asset management is going to be essential moving forward. Melon alongside others is strategically addressing this by collaborating with MAMA. Considering the high administrative costs in the traditional asset management world, on-chain asset management provides tremendous opportunities for the entire

value-chain. Overall, it is likely that the benefits have the potential to outweigh the risks.

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6 Appendix

Appendix I

3-Year Roadmap

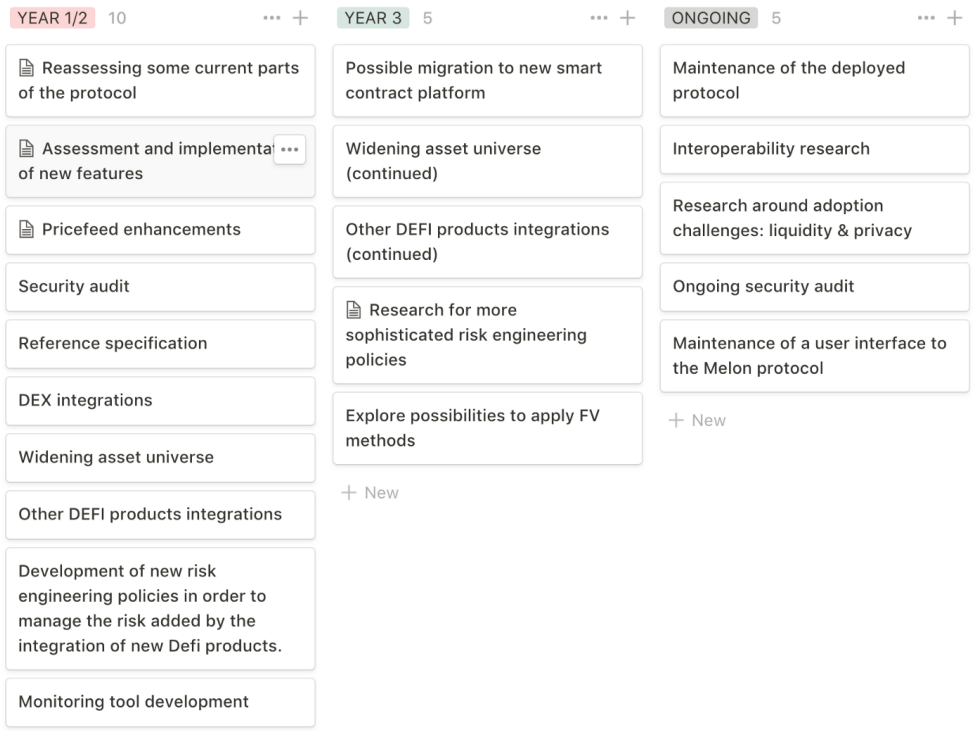

Figure 12: 3-Year Roadmap AvF. Source: AvF (2019)

Appendix II

Performance fee distribution across funds

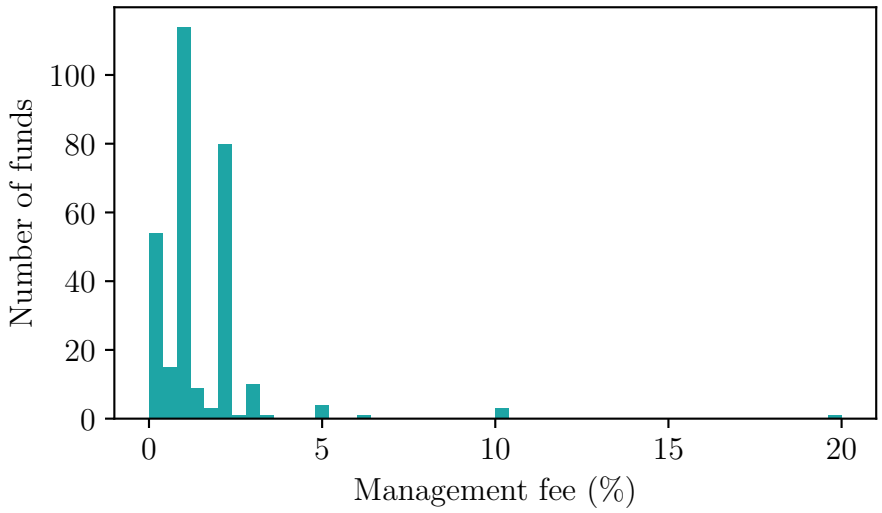

Figure 13: Performance Fee Distribution across Funds

Evolution of AuM

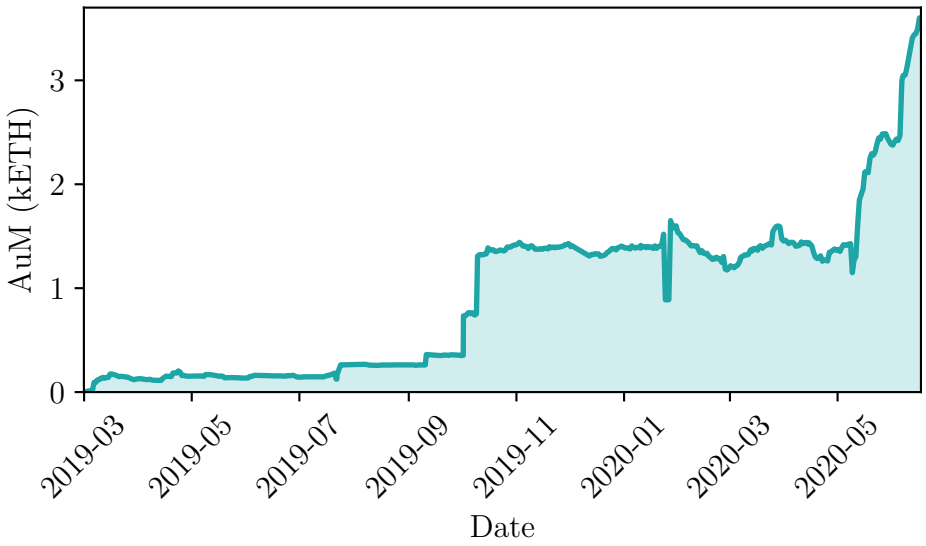

Figure 14: Evolution of AuM

Appendix III

List of Tokens

ANT Aragon Network Token

BAT Basic Attention Token

DAI Multi-Collateral Dai

DGX Digix Gold Token

KNC Kyber Network

LINK ChainLink

MANA Decentraland

MKR Maker Token

MLN Melon Token

REN Republic Project

REP Augur Reputation Token

RLC iExec Token

SAI Sai Stable Coin

USDC USD Coin

WBTC Wrapped Bitcoin

WETH Wrapped Ether

ZRX Ox Protocol Token

Correlation Matrix Asset Prices 2

	ETH	ZRX	REP	BAT	KNC	MKR	MLN	SAI
ETH	1.0							
ZRX	0.5	1.0						
REP	0.4	0.6	1.0					
BAT	0.6	0.7	0.8	1.0				
KNC	0.3	0.2	0.1	-0.1	1.0			
MKR	0.4	0.6	0.6	0.6	-0.4	1.0		
MLN	-0.1	0.3	0.5	0.2	-0.2	0.5	1.0	
SAI	0.2	0.3	-0.0	-0.0	0.6	-0.1	-0.2	1.0

Table 9: Correlation Matrix Asset Prices 2

Appendix IV

Node ID Ethereum Address translation list

Node ID	Ethereum Address	FM vs. Ext.
0	0x8ab60358b9b0015859724737fae48586644661d3	Fund Manager
1	0x2d8ff8b0ca5fa71439394e28cf7503093979a624	Fund Manager
2	0x32e14f0cf857506debfff26bb2f9d351b7ced23c	Fund Manager
3	0xc28e21b841487f6a50acbae4d09d7f4d4d012bcc	Fund Manager
4	0xfd89d3831c6973fb5ba0b82022142b54ad9e8d46	Fund Manager
5	0xc380e58c73ef0d37c28a1c56512c6c46eea7b9f8	Fund Manager
6	0xb0cd1c7d81c9a204d620aa2ee0ec85777d4ad817	Fund Manager
7	0xbd26f03131085dcb08bdeb6b70b84b82042c2f2c	Fund Manager
8	0xb6a01de0a603e09671ba1756c9e78170c2fee8c5	Fund Manager
9	0x97ed1654325a7cf52fc3f5ca25336b1646b3c39b	Fund Manager
10	0xe4d5027c3026674427c70e1fd6d54de8de1a383d	Fund Manager
11	0x8fdf9a7cf1f761edd912eeddf8a0dccab6ae63d5	Fund Manager
12	0x35b27437fdc7371458c26ba8bf8ef402a1916d0f	Fund Manager
13	0xa24f2e6dcbd2da9a220958401dab74b365bd34e1	Fund Manager
14	0x34fa4af2d182209956fa69d849953a4c0402002a	Fund Manager
15	0xe15aaa234b0245e40a60b726e38dd372f19cfcf4	Fund Manager
16	0xb1b5588775075f04024248d36b034faffbe14300	Fund Manager
17	0xc7c10a6f0dd8ba3c108e739b3e669d636550be72	Fund Manager
18	0x1161b70d1ddc964785189ab7cff5006cbbefab4e	Fund Manager
19	0xf8a180d8696fbed9b718d4b9c9875873b54d6cf0	Fund Manager
20	0xf4d9a2d0075e0f003410ae774456fbeeedd18c72	Fund Manager
21	0x9da17502d7105f9bf06b84b5ba1d163cea21f937	Fund Manager
22	0x57f001d6714347afd67f097d92f0ddf3da9d0174	Fund Manager
23	0x80d19c4c5d47aa7e8f815a2e12f7a7b13d3d774a	Fund Manager
24	0xef43fd69a291683a3b728667f70c4df1ca600d41	Fund Manager
25	0xaddb3aa06d23f1a7c873ebdc353124307690b4c9	Fund Manager
26	0x849375192d1dba1d6b120bcf149a1ce3f1afa0a5	Fund Manager
27	0x90a64ed7b118631520ac1d71f348ff213ca51817	Fund Manager
28	0x037b22bd2ed3df1e5bb8fbf7faa2feac9dda22b0	Fund Manager

Node ID	Ethereum Address	FM vs. Ext.
29	0x22f25976bf896d3b1d09d2a20dbdab4f39ceded8	Fund Manager
30	0xdbd98d9f2915888f8c3084f8a6d7ea1867d6a8e6	Fund Manager
31	0xb9d0f4802a7a1d4c3de825a9122f64c1ee401139	Fund Manager
32	0x39196195a59d4d6f477e66d6437dced435bfb482	Fund Manager
33	0x73df55055bd83d2b746792f0e9df65b254f929f9	Fund Manager
34	0x223cbc591999d8a9fce5f93f01d96b05cf6e58cb	Fund Manager
35	0xcf0368aafe3f9e9d89a5b194b493f13d1d61f96c	Fund Manager
36	0xa73557c2749fea5a185eae5facf9ef310c76ea6a	Fund Manager
37	0xb63504285cbb25094a43b93d4ac34d65ebfaa4c7	Fund Manager
38	0x95dd0df95ffae9c5e95976299ceb7230ea869cdc	Fund Manager
39	0x8f4c07878e9bb0c61baaefaa18738ead78005286	Fund Manager
40	0xf23515ac4c35b164675ba2244316ce2b2c70c988	Fund Manager
41	0x6982211707f584a3346e7af34e71d643878c4bc2	Fund Manager
42	0x427c8dde1e5f1b348110ee8bbd6655cf56ed957e	Fund Manager
43	0x0eeb363055576a326c53c14158167df345df34a8	Fund Manager
44	0xa00627ef775a0e8432a5667b586932e42ddccd4d	Fund Manager
45	0x837063a63f24780d14202b7a950866ad503caa8a	Fund Manager
46	0x605daaf43d31b56a0abdcf8aedbd4e9f74723aea	Fund Manager
47	0xfd4e7749ef6310980831ee271cca0ee5c4302c98	Fund Manager
48	0xa1179fb2f411d1c5b1e10b1658b61fd9e364253d	Fund Manager
49	0x6ffbd82a127a55097d8a4aec1d1bd034e4b7b475	Fund Manager
50	0x1cdc91be9153b27585ede842bd6c1abeb7252461	Fund Manager
51	0x3051af9312651aea6e6d8a7b7a80d25c5f1152e1	Fund Manager
52	0x333cf8eed546d0e12afd758efd0e4dc2f30f0793	Fund Manager
53	0x2d7d3c9fbe70f7bb7bb6c3bc251ef6809e47c3f4	Fund Manager
54	0x2d50ae8a797ec7085b8e4ed8c2f22afa6b9665d4	Fund Manager
55	0xd9dbcdf263a187cf49530f6e8a505ae001e47dae	Fund Manager
56	0x6d4f45fd7011827f07305c44e5621fa6cf737387	Fund Manager
57	0x1e696889e642b6e9f04f63dd28b2debfec87a2df	Fund Manager
58	0xee98fe37ede0f727aa73b42ea5f79a4789917937	Fund Manager
59	0xfd9ce79fd7f62ca88ace958cd2716f4cce25e2df	Fund Manager
60	0x960bb2943bec69737e3b57205193fdc426aee8c3	Fund Manager
61	0xbb440596bccebac55c889838bf6d6804e4f9d6e7	Fund Manager

Node ID	Ethereum Address	FM vs. Ext.
62	0x4b8f8a1a45d229c05e18cbe74c55104b89250ef1	Fund Manager
63	0x013697d826af4dbb6c65ee4f7ed55a32382edbf3	Fund Manager
64	0x512fce9b07ce64590849115ee6b32fd40ec0f5f3	Fund Manager
65	0x4463ea4e7a56511de8eff676a8167e993e4bd48c	Fund Manager
66	0x003cc017e32ca02e9657baf5a3a8c30a21700fd0	Fund Manager
67	0x31132888d62bbcf35b702123b8a8a37db411185a	Fund Manager
68	0xffe5437c1b64471797fad49ff5d68ce330bcf439	Fund Manager
69	0xa41b3fd123dbbee022607e862e731f168d122b35	Fund Manager
70	0x02a13176cf74e9a2fda3e92acfb9f522e3805641	Fund Manager
71	0x5c56a26695585c5e9849c09367c694b711cedce4	Fund Manager
72	0x4a455167c7c6b2a19ccf4df017903850e0ae4b55	Fund Manager
73	0x32d731fe3857586fbbb1586cc92e1447b88ecf9f	Fund Manager
74	0xc480c3fd10d8965eb74b9b53ee65bea24b2a6a73	Fund Manager
75	0xe5fd31e9028f156396cf0b37833fc449fd3bfe57	Fund Manager
76	0x0d947d68f583e8b23ff816df9ff3f23a8cfd7496	Fund Manager
77	0xc6f8a87dc6b52cbe3bea8b27b68eed39b9ea3b8a	Fund Manager
78	0xa65e7063f9f527ce14cde8836cf038067117d224	Fund Manager
79	0x92a52d656bea45ba6b6dca91c829e306193a3808	Fund Manager
80	0xb351b1f965b6ba08177f78137f31d96186ee3d22	Fund Manager
81	0xcb01d8d7b0bf413b8e2f6948733e3427e94e79c5	Fund Manager
82	0x2563b350ba50111b9907289ec99b45fc5d72f15c	Fund Manager
83	0x44fd6089860dc902d47accf7fc193b013094a4de	Fund Manager
84	0x8a2da4fc8c6854be3f754f8dddd37a2b9d69c8c2	Fund Manager
85	0xc3c35a2350b7d45dde59850cd33096ff12e2e2ce	Fund Manager
86	0xa8bcf24122c87e2f8367bb368bf91efb92e19f06	Fund Manager
87	0x8d8db6f2441a2256a3a57fc87a84c6f46ba69214	Fund Manager
88	0x2b7a52bf4e306cc8372a74b8f4608cf3421b1a55	Fund Manager
89	0x75d97e7ab7857a82f099664a24af3502caa20200	Fund Manager
90	0xa013935d76d4185b3fcf81533923e7960ec3d295	Fund Manager
91	0xb2c3544ac574a12c3224b8c743b3092c2bd9170a	Fund Manager
92	0xa20b86d0080d36cc156fa9f982846f75c84a405a	Fund Manager
93	0xd44b78fdebd874397dbb35a6658d29bc42fa6415	Fund Manager
94	0x75b6b138549b32a142014dd5e2757b9e6d77e6b2	Fund Manager

Node ID	Ethereum Address	FM vs. Ext.
95	0x5b7116fbba614df65d5859f29503b58e318029b3	Fund Manager
96	0xca81319a0576854c2e8a9903a9c4f37bf42ebbd3	Fund Manager
97	0xd1b265540a34f845308f9f4dd837bcc89261fce6	Fund Manager
98	0x1f0aef221b865213af9214cd6b4debfbc4ec4c1d	Fund Manager
99	0x4b3662501d5c89ba5b1253dfa0e0bb8c5f4f8252	Fund Manager
100	0x4c6391d809fc4112b932924ef78ef2526e857dbf	Fund Manager
101	0x885b239d48ebc59049df3865c1142a1314f52f87	Fund Manager
102	0x1c6ed32cb611e658133a62416f82c19b8b536ddc	Fund Manager
103	0x31026b483ce8b61ca0acdbe7cb96fd8b83246406	Fund Manager
104	0x5c586be9fe43d029cd8d4d73431da64db81d273f	Fund Manager
105	0xcbd4a2025dd210c9868d052f80d682de198c8bfc	Fund Manager
106	0x1c08b02348f4f713d3a25a220a430cedc4835013	Fund Manager
107	0x6408733a54578b583dfd169eb649114b9fd114fa	Fund Manager
108	0xcd8ff627d21a4d2a67fb10f849f2e3454770bcd1	Fund Manager
109	0x3bc1f674afcfb012f189e9969871c5d0ad1443fc	Fund Manager
110	0x1e1c1ba503cc84b1bcf0151c68a8b5ddc90e4a2e	Fund Manager
111	0x2483c1bc0e283a97e4c30c12d05d9db58d145aba	Fund Manager
112	0x09a66115645c2c39902c50bad6c18a5141906a69	Fund Manager
113	0x383221b7eb063bb83866c9b98e3e4773ea53aa2c	Fund Manager
114	0xd7f2577e15dd5cfeb57072f59ed14732f5ee18a9	Fund Manager
115	0x6469ef4d0d8ed54c461bdad4dd5f9e3b950ada0d	Fund Manager
116	0xbddfd8f68b6d2c92ed6847d6f6a3d0505bb5e5de	Fund Manager
117	0xf56cd3a44420b07c782d95f19fa4de7c99d91a91	Fund Manager
118	0x06a6310120cde2c4032ef973989f3b2c6405bcd9	Fund Manager
119	0x67b235199692cc88f22438fab73ae9378f67fd07	Fund Manager
120	0x05e3fddf871bcba3f0651fb01fd0d621ad087be2	Fund Manager
121	0xea67b806671b262650fea7619588a71bd63bcc89	Fund Manager
122	0x8e21459e973012d923ccc2572fad1da5725ad3a8	Fund Manager
123	0x759ab7fba0a95670b0b9ee2c6de376ab34d7603a	Fund Manager
124	0x6ba587d25f2ebb4401f8da0f754b195560586846	Fund Manager
125	0xedfba88a49598350c44add31e527ba26d70bf811	Fund Manager
126	0x8aca2902dbc766c2d5a5a335c37139de2cdbc280	Fund Manager
127	0xca105c17941f772e050ab8984c9e45f6b72a84db	Fund Manager

Node ID	Ethereum Address	FM vs. Ext.
128	0xef4b55e0dee0d3fbae4cd3830bfe4eaec600c273	Fund Manager
129	0x576695dd636389323fbdf285ccd5000cb4abebca	Fund Manager
130	0xbee1478aa0e827b8f509d9a5c2788d8761650420	Fund Manager
131	0x30887fc55cbfad3487cb55bfe1779f6d2ba1c118	Fund Manager
132	0x7505223c6566fe04bd8de3c47faf787a3123b16d	Fund Manager
133	0x6061dfa74bf61f33f328dbb7f32d806f46781a10	Fund Manager
134	0x64fbab09de77523b933ebea0ebb645adcdc565f3	Fund Manager
135	0x487e374a8df5d8c95cacadc4618674680d6c8f70	Fund Manager
136	0xe31f6c2bd4650a03bb9a061c833837657f112818	Fund Manager
137	0x434096bc38a98d029956b18144f6d5b8520be62b	Fund Manager
138	0x1fbabda22de319a208358f3d31cb7b6cc049b903	Fund Manager
139	0x66b894ce2c8ff9bf9be4706f7729996e347acf8f	Fund Manager
140	0xe8e7f4257ccb985791647310b83fa5d54f802870	Fund Manager
141	0x4c1ca681f090a42af7fddef4262349dd2ad43e42	Fund Manager
142	0x9e4f52e090e5dde9b8a8c05d254966316f92c094	Fund Manager
143	0xeb708237592a02b2d8079fe47ed012209b91a158	Fund Manager
144	0xd01370312cdf3e44fbafd9650feb142ac0ae95e8	Fund Manager
145	0x1b1546062f9d70342b453a469d7c62b658065428	Fund Manager
146	0xf906eb6486bebe7cdee92dbf7dc52df2d04744b3	Fund Manager
147	0xefcc619eaca60a66f57696a22cbe5fcf0e191a2c	Fund Manager
148	0x7a2ad80a6bdfa23164c3f40b3ad3abf44b179ba3	Fund Manager
149	0xfe9fe8c9e227875d0f5dfebe147b22c91e52818f	Fund Manager
150	0x8c7cd5c6eb69aea85d645e734c79d0072baf0421	Fund Manager
151	0x22579eebee9be963bcbd688ee80845c1a031390a	Fund Manager
152	0x012e01e9b8b5f42529bbc18c5f48050cc80711fe	Fund Manager
153	0x369987decd26db2b72c1218ea6692b79fde04d24	Fund Manager
154	0x206b46b9b82e056dfd40973c37fef740345b759c	Fund Manager
155	0x422ddaafbb305071291888507d3e5502ac13cd86	Fund Manager
156	0x1f4ce6ce735dc9752e317aba6e759a278712890a	Fund Manager
157	0xffe17b93d5b44c67c6e3616dd3e95be1bf390efc	Fund Manager
158	0x41647a74673c90f4a13884bee4f8a89034fb85e8	Fund Manager
159	0x09273554a3c588b0a306371d7064c4b8e5bec3d2	Fund Manager
160	0x319a056425afb13e9e4186c88c9a2116d9452963	Fund Manager

Node ID	Ethereum Address	FM vs. Ext.
161	0x16168ecece0ba13df42c1f0cc06a709c2b3d14f	Fund Manager
162	0xe740475f603f57f094803a8c4a8c1279b6df4068	Fund Manager
163	0x3d20f1db694995d4ea6c1cb13f4c391f292808fd	Fund Manager
164	0x94a468fcb53a043bf5cd95ef21892e02c71134be	Fund Manager
165	0x5648d18a9f3e992f09095976d7e5d9f52870eedf	Fund Manager
166	0xce3696f3b57db19e5ebe014aa2d5636e87f9f22d	Fund Manager
167	0xc463029561171fa5cdb7e3a9433b1fb631e78d4e	Fund Manager
168	0xaed0672041311d8b9a49740dfe3c6d21be707dbe	Fund Manager
169	0xe7341969114021ed8738ab89c620f67115c6dbbf	Fund Manager
170	0xb125bdcaa9f595fdc84e854bf9462ac6d462b1e5	Fund Manager
171	0x2482dc04ac628a4b2700c071bfee557fd86c91ea	Fund Manager
172	0x42526af3269d0ee8ebb56eadaa68eb2f46d6d8c1	Fund Manager
173	0x119ac0356b561a2558861d042c10970f057fe529	Fund Manager
174	0xfe0992ca6c5b43c25657c829804a2bbad73cc063	Fund Manager
175	0x813c6d2a81007fa026b661cb49bc04031e65d41b	Fund Manager
176	0x58c88f6a8a61e982701088992e39e0b062ba2608	Fund Manager
177	0xa0453d0caf9444697986a5173f4fe5cffc04c1f6	Fund Manager
178	0x27c83d130e961d35648ec852fbc05c5ab7e3024a	Fund Manager
179	0x5b670a7a6d2952aa3ca34becfc79cd66da1a1d5f	Fund Manager
180	0xc247fe247fa459ffa26150dba041842a56407a9b	Fund Manager
181	0x17d1f4737fd499a58944c4532e790ee6a1c1a505	Fund Manager
182	0x2fb376814f8005e5f468505535bc9df119174e07	Fund Manager
183	0x21c0d2190f21390206ac1610c64f83b848059f4a	Fund Manager
184	0x4ad4f9e23a1fedfddc466382ad0db9cac33c5993	Fund Manager
185	0xcf2666b511fcc974964e8e90bce3fdef019ac84b	Fund Manager
186	0x91ccf7b1b327c947dc27ed1961dad33e290a325b	Fund Manager
187	0x978cc856357946f980fba68db3b7f0d72e570da8	Fund Manager
188	0xf28b3c734a30af72085208282226cd4d1196dede	Fund Manager
189	0x68358c5e28366aa9bd5a833cd8727e92f3acb108	Fund Manager
190	0x497eb3328a16e88d86e2d696082f288c82292813	Fund Manager
191	0x044c53d8576d4d700e6327c954f88388ee03b8db	Fund Manager
192	0x6c96854fab081ac23936d8f49bab246df9a5ee9a	Fund Manager
193	0x2f5859eafe0a10c2df0218183fe2526b3684bfe8	Fund Manager

Node ID	Ethereum Address	FM vs. Ext.
194	0x8a333a18b924554d6e83ef9e9944de6260f61d3b	Fund Manager
195	0x5e2b00e76b9ec64c1023299e679ad0cfc17dc26a	Fund Manager
196	0x80fc426cde39f5319434cc1533c3867140b9fd75	Fund Manager
197	0xd9a4cbde8fa41d35ae3e420e248bb106e0215880	Fund Manager
198	0xcae14ec6fef79297530f73c417b0326efb09772d	Fund Manager
199	0xaafcffc44f6f62dd8ca9bf94b3fbe7fc847accd5	Fund Manager
200	0x307012a4904267fd20c117bb71dc61c3e505d3f6	Fund Manager
201	0x5a486a0b8a6aeea044bfb3b895ff253e1b033baf	Fund Manager
202	0x205b73abd95a054205d637315797416544505 80d	Fund Manager
203	0x8b56892abc5ee91684114f4d0dd76e5d503dca75	Fund Manager
204	0x3b462bc67de63b6a731c31ca46ab79b94dc9b143	Fund Manager
205	0x3f6269cc4c27516f423673b257eaf4eadc8a8cc4	Fund Manager
206	0xdf9322fb774a7a9c999a8a98a0d82b28441a4363	Fund Manager
207	0xac1cdd29b1e673f576c983eda1542484f98c42df	Fund Manager
208	0x40b9edb151a3d935ca6adbb2384356e2bbeb99db	Fund Manager
209	0x23816b6481f6ee61cad37efea79745b0e186bc4b	Fund Manager
210	0xb109b37202440206af692df4b17aef885668844b	Fund Manager
211	0x2f342f8998468a5ac1677da485e98d33541ddf29	Fund Manager
212	0xcfc24b3d0ff80d0c3709a634623cc44d340f6fe1	Fund Manager
213	0xe4a51e578ba18254d892e0eb74d758afe6fefac1	Fund Manager
214	0xc2954f5752c5bf0f5630dc5b902b69ca09fd5211	Fund Manager
215	0x68b24f2d29907b0b836a2526a46269cd8869050a	Fund Manager
216	0x3e0cf03f718520f30300266dcf4db50ba12d3331	Fund Manager
217	0x3b0137f37333ee2c724b6d4d9be9961a27b20b92	Fund Manager
218	0xa1c30793820d44e3ff61473da56b6944c6172270	Fund Manager
219	0x12e00ac6397aac62c7aff43667c6304bf184098a	Fund Manager
220	0x5c76c5f815726ab061640d8d5c09189eb22e8adb	Fund Manager
221	0x370ceca4fc1287ed99924bba76259f6c771a6022	Fund Manager
222	0xa97ebecdf64696ebda64191df35687dc2b05b2b2	Fund Manager
223	0x17edde2dda64d2a7e92ab4619c785b44727d340b	Fund Manager
224	0xd85921bef9e4adccd68f04f29c6d31b7093bbe77	Fund Manager
225	0x4ada1b9d9fe28abd9585f58cfeed2169a39e1c6b	Fund Manager
226	0xc94d327dcee43949fef61dbef783286a2d039324	Fund Manager

Node ID	Ethereum Address	FM vs. Ext.
227	0x30665efa92f5f6b4da7dd4831fb656a1dc800ecf	Fund Manager
228	0xabcf5bdfe7b75b35b8d1c9c3b97d4f9c2415194f	Fund Manager
229	0x992c9cd378def531b647696a28c42f9b4977187c	Fund Manager
230	0x550844aa8ca726ef4a2defeb1015ebc63590f39b	Fund Manager
231	0x57eccef5b248035bfdf74587ebb0210e368ecee3	Fund Manager
232	0x105714415ed6d73c8b72d2759748af9d6085acf9	Fund Manager
233	0xd80ecfe23af371bbbb8641b35e989a465db326af	Fund Manager
234	0x5b0c336ee4de1c596d322defda8dda650a134816	Fund Manager
235	0xb96d24ce9bcf7fe6343915fc2b4a015e29f03912	Fund Manager
236	0xc17a7fd5565b0010b80ad20d099c84936cdcc580	Fund Manager
237	0x3821fd8197ecad7bb29ec29247bbe3891de2d7b4	Fund Manager
238	0xe5818d70a9b5aed2bfde4e41fbcb07dd80f8fc84	Fund Manager
239	0xf5cd58dc65b81c661fe63a9c88d291d26bb0af9f	Fund Manager
240	0x13552ebe89db737ce886d12a3b16ff961ba3e296	Fund Manager
241	0xb923d992a5115731592df6b202796b71e05ed9f8	Fund Manager
242	0x92f5aef4e3306e4514fc85bfc67c872a39cdaf15	Fund Manager
243	0x1673646145dca5b57b676753d74442eb61bfe9d8	Fund Manager
244	0xdb1abe0904ad35052ca5ef29b56d9518e2bae9f4	Fund Manager
245	0x2e23c1b89f5ce1a4081bd8a2c2eaf5f7d248ca0c	Fund Manager
246	0x4cf1fc305dfb17e01fd47a16e65bdc980f7e451d	Fund Manager
247	0x9630387f2b0f382f64f2107f4e49ab872abc759a	Fund Manager
248	0x3b2dfdd48b5b474bb2746e58c51ead2c61990e74	Fund Manager
249	0xbf5393793fd8cc48cdb978f7665b161234c389d6	Fund Manager
250	0x4a5b2f95e31734cd65607aa55362f1c857ac3a07	Fund Manager
251	0xab947d08ec72458d103fe736ee8a989a40bc0a5f	Fund Manager
252	0x7c578237563aaf26f5c2b28241a30388900c31ec	Fund Manager
253	0x0497763e7e93dcadbc81eb2930c6ddc113dfecc5	Fund Manager
254	0x91c37f3608898ad174f3e9e47503eaac22983f02	Fund Manager
255	0x96474c340aec29491c470d997fe6f9e7f71c4e4e	Fund Manager
256	0x954957c811facfe062ce05b5b3a39264e153962a	Fund Manager
257	0x0f10f27fbe3622e7d4bdf1f141c6e50ed8845af6	Fund Manager
258	0x7c4401ae98f12ef6de39ae24cf9fc51f80eba16b	Fund Manager
259	0x30ccdea3912576a2de0e99e48c95e1ee9772489c	Fund Manager

Node ID	Ethereum Address	FM vs. Ext.
260	0xf31b066cb8362cbf8e70062cdb9a6bfd32fecece	Fund Manager
261	0x59a5a9f9325130fb6eaade6e77b092d04e1cef08	Fund Manager
262	0x980548615bc35a1bd5281a0b58d0b24d4a723e3c	Fund Manager
263	0xa1bd817e13ed6bb524ed491cff76c83afec773ac	Fund Manager
264	0x036ca8b5bb89533fd06e0a35b9da10213da98d88	Fund Manager
265	0x071f61d280f43ba819528f4a59f6f79642dc858b	Fund Manager
266	0xaaf289f51010e20d33723b6f3a71d3da4067db46	Fund Manager
267	0x586cdc28fd8b8f5b6cc6e0912c9b77502c35db36	Fund Manager
268	0x73d5bb23390693a56340543de5ab164bade3f8e5	Fund Manager
269	0xa708a9f4291162ffa28b64744f70b8338e385bf5	Fund Manager
270	0x6734386d6a8b370f5eb13b91ee8d81f85c32d78a	External Address
271	0x7e5e402012c92b4d038667ac213abb7e3912971c	External Address
272	0x904d67de70f1ba8ec6f9a575fbd4bf2c568d7a11	External Address
273	0xa1a2992ac63f7b14ccda14a2bf502b53d1a89843	External Address
274	0x005569c7a3f08bad4aa27a7ca7cc13bde1286f32	External Address
275	0x221881bb081503a7709ea066a3bf542867ad1ea0	External Address
276	0xb86cd9142c8b5567bff195835133a407f976de4b	External Address
277	0xe538a621a76ae4498d494f24a5620c3b8de6f90b	External Address
278	0x2e7766b83feacdfe9f81c137442870f6408ed1c3	External Address
279	0x66e6c282a304ceed7a08828b7e5958b788430fa0	External Address
280	0xc25048680b2d72ba7459c103d781a571a5ead74e	External Address
281	0x300973a61475a9cec39d156e81155484b88784bf	External Address
282	0x347c59b15272f444f6149e3bc50fba4eb99e12fe	External Address
283	0x09e7c867026a6400ff4fd98736c9aa0fd85abd34	External Address
284	0x10031a8001d7ac0bf507cad46ff5e835c339d89a	External Address
285	0x2ad0ff197f939822b6cd1f91d3e32b9c74382016	External Address
286	0x6e25f352ecad47eacf148abccc075ae30d89ba72	External Address
287	0x13d81922982bcf239231443e2ff2099cfccf9b13	External Address
288	0xee2bb8598725445b532bdb14f522a99e04e84b38	External Address
289	0x930109d55445478a57ab3e3fb1ede4f64e49e291	External Address
290	0x933427b25d4b945c7b4509234d75e4a7c2b70507	External Address
291	0xee90ce56e68b011fc1b9e84aac62156b8c27763f	External Address
292	0xbfede1b62b66138ba3485711e8957e2b7d4549df	External Address

Node ID	Ethereum Address	FM vs. Ext.
293	0x757fb883fe3d52f7af7b00510f2c481497026333	External Address
294	0x48e194d84396a712257e7c8b9814d819dd7c7b44	External Address
295	0x3c209c7457204e7437bad03e68e724905489317d	External Address
296	0x69f965cc782c40cab434568b7d0325bb564d4835	External Address
297	0xa5aa62456bbb2fa88784591e7b3d8eee09d59321	External Address
298	0x67785bad6248414e57e42dae2ecb4dd63add5802	External Address
299	0x894139e8a081b1feecf03481e3987b7626953a48	External Address
300	0x4ce3004366ee121a2eca149bc6e8b3af40b33ce2	External Address
301	0xa798dbabc63fda829c5ee9fbd9aa10bb67f42b75	External Address
302	0xb3c0738da72a4766659ddaf8981c40e867ad2277	External Address
303	0xeea30ea8149f0ea32488dee2fee26cd620d9756a	External Address
304	0x2b9bd73745e010eac3a774511c3fd992b2551c32	External Address
305	0x1718167815ff4a8a395e3ade3b0d6595bde0d370	External Address
306	0x4c34ae54dc716808e94af3d1d638b8ea3a23fa9b	External Address
307	0x4b9b2c0125443dd560b9853e7416cef9ea40e645	External Address
308	0x51661ece8190cb826b4366848179c6e93dda291c	External Address
309	0x9cbfe6ff994401e07bf586e4627b3eeb67e43a0c	External Address
310	0x9580cc834a01d80a39bd470440711dd975d58545	External Address
311	0xc2a3cf22213990ecf7892d53623964c60ef54523	External Address
312	0x9f5304da62a5408416ea58a17a92611019bd5ce3	External Address
313	0xd6f46475ae01a6e8ca0f45d4137f2404ba63ede1	External Address
314	0x230ba7ce19455a72f4932b2e191140ad4532fe92	External Address
315	0x0f6ee005bb5bda84fbdb4ea1a4b5c591454c521f	External Address
316	0x7fd4ffeb5c0fe63b34fd0813658573b68e038d00	External Address
317	0xb0804b6dbe7159bddc1b6c9c00c796d94eee1858	External Address
318	0xbef07f3928bdbaa7095b9b06bd5330b25b0a2371	External Address
319	0x0010e77665415c63e47bbe3dac8a0859f10cb525	External Address
320	0x3d2d280b96995fbf33d7df7e570da2bcba96d4d6	External Address
321	0xc7ccffc8564f4dca626f0ae10501c39efd939294	External Address
322	0x246aab384fc80710bb1380293c466e16484892cd	External Address
323	0xde86e7bcd6a1d5898ccc2694fd80026a9f054b7f	External Address
324	0x33538b3808aa60f88d9564bc93e2f70b51e79a55	External Address
325	0xe315bf91955f5427c30afe8a10f854f1a13deab2	External Address

Node ID	Ethereum Address	FM vs. Ext.
326	0xbd9aa5c645b141424752ac94804d1bac8ba7f6ed	External Address
327	0xc986893af2e429728492a807b93a4d9bef9e931a	External Address
328	0x694e6bdf38831ed5dd4cb6583437b5f0aa86a727	External Address
329	0x2b15f489c0fbe7790cb7b32ff4bca00f7225e5af	External Address
330	0x2f9d3a8dca5834c011aef326e60e5eb74e6304ca	External Address
331	0xe2b752d534440d9365981d166ead4683f6415a18	External Address
332	0x40fd4df6a926a3085a91fa9e5071e850abba2048	External Address
333	0xb520673dd448975d77703af83ed1e5fbd03d8000	External Address
334	0xe4fc88b724cc623e584d45da9dc6edb1baee71a2	External Address
335	0x551423cd9f4ecf18a238175b491fa146614c455d	External Address
336	0xa5e1e5d11a70db7a0f79d32ecc7d11c3d23fdc49	External Address
337	0xb5bb1feeff8835b64946c496ba6b2160856de991	External Address
338	0x90428921d5a9fad1f7cccc5c174948f3c488f78b	External Address
339	0x5494c0523bdf6bfa427a68513dcdd1d0a5e35bed	External Address
340	0x1f4171cb6366dcdf1c24d98e1ade5b955a1eaa05	External Address
341	0x2dd6760f98bdbb51ce69ebede44674292f4f7fa4	External Address
342	0xbd42a461cc98c4ecca7254a1d5b9db6665c30ed6	External Address
343	0x5968e04d6ac750a1ec338a46dd88101fb9b7ad87	External Address
344	0x2f70305965cc71bcc6f00c6253282fe33a3170a2	External Address
345	0xfd7c450df95b4aca3aca6aaecf6a5848fff6c2c4	External Address
346	0x3fd312c95fd753ed290650a56dc17bdee9aa3a8c	External Address
347	0xa99b739f9b3f77872493212f3dcd7dcc0997a41c	External Address
348	0x3a39fcce56caddef5865e5ab47ea6b5527cbadc2	External Address
349	0xd48e86e3d622a5f74f13934d9613212ed2367eb2	External Address
350	0x66a1ca6553a01fedf175934c08741804b07fd2c8	External Address
351	0xc77244f53187f562d89a708c1515acb8fb49e1d6	External Address
352	0x31de2bcec79d1d29e6be9903796ef5df619e37e8	External Address
353	0x9429fb11c08dfbbf2f54ee57e829f87c27557e76	External Address
354	0x22cb67982e4a951f12319fbb6d9aaadd26165a50	External Address
355	0xdf4b6fb700c428476bd3c02e6fa83e110741145b	External Address
356	0x88f4602b2fc06acc890aea6de5ce71428af5c770	External Address
357	0x5f16de7acfe9e6c695d86cd7791fe14aed19c18b	External Address
358	0x86498c73a01746cb1ebd294d278d77b25e998701	External Address

Node ID	Ethereum Address	FM vs. Ext.
359	0x8af84aa1d022f74eb99a6c792a571b413ecbea4b	External Address
360	0x20e0e3756374179c5d71d122203bb7d8a75fb2f9	External Address
361	0x92dee2afb6ab02270f4cc7d0e203480812c0b18f	External Address
362	0x645f9ea9f6662eb77a9c5bed33d8fd79ae13d91d	External Address
363	0x29805484336e34e324284e4b7c264dd3fe422c72	External Address
364	0x3644b986b3f5ba3cb8d5627a22465942f8e06d09	External Address
365	0x317e6777ef5d312471071b596fffb9253cd5e858	External Address
366	0x9990e29f8e998d699b787506fbca67ba8dde87a3	External Address
367	0x30e14a1f2371af78657c5f4bcc75faa3acf59a5c	External Address
368	0x41d57e163b6c64fca2cd6535fcaa199b1fedd98b	External Address
369	0x28b9edc844abfa3b56ad85fcbd46229fee2cdfd2	External Address
370	0xb83488322899d7e039bcec4f2cb6ee7b88303a4b	External Address
371	0x1754069120821fa76a0ee01e24365a7af537c568	External Address
372	0xefabfec7019e4d45007fb430413cf3573d466751	External Address
373	0x5582ef1846f5233c718e37d217f9b661673d5626	External Address
374	0x3e7614cecc9f27812848eafeb80ac14a08c6e183	External Address
375	0x97755c14004568e2c6bfaf2ae9b32489d5c28cf1	External Address
376	0x3efd3391a0601eaa093647f911c653d77c11e3fd	External Address
377	0xbea6be72eb1a6492372caee485eea6296335559a	External Address
378	0x166bb3be1420f577f18e8fc6f107c5687e7d122d	External Address
379	0xe384881103c7c1195167aafad338ac17a06bb3bf	External Address
380	0xedd080af2e2cf913d13040243c4ec8594ee2cf66	External Address
381	0x4643fccaa6bf5bd9f48b714371ab46a1c9a58bea	External Address
382	0x214a86926b8c1a70b19d023a47a977de543accdf	External Address
383	0x5788ea016734ed1e8e9de587db7bc7c423080bb0	External Address
384	0x60ae79fe603e4e76a24ef06bd05c3cb4f8be52e7	External Address
385	0xcac0ca9db5c3f829f017cfc649277bfdee135088	External Address
386	0xcf5b2298d3be9c5f3f5f5bca3fab64863304c10a	External Address
387	0x3bed11ef12dd3e85dc1712c690a4e4904622a36c	External Address
388	0x76497cfc3d5659fe72c2d8320227fb60c2eaec81	External Address
389	0xa0b4a1f128316d0d0f15b9c7cfc66c6950754100	External Address
390	0xfdac6e65aba2b0bc65d8c614c243ad9eafdadba4	External Address
391	0x7de8ae08a662d3aa95bcc79266e0cb4dbb5573dd	External Address

Node ID	Ethereum Address	FM vs. Ext.
392	0x85a993307735e5c275c6d7564e2f557329a8a4b1	External Address
393	0x2f09d3c272b5b7354e4364ef6c00ee8098a34097	External Address
394	0xbbdb0b952c6611a6bf73df8a211281feb530018d	External Address
395	0xa8c87c8b90292d57e549152e8372fcd3e84ac0ae	External Address
396	0x2b0b04012045d6dfdec6802406104e5574714061	External Address
397	0x16a60b1aecb827bde939d9de56593a173042c7f8	External Address
398	0x002f9caf40a444f20813da783d152bdfaf42852f	External Address
399	0xc04b02a344a20c8689dcb3a30448b9dbf9197319	External Address
400	0xf9169afebb3a8bc4e5ecfda9393196c1fbe52ec0	External Address
401	0x7ac17c07142e7a6ec0ae5ec7096dcb7f579b14c7	External Address
402	0xe1e143aa6f360451e59343ba5b6a5482badc8f0b	External Address
403	0x89dcc51e3aadf0323f3888e4dbb65be520ae5ebf	External Address
404	0x27147314b9172a929041c1f462a85c74a8ffaa27	External Address
405	0x9434a8a6d48697e7689867712c106ceb4ded4ed4	External Address
406	0x34b35fb1080578b04b19cb16f669aca20281ce63	External Address
407	0xb2e19dd996848818d972dd3a60a1b7faffb82330	External Address
408	0xa6a18d62836fa0cd181d804ac85f405e45a96bd1	External Address
409	0xae878029564e2ac8c1d71bf1e369401da31bee1a	External Address
410	0xc74a73576f9ca7c88c905edcc5f0f5f339d52380	External Address
411	0x25d188bc3d9002436a7b5325041f7205eb6650b8	External Address
412	0xb5ec32d9806c2c49c72e85d95e960862d5141cdf	External Address
413	0x622d20b2af4f4075e55a60032836214f5f22f0a4	External Address
414	0x6b6ce24037128b7dd6053baee8e17d157cdb0c43	External Address
415	0xc9b6e278ff5b3f2b2588bd3d1b2dddd6a828ea5b	External Address
416	0x221c820f3408865e33a37b783b7f272c6af4f067	External Address
417	0x7ab685a614d0aac012e85f778fcc36913f3b2271	External Address
418	0xd17f676a8ff3fe34ca3143e26ec7c78e3c8898b4	External Address
419	0x3c65f98361a29d642abd7083b81b6ffc312f444a	External Address
420	0x50399b8152a9278d02054592884ca02538e1335a	External Address
421	0x782b2b992830ba33b9dff0f5421da2752ca0e4cb	External Address
422	0x8fb64b4f2d3d23f2e3a1139f8621a562582fe08e	External Address
423	0x3b8c1487b58e129cfba07e6aedc60915614e71ee	External Address
424	0x72591e8a485d5b0f0d77543d17d75a6e5121ebf7	External Address

Node ID	Ethereum Address	FM vs. Ext.
425	0xbe8765253bf0192e584e7571036ea5ac28e8cf19	External Address
426	0x1b48d55b9b9ab6aeca845994e742bd250ded180c	External Address
427	0x444c996b74631763ce0c406fcbe9aa13d35f395e	External Address
428	0x15f4f2cc0614c146a43cc4d6794b5e66b574f460	External Address
429	0xd3c30bfcf3527cbde5ddf815a65c013d5a232940	External Address
430	0x5ce0967a6c388bce5e9720a8af0b02db9353c991	External Address

Table 10: Node ID Ethereum Address Translation List

Level 0

Cluster Size	Cluster ID	Node ID	Cluster Size	Cluster ID	Node ID
12	19	19	4	8	209
12	19	23	4	8	244
12	19	41	4	11	73
12	19	105	4	11	84
12	19	115	4	11	85
12	19	139	4	11	196
12	19	159	4	20	17
12	19	161	4	20	55
12	19	168	4	20	56
12	19	172	4	20	205
12	19	223	4	22	1
12	19	264	4	22	110
11	0	228	4	22	118
11	0	229	4	22	255
11	0	230	3	1	215
11	0	231	3	1	218
11	0	232	3	1	224
11	0	233	3	6	95
11	0	234	3	6	138
11	0	235	3	6	192
11	0	236	3	14	63

Cluster Size	Cluster ID	Node ID	Cluster Size	Cluster ID	Node ID
11	0	237	3	14	87
11	0	247	3	14	145
11	21	5	2	2	184
11	21	6	2	2	185
11	21	32	2	3	181
11	21	34	2	3	187
11	21	45	2	4	119
11	21	75	2	4	200
11	21	76	2	7	92
11	21	90	2	7	212
11	21	93	2	9	82
11	21	183	2	9	83
11	21	203	2	10	80
8	23	0	2	10	81
8	23	48	2	12	71
8	23	239	2	12	72
8	23	240	2	13	68
8	23	241	2	13	79
8	23	242	2	15	58
8	23	243	2	15	101
8	23	245	2	16	52
4	5	113	2	16	53
4	5	133	2	17	47
4	5	137	2	17	214
4	5	189	2	18	22
4	8	91	2	18	111
4	8	140			

Table 11: Level 0 Cluster List

Level 1

Cluster Size	Cluster ID	Node ID	Cluster Size	Cluster ID	Node ID
59	15	5	59	15	264
59	15	6	11	0	228
59	15	17	11	0	229
59	15	19	11	0	230
59	15	22	11	0	231
59	15	23	11	0	232
59	15	32	11	0	233
59	15	34	11	0	234
59	15	41	11	0	235
59	15	45	11	0	236
59	15	55	11	0	237
59	15	56	11	0	247
59	15	60	8	17	0
59	15	61	8	17	48
59	15	69	8	17	239
59	15	70	8	17	240
59	15	73	8	17	241
59	15	75	8	17	242
59	15	76	8	17	243
59	15	80	8	17	245
59	15	81	5	5	82
59	15	84	5	5	83
59	15	85	5	5	95
59	15	90	5	5	138
59	15	91	5	5	192
59	15	92	4	16	1
59	15	93	4	16	110
59	15	105	4	16	118
59	15	106	4	16	255
59	15	111	3	1	215
59	15	113	3	1	218

Cluster Size	Cluster ID	Node ID	Cluster Size	Cluster ID	Node ID
59	15	115	3	1	224
59	15	117	3	8	63
59	15	119	3	8	87
59	15	124	3	8	145
59	15	133	2	2	184
59	15	137	2	2	185
59	15	139	2	3	181
59	15	140	2	3	187
59	15	147	2	4	125
59	15	159	2	4	126
59	15	160	2	6	71
59	15	161	2	6	72
59	15	165	2	7	68
59	15	168	2	7	79
59	15	172	2	9	58
59	15	175	2	9	101
59	15	183	2	10	52
59	15	189	2	10	53
59	15	196	2	11	47
59	15	200	2	11	214
59	15	203	2	12	25
59	15	205	2	12	265
59	15	208	2	13	20
59	15	209	2	13	249
59	15	212	2	14	9
59	15	223	2	14	216
59	15	244			

Table 12: Level 1 Cluster List

Level 2

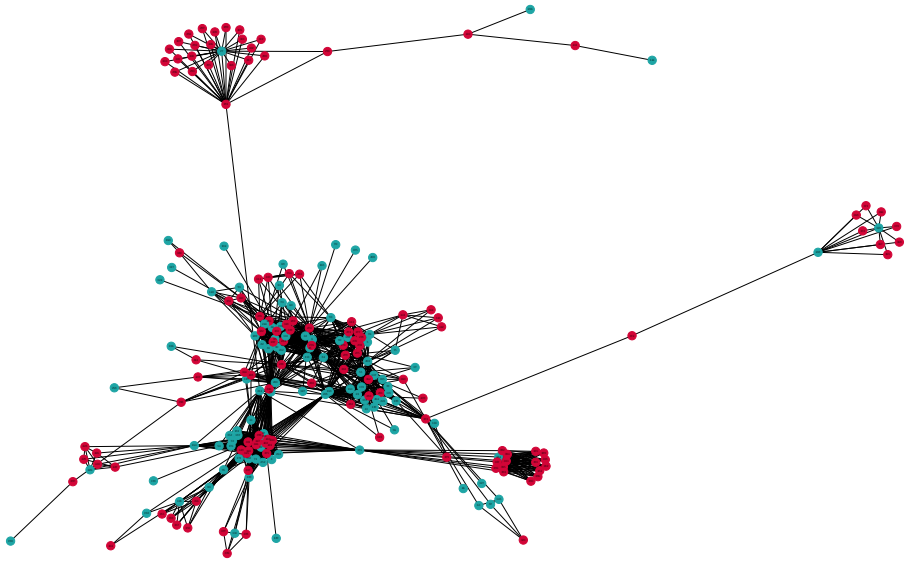

Figure 15: Largest Cluster Level 2. Node ID in Black. Data Sources: Etherscan, Etherscan API, Melon API

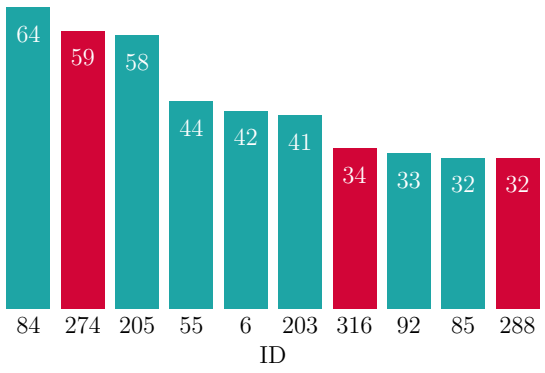

Figure 16: Top 10 Connected Nodes Level 2. Node ID in black, number of connections in white. Data Sources: Etherscan, Etherscan API, Melon API

Cluster Size	Cluster ID	Node ID	Cluster Size	Cluster ID	Node ID
101	11	3	101	11	183
101	11	5	101	11	184
101	11	6	101	11	185
101	11	13	101	11	187
101	11	17	101	11	189
101	11	19	101	11	190
101	11	22	101	11	191
101	11	23	101	11	192
101	11	27	101	11	196
101	11	32	101	11	200
101	11	34	101	11	203
101	11	41	101	11	205
101	11	45	101	11	206
101	11	46	101	11	208
101	11	47	101	11	209
101	11	54	101	11	212
101	11	55	101	11	214
101	11	56	101	11	223
101	11	60	101	11	226
101	11	61	101	11	238
101	11	63	101	11	244
101	11	69	101	11	252
101	11	70	101	11	258
101	11	71	101	11	263
101	11	72	101	11	264
101	11	73	11	0	228
101	11	75	11	0	229
101	11	76	11	0	230
101	11	80	11	0	231
101	11	81	11	0	232
101	11	82	11	0	233

Cluster Size	Cluster ID	Node ID	Cluster Size	Cluster ID	Node ID
101	11	83	11	0	234
101	11	84	11	0	235
101	11	85	11	0	236
101	11	87	11	0	237
101	11	90	11	0	247
101	11	91	8	10	8
101	11	92	8	10	9
101	11	93	8	10	36
101	11	95	8	10	43
101	11	104	8	10	146
101	11	105	8	10	216
101	11	106	8	10	217
101	11	109	8	10	257
101	11	111	8	13	0
101	11	112	8	13	48
101	11	113	8	13	239
101	11	115	8	13	240
101	11	117	8	13	241
101	11	119	8	13	242
101	11	120	8	13	243
101	11	124	8	13	245
101	11	127	4	12	1
101	11	129	4	12	110
101	11	131	4	12	118
101	11	133	4	12	255
101	11	137	3	1	215
101	11	138	3	1	218
101	11	139	3	1	224
101	11	140	2	5	58
101	11	144	2	5	101
101	11	145	2	2	199
101	11	147	2	2	201
101	11	152	2	3	125

Cluster Size	Cluster ID	Node ID	Cluster Size	Cluster ID	Node ID
101	11	159	2	3	126
101	11	160	2	4	68
101	11	161	2	4	79
101	11	164	2	6	52
101	11	165	2	6	53
101	11	168	2	7	40
101	11	170	2	7	266
101	11	171	2	8	25
101	11	172	2	8	265
101	11	175	2	9	20
101	11	176	2	9	249
101	11	181			

Table 13: Level 2 Cluster List

Appendix V

ENS Domains per Address

Node ID	ENS Domain
4	léonard.eth
27	ollett.eth
28	valex.dcl.eth
31	ajder.eth
36	blazar.eth
39	cryptosauce.dcl.eth
43	1.moneystorage.eth
43	saucony.eth
43	[129c925819bb193836e27a28f2a82026cb719c759f0ceb288c301df05a21e66f].eth
43	ukrnet.eth
43	modnakasta.eth
43	moneystorage.eth
43	lonking.eth
43	poettinger.eth
43	pactera.eth
43	newstartups.eth
43	kasta.eth
43	obozrevatel.eth
43	ragozin.eth
43	ethaccounts.eth
43	stylus.eth
43	answear.eth
43	novaposhta.eth
43	mobilluck.eth
43	skanska.eth
43	chengshin.eth
43	vovnenko.eth
43	intertop.eth
43	technadzor.eth

Node ID	ENS Domain
43	fotomag.eth
43	zanussi.eth
43	oschadbank.eth
43	bumerang.dcl.eth
43	triolan.eth
43	perkville.eth
43	sensoramalab.eth
43	kawneer.eth
43	bipandgo.eth
43	storagemoney.eth
43	travelsim.eth
43	alutech-group.eth
43	shantui.eth
43	rozetka.eth
43	novoposhta.eth
43	bumerang.eth
43	xinfagroup.eth
43	kyivstar.eth
43	vestfrost.eth
43	freefilms.eth
43	leboutique.eth
43	sinoptik.eth
43	sportshop.eth
43	easthope.eth
43	bokobok.eth
43	concepter.eth
43	changer.eth
43	gorenje.eth
43	karcher.eth
43	reynaers.eth
43	pautina.eth
43	datagroup.eth
43	amazone.eth

Node ID	ENS Domain
44	emiratesgroup.eth
59	dclancy13.dcl.eth
74	indus.eth
74	turki.eth
74	pavle.eth
74	baise.eth
74	miloš.eth
74	michal.eth
74	jumbo.eth
74	dhruv.eth
74	krona.eth
74	rubber.eth
74	krone.eth
74	tareq.eth
74	elalto.eth
74	anoop.eth
74	darryl.eth
74	aachen.eth
74	rufus.eth
74	daniël.eth
74	twittter.eth
74	nymex.eth
74	kurwa.eth
74	rupee.eth
74	ahmat.eth
74	milton.eth
74	cádiz.eth
74	brahim.eth
74	kylian.eth
74	420blaze.eth
74	drogas.eth
74	cruijff.eth
74	koruna.eth

Node ID	ENS Domain
74	yassin.eth
74	málaga.eth
74	fazerain.eth
74	matej.eth
74	melvin.eth
74	ricegum.eth
74	sorghum.eth
74	kisumu.eth
74	lucio.eth
74	virat.eth
74	portsaid.eth
74	ruble.eth
74	matas.eth
74	lemans.eth
74	khomeini.eth
74	didier.eth
74	halakha.eth
74	eymen.eth
74	zloty.eth
74	maize.eth
74	vlone.eth
74	moham.eth
74	haruki.eth
74	forint.eth
74	ilija.eth
74	marion.eth
74	złoty.eth
74	renato.eth
74	jimmie.eth
74	mauro.eth
74	bubbleboy.eth
74	tomás.eth
74	fish.dcl.eth

Node ID	ENS Domain
74	reims.eth
74	mainz.eth
74	kaskar.eth
74	broke.eth
74	[9554ab7d3572968f4017c893c50e80e838f9bc17b4050ea308514f6f4b33a3a0].eth
74	kostas.eth
74	bochum.eth
74	phibro.eth
74	dinar.eth
74	lucius.eth
74	madre.eth
74	clyde.eth
74	sharia.eth
74	shekel.eth
74	zeynep.eth
74	barack.eth
74	amason.eth
74	pogba.eth
74	mugabe.eth
74	giulio.eth
74	roull.eth
74	targray.eth
74	rupiah.eth
74	wheat.eth
74	rapeseed.eth
74	ganar.eth
74	delia.eth
74	arush.eth
74	gunvor.eth
74	etthereum.eth
74	etiqu.eth
74	massimiliano.eth
74	bandar.eth

Node ID	ENS Domain
74	muham.eth
95	gardenofether.eth
102	pay.oweinch.eth
102	oweinch.eth
103	nickgustafson.eth
108	doppelbock.eth
122	[620370a00d62fc1a05e6a83703550a9813fd9040fde25eadcd58e5be826a0843].eth
131	pumahash.eth
152	baarzar.eth
158	dickpound.dcl.eth
163	achilleus.eth
166	vanmoortel.eth
166	manon.vanmoortel.eth
171	amadeobrands.eth
194	st3ve.eth
199	thunder.dcl.eth
199	rialabs.eth
210	casca.eth
214	[aba98eadf98b176a4aa405cfa222a0e9f7cad0922db72bcf1339056bb8bb2278].eth
216	especulacion.eth
225	johnn.dcl.eth
225	jaysall.eth
226	fbrncci.tokenid.eth
226	fbrncci.eth
238	leoleo.eth
238	mars.unidao.eth
238	mars-dao.eth
238	cbdaoone.eth
238	[397d816cb3ee67134794f4969a8e18029a94f6d0803bdcbf3836eaca16d77102].dcl.eth
238	budget.berezka.eth
238	uni-dao.eth
238	marsagent.unidao.eth
238	unidao.eth

Node ID	ENS Domain
238	berezka.eth
252	codonyat.eth
257	daoresearch.eth
258	sexology.eth
258	pipernet.eth
258	cybercitizen.eth
258	xfund.xhipster.eth
258	cyberprop.eth
258	bitrobot.eth
258	[ac4bac3ae9af16c042f31ec4564222e54dbd010e9271541041464c08cf5d66c3]. addr.reverse
258	cyberbazaar.eth
258	cybertix.eth
258	xhipster.eth
258	cyberledger.eth
258	cybercast.eth
258	[9869eec82777c0c0eeacf37ff68895fd13bc712eb29348116161d468084658ff].eth
258	cyberweek.eth
258	cybersale.eth
258	cybercongress.xhipster.eth
258	cybertrade.eth
258	findsex.eth
258	cybernation.eth
258	cyberacademia.eth
258	newsblog.eth
258	mana.eth
258	bnb.eth
258	[75944d74a123925f2db2957398cddd14c23290b6f77b1c7256f9852e120459f9].eth
258	scienceblog.eth
258	[a428ca170b5115a1b8c364c717545bd1df62606268286e99a8ec6b95a7ba905f].eth
258	cybernomics.eth
258	murziki.eth
258	carbonmarket.eth

Node ID	ENS Domain
258	cybertax.eth
258	cyberlaw.eth
258	test.xhipster.eth
258	miningpool.eth
258	proposer.eth
258	cybercoins.eth
258	cyberid.eth
258	cybercode.eth
258	bibot.eth
258	replicator.eth
258	cryptopian.eth
258	cybercam.eth
258	indivisible.eth
258	techblog.eth
258	shapeshift.eth
258	lovemom.eth
258	cybercafe.eth
258	sexiness.eth
258	routernet.eth
258	whispernet.eth
258	cyberduck.eth
258	minernet.eth
258	cyberevents.eth
261	alexhart.eth
285	keithtaylor.eth
288	blablalines.eth
288	dronevolt.eth
288	transitaire.eth
288	givemecrypto.eth
288	cosmétiques.eth
288	010203.eth
288	chaussure.eth
288	[05733be921e9e2a969ec25ab288db04b768e5e4c653615a8ce8d6f0ad92e9de9].eth

Node ID	ENS Domain
288	[969610da5143ffc664c901c9cd65de5800d1eca5a875e6d3651127078ed01779].eth
288	écoledemaquillage.eth
288	covoiturage.eth
288	zezette.eth
288	aicha.eth
288	lafrancaisedesjeux.eth
288	foodstock.eth
288	shams-al-dîn.eth
288	président.eth
288	samedi.eth
288	dronesecurity.eth
288	camping-car.eth
288	pinceau.eth
288	makeupacademyparis.eth
288	réservations.eth
288	ministre.eth
288	nessou.eth
288	exchange.sendmecrypto.eth
288	bateaux.eth
288	chaussettes.eth
288	cheveux.eth
288	cuisinier.eth
288	kindi.eth
288	[f09796ecc420f7972f233efe3bde4a77e820e75f8a9985c9270516db32558f86].eth
288	[135082e08b97900dee204a5b11f3288273dff55eab1eaf5937e8f756038b5daa].eth
288	bateau.eth
288	e-tron.eth
288	kangourou.eth
288	chemises.eth
288	manucure.eth
288	minceur.eth
288	e-course.eth
288	lefrenchimpact.eth

Node ID	ENS Domain
288	émiratsarabesunis.eth
288	bouzid.eth
288	humanis.eth
288	pharaon.eth
288	kindicapital.eth
288	blockshipping.eth
288	0605111100.eth
288	jouet.eth
288	robedesoirée.eth
288	photographe.eth
288	jimysa.eth
288	[c5d2460186f7233c927e7db2dcc703c0e500b653ca82273b7bfad8045d85a470].[d2af8d10e87fac2f84430fccba855267ffa8651bd303cff8f93d474b2a1331aa].eth
288	fraise.eth
288	robedemariée.eth
288	chaussette.eth
288	pnlmusic.eth
288	sirine.eth
288	contentsquare.eth
288	blouson.eth
288	autopartage.eth
288	chatillon.eth
288	ya-sin.eth
288	ayanakamura.eth
288	patissier.eth
288	trottinette.eth
288	alphataxis.eth
288	isladelice.eth
288	déménagement.eth
288	lissage.eth
288	pinceaux.eth
288	banane.eth
288	maqpro.eth

Node ID	ENS Domain
288	areej.eth
288	lundi.eth
288	[cf3437728a11ccfd3287e281b84b0fc8b9fed4d23ca4c153b71c401ab3540714].eth
288	pantalon.eth
288	expertcomptable.eth
288	magnetik.eth
288	demenagement.eth
288	parisbynight.eth
288	[4a7cd1ab15afb6fb47bbec183f50695b60a6624ab9af28b4d841824426a8c229].eth
288	formations.eth
288	annaba.eth
288	blockchainconnect.eth
288	frenchtouch.eth
288	malakoffmédéric.eth
288	[4406be667d64658e152f197decbff93414970c28cf346353793ba85010f4c6cb].eth
288	isladélice.eth
288	securidoc.eth
288	braderie.eth
288	influenceur.eth
288	champs-élysées.eth
288	dictateur.eth
288	toufik.sendmecrypto.eth
288	blablabus.eth
288	frenchimpact.eth
288	dimanche.eth
288	buygoldcash.eth
288	indianacafe.eth
291	[28146b7a19c8173a9b7c63e89bc2030510d891421f67c34e161f8ff535e06144].eth
291	[38732aaf34a4931a75ceb548e085ca67a2beb3730746a6d9c8d6c7fb164c78a0].eth
291	justicedems.eth
291	lukas.uebelacker.eth
291	[23b20aa1ee9c054a347de3005149d2a1d91f025c864bc71d55c08b1bb9085584].eth
291	[066f49b01746b9f22cc8b9d91e2a0a47b8e78370f922d6ff6ec8591da4d93bad].eth

Node ID	ENS Domain
291	[4d9bdbd87dc3cb9c80c710822a72d1f3dd13a07f177a70e8a634e96c6bbaab09].eth
291	[088353d174afef55c5c181c13b497a604d90071f68a7485a8588b508f19309a9].eth
291	[3f53e6133166380cbeaadc718f8b315f353232a6ae69fe255a40b6e1c2638b81].eth
291	[02473deba86beeaae156a60962450c293801a2e69f9ea606c7acc232b0e8c1bf].eth
291	piratenpartei.eth
291	[3e70fc9fbbeb1c7e811d1b256ecb8966c152e11732d7c7bf177857cea9f75d70].eth
291	[092dc685e232dc2899e6022d41daf1fa741417b851b9116449c4043ece18dc9e].eth
291	tageszeitung.eth
291	[23d5d18b5d03c2657af46aebb6bcdaabec9bbfcd8e8987d1303980afb34a6c59].eth
291	[32a48445c5838df01bf3688c1ca72383d29e3b018841e6f5d8496dedfc7f5e94].eth
291	[2e651d24c9b0cfed09d13e01c114877f65bb5da8a9bed2633fe0f316f1c57087].eth
291	landesregierung.eth
291	[5d8b6c00bea3c3cea67b232a64ffbc9ac535fd8744bba9fdb84dea00ccb332c2].eth
291	[08fe2041a5465d94f3be38c5c18ddea43f33ea4c798ad3c85e60699ec085fcbe].eth
291	[8294c3a72b5b6d9ade44bb79a2b70cb0fe60f058c5fa21a9cef3ce5c2ed39838].eth
291	schulen.eth
291	yannickmueller.eth
291	deutschlandfunk.eth
291	lassezimmer.eth
291	rosaluxemburg.eth
291	uebelacker.eth
291	[34ef08e8d76ebcbf4974b2fb11601cde385a8ceee5c825713fed0e39edb85b2a].eth
291	maxbender.eth
291	janbrinkmann.eth
291	cheguevara.eth
291	diegruenen.eth
291	[824809128df9c4a518cfbae99932e8e8991460190141c06ad982a8ebd5447dd4].eth
291	[5ae0f490581df0bbefc97c9e960fb092f23ad3182c502cf7e7048847716f9e79].eth
291	diepiraten.eth
291	[06f39fc4acd0ba0690bba9c68232031d6ad850abe44ec1892c516267f3b71750].eth
326	naomiriddle.eth
347	nestor.eth
358	tirana.eth

Node ID	ENS Domain
359	waitan.eth
383	pillarz.eth
394	floki.eth
394	renzo.eth
397	schnellreich.eth
398	roboticsfund.eth
398	sharedrop.eth
398	spacefund.eth
404	ulemiste.eth
404	[3d5a714894f37a727e0386e744456f224f347dfb43f18b6219569cc567d0f133].eth
410	jspaceman.eth
427	[5c96716972dbff3aba33f36dcd8e51d20a584a5cfa0ec507cbd3254ce7fa9793]. stateofus.eth

Table 14: ENS Domains per Address

Appendix VI

Etherscan Page Example

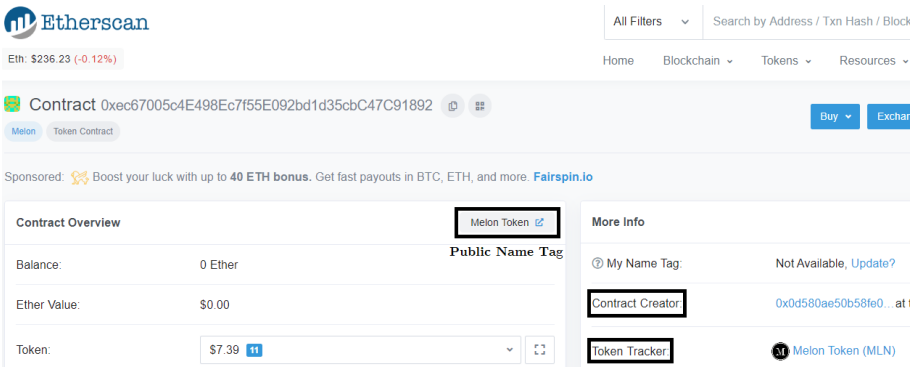

Figure 17: Etherscan Page Example 1. Data Source: Etherscan

Etherscan Page Example 2

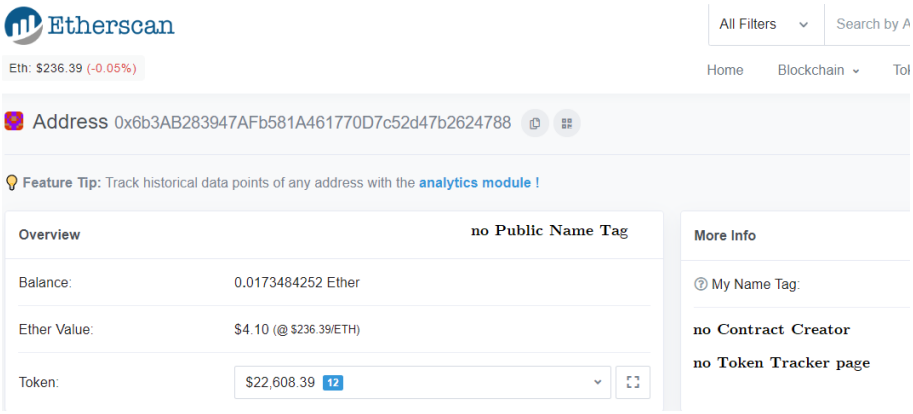

Figure 18: Etherscan Page Example 2. Data Source: Etherscan