

Analysis of selected mixers in the Bitcoin network

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Abstract—The pseudonymous nature of Bitcoin continually generates interest in services aimed at enhancing transaction anonymity. One such solution is the use of Bitcoin mixing services, commonly referred to as mixers, which are employed to increase user privacy. However, their use can be controversial, as while they serve to enhance financial privacy, they can also be exploited for illicit purposes. One of the challenges faced by law enforcement is identifying suspicious Bitcoin addresses. The purpose of this article is to examine the behavior of selected cryptocurrency mixers as a foundation for future research in this area.

Keywords—cryptocurrencies; Bitcoin; mixers; tumblers

I. INTRODUCTION

A CRYPTOCURRENCY mixer, commonly known as tumbler or laundry service, is a platform designed to enhance the anonymity of Bitcoin transactions by "obscuring" the history of funds' origins. In simplified terms, these services aggregate a large number of unrelated transactions, "mix" the associated funds, and then distribute them to new addresses, thereby making it significantly more difficult to trace their origins.

A Chainalysis 2023 report [1] states that mixers are still a popular obfuscation service used by crypto criminals, taking in 8.0% of all funds sent from illicit addresses in 2022. The report pointed to two trends observed in 2022: the total amount of cryptocurrency sent to mixers fell significantly, and the funds that did travel to mixers were more likely to come from illicit sources. In the last Chainalysis report [2], issued in 2024, states that 2023 saw a decline in funds sent to mixers from illicit addresses, from \$1.0 billion in 2022 to \$504.3 million in 2023.

2022 was a year of sanctions imposed on mixers. Firstly, in May OFAC¹ closed Blender.io, which was designated for its role in laundering cryptocurrency stolen by North Korean hacking syndicate Lazarus Group [1]. Next, in August, Tornado Cash mixer was blacklisted for the same reasons. In March 2023, Europol announced that it had successfully shut down the popular cryptocurrency mixer ChipMixer, seizing the equivalent of \$46 million in cryptocurrencies [3]. While OFAC designated mixers Tornado Cash and Blender.io in 2022, its sanctions mostly targeted groups and individual actors in 2023 [2]. Cryptocurrency mixers are used in places where the source

of the funds was to be hidden. However, their use is not always fully effective. Elliptic's analysis reveals that China's spies are using Wasabi Wallet to conceal their transaction trail, paying Bitcoin bribes to FBI double agent [4].

To curb illegal transactions across borders and prevent the financing of terrorist activities, governments have implemented Know-Your-Customer (KYC) rules and Anti-Money-Laundering (AML) regulations on numerous financial institutions and other organizations. AML rules also have been applied to mixers, which caused some sanctions on bitcoin operators [5].

The topic of cryptocurrency mixers remains a constant focus of interest for law enforcement agencies, which, when analyzing the history of cryptocurrency transactions, consider it purposeful and justified to investigate whether any obfuscation of the funds' origins occurs within a given transaction chain. Frequently, expert witness appointments explicitly include questions aimed at identifying such activities. However, the answer to this question is not always straightforward, as will be demonstrated through the research conducted for this article.

II. RELATED WORK

The tweet² posted by Hal Finney less than two months after the publication of the Bitcoin whitepaper [6] highlighting that concerns regarding Bitcoin's anonymity were a significant focus for its early developers from the inception of the technology.

In 2013, Moser et al. [7] investigated the functionality of three cryptocurrency mixing services available at the time: Bitcoin Fog, BitLaundry, and Blockchain.info (specifically, a feature of this service known as Send Shared). Through a series of experiments, they determined that for one of the services, BitLaundry, they were successfully able to trace the flow of transactions from the originating address to the destination address. The other two tested services effectively anonymized the transactions.

In 2015, a report by Novetta [8] presented the results of research on the mixing services: BitMixer, BitLaunder, Shared Coin, and Bitcoin Blender. The study revealed certain transaction patterns for mixed funds, including recurring mixer addresses, fee structures, and repeated branching patterns. These data can be useful in identifying specific mixing services.

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¹Office of Foreign Assets Control (OFAC) is a financial intelligence and enforcement agency of the U.S. Treasury Department.

²"Looking at ways to add more anonymity to bitcoin", source <https://x.com/halfin/status/1136749815>



In 2017, Balthasar et al. [9] demonstrated that Bitcoin mixers have significant security and privacy limitations. They showed that some, namely Bitlaunder, Darklaunder, and Coin-mixer, provide a poor service that can severely compromise the security and privacy expectations of legitimate users. Unfortunately, even major players like Alphabay and Helix exhibit substantial deficiencies. They conclude by stating that devising and implementing a secure mixer is far from easy and is fraught with numerous opportunities to make mistakes and compromise the service.

In 2021, Pakki et al. [10] did comprehensive research on several common mixing services from different aspects, concluding that mixing services focus on presenting users with a *false sense of control* to gain their trust rather than employing secure mixing techniques.

In 2023, See [11] conducted an analysis of techniques aimed at addressing money laundering in Bitcoin mixers, identifying specific gaps that could enable criminals to successfully launder Bitcoin acquired through illicit activities.

III. MIXING MECHANISMS

Following approach presented by Wu et al [12] the process of a mixing service can be modeled as a three-phase procedure, i.e., taking inputs, performing mixing and sending outputs. Formally, a Mixing Service (denoted as $\mathcal{S}$) can be defined as a triplet: $(\mathcal{I}; \mathcal{O}; \mathcal{M})$, where $\mathcal{I}$ and $\mathcal{O}$ represent input and output addresses, respectively, while $\mathcal{M}$ means the mixing mechanism. Specifically, the mixing service $\mathcal{S}$ first takes Bitcoins to be mixed as the inputs ($\mathcal{I}$). This is achieved mostly by requiring users to send bitcoins from $\mathcal{I}$ to a service-provided deposit address. After taking $\mathcal{I}$, $\mathcal{S}$ is responsible for performing the process of mixing with its mixing mechanism ($\mathcal{M}$), which consumes the collected user inputs, and prepares the outputs ($\mathcal{O}$) for each user. Finally, $\mathcal{S}$ will send thumbed Bitcoins to the user addresses $\mathcal{O}$. Typically, users specify some output addresses to $\mathcal{S}$ to indicate where the mixing output should be sent. The procedure to handle $\mathcal{I}$ and $\mathcal{O}$ is similar in different mixing services - users provide those data on website interface.

The techniques for obfuscating traces through the use of mixers can be divided into three main approaches. The first approach involves using centralized services (commonly referred to as coin mixing). The second approach consists of decentralized mixers that utilize automated CoinJoin protocols. The third approach is the use of cross-blockchain mixers.

CENTRALIZED MIXERS are a type of service provided via a website by third-party entities. To use coin mixing, one must visit the website, send their bitcoins to a designated address provided by the service, and input a destination address, meaning the address where the funds should finally be sent by the mixer. After transferring the funds to the mixer and paying the service fee, which is usually automatically deducted by the mixer from the sent funds, the service adds the received funds to a pool it manages, effectively mixing them with coins from other users. The mixed crypto-assets are then sent to the destination addresses specified by the users. There is no single defined mixing technique, and users rely

on the creativity of the service operators. For this reason, it is difficult to describe the technique in a visual manner. The centralized mixing service faces a trust issue. Firstly, there is no assurance that service providers will send the mixed coins to the addresses specified by users. Secondly, they can log the original connection between user inputs and outputs. As a result, if the service is compromised, anonymity will be breached.

DECENTRALIZED MIXERS are predominantly based on the CoinJoin protocol, which was proposed by Maxwell [13] in 2013. This protocol involves the aggregation of input data from multiple users into a single transaction. For such a transaction to occur, as illustrated in Fig. 1, four users must independently specify their transactions, including the information about which address the funds should be transferred from and to. Next, the coordinator, usually the software of a specific wallet (for example, Wasabi Wallet), combines all this information into one aggregated transaction and requests each participant to sign it before submitting it to the Bitcoin network. Once the users have signed the transaction, it cannot be modified without losing its validity, which mitigates the risk of an untrustworthy coordinator. The decentralized mixing service does not rely on a centralized server to perform the mixing.

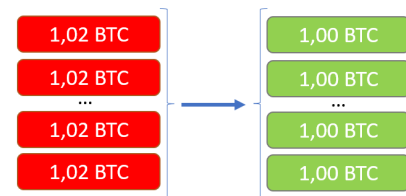


Fig. 1. The concept of CoinJoin protocol.

CROSS-BLOCKCHAIN MIXERS are services offered by cryptocurrency exchanges or specialized conversion services (e.g., shapeshift.com, changelly.com, flyp.me). This process involves exchanging Bitcoin for other cryptocurrencies (e.g., Zcash, Ether) and then potentially returning to the original crypto asset. We can also extend this process by creating what is known as chain hopping, illustrated in Fig. 2, which effectively complicates or even prevents subsequent investigative analyses.

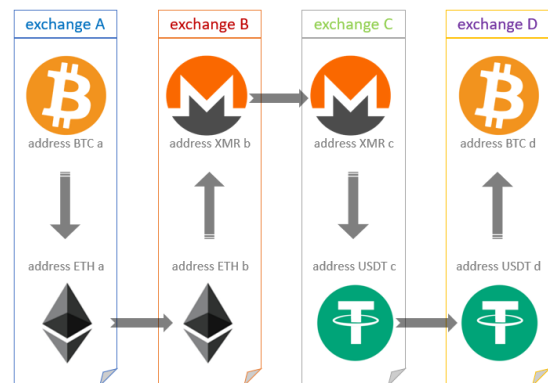


Fig. 2. The concept of chain hopping between blockchains.

IV. METHODOLOGY

In this section, we present our methodology for analyzing mixing services. We begin by selecting representative mixing services and collecting sample transactions. Using these transactions, we then conduct a transaction-based analysis to identify the mixing mechanisms employed by these services.

The first step before conducting an analysis was to select individual mixing services. Due to the popularity of the topic and the variety of solutions, it was decided to use one of the many available lists from the internet at the time [14]. The list included 12 mixers, each accompanied by a short description. Due to financial constraints, the first seven solutions were selected for the study: 1. UniJoin, 2. YoMix.IO, 3. Sinbad, 4. Coinomize, 5. MixBTC, 6. ChipMixer, 7. CryptoMixer. However, during the research, it was discovered that the domain under which the ChipMixer operated had been blocked (see Fig. 3). For this reason, this mixer was excluded from further research.



Fig. 3. A screenshot showing the blocked ChipMixer website.

The following research methodology was adopted. For each mixing operation, two entirely new BTC addresses were initially created, referred to as the initial address and the DESTINATION ADDRESS. The initial address was first used to deposit an initial amount of 0.01 [BTC], and from this address the transfer to the mixer-specified STARTING ADDRESS was made. The second address, the DESTINATION ADDRESS, was used as the address where the funds would ultimately be sent from the mixing service, meaning it was the address specified by us in the mixer for the return of the funds. For each mixer, the smallest possible transfer delay was set, along with the minimum transaction fee charged by the mixer (service fee). For each mixing operation, only one DESTINATION ADDRESS was selected, even though most of the tested solutions offered the option to split the initial deposit across multiple addresses. After the mixing operation was completed by the mixer, the transaction path was analyzed to search for any connections between the STARTING ADDRESS and the DESTINATION ADDRESS. This analysis was repeated approximately 9 months and 18 months later to identify any potential changes in primary results. In conducting the research (visualizing flows and examining address affiliations to clusters), the services graphsense.info ([G]) and walletexplorer.com were used. Each mixer description begins with a brief overview highlighting its most significant features, sourced from the websites of the solutions.

V. EXPERIMENTS

A. UniJoin.io Mixer

The maximum amount of bitcoins that can be mixed in a single transaction at UniJoin.io is 1000 BTC. The fee charged by the service for the mixing operation ranges from 1% to 3%, and its size is generated randomly upon detecting the incoming payment. This is intended to further complicate tracking efforts. The service allows users to define mixing operations for up to eight destination addresses, and the mixing time can be set between 2 to 72 hours (see Fig. 4).

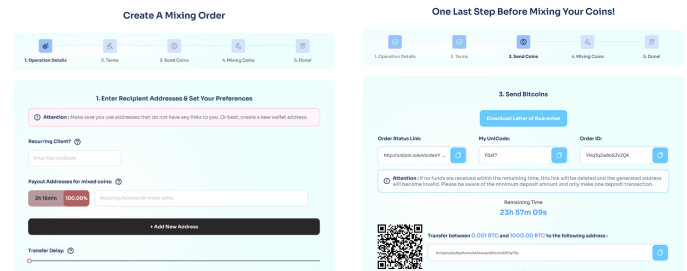


Fig. 4. UniJoin.io mixer screenshots.

The mixer indicated the STARTING ADDRESS **bc1q0e5d**. As of the day after the research was conducted and on the day of finalizing this article, this address belongs to a multi-address cluster (00001b64108e90e0³) that includes over 300000 addresses. Funds were deposited into the STARTING ADDRESS in block 784094 (block confirmation time: 2023-04-05 20:51:50) in a transaction f9d80aeb4a.... In block 784125 (2023-04-06 01:44:04), these funds were transferred (along with other funds from 159 different addresses) to 192 addresses in a transaction 8d0c1c01c2... — a transaction typical for CoinJoin mixing, containing multiple input and output addresses. The DESTINATION ADDRESS **bc1qrqk8** was funded in block 784119 (block confirmation time: 2023-04-06 00:38:57) in a transaction 0f7f513101.... Of particular importance is the preceding transaction edc743234a..., which funded the address bc1qxayz.... This transaction is also typical for CoinJoin mixing, containing multiple input addresses (151) and multiple output addresses (195). It should be noted that the funding of the DESTINATION ADDRESS occurred in block 784119, while the funds from the STARTING ADDRESS were transferred in block 784125, which was later. The analysis of the correlation between the STARTING ADDRESS and the DESTINATION ADDRESS did not reveal any direct connections between them (see Fig. 5).

On the date of the article's completion, 18 months after the research began, the analyzed mixer was no longer available at its original web address. The last available snapshot on The Internet Archive is dated on April 2024⁴.

B. YoMix.io Mixer

The minimum amount of bitcoins that can be mixed in a single transaction at yomix.io is 0,001 BTC, while no

³<https://www.walletexplorer.com/wallet/00001b64108e90e0/addresses>

⁴<https://web.archive.org/web/202404040405032/https://unijoin.io/>

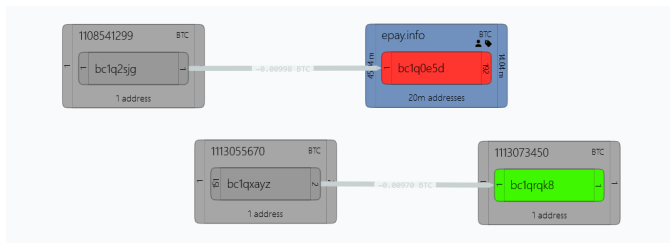


Fig. 5. UniJoin.io correlation simple analysis; source [G].

maximum amount is specified. The fee charged by the service for the mixing operation can be set by the user within the range of 0,7% to 5%, and the mixing time can be set between immediate and 3 days. The service allows users to define mixing operations for up to five destination addresses. The website states that the service does not keep any logs related to user activity (zero-logging policy) and does not store any personal data of its users (see Fig. 6).

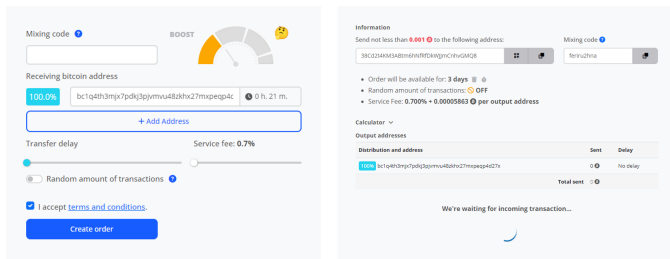


Fig. 6. YoMix.io mixer screenshots.

The mixer indicated the STARTING ADDRESS **38Cd2t4K**. As of the day after the research was conducted and on the day of finalizing this article, this address does not belong to any multi-address cluster⁵. Funds were deposited into the STARTING ADDRESS in block 782862 (block confirmation time: 2023-03-28 08:13:41) in a transaction d1f1f6387e.... Then, in block 782917 (2023-03-28 17:08:32), the funds were transferred to two addresses in a transaction 2ef421c646.... They remain under one of these addresses by the time of finalizing the article. The DESTINATION ADDRESS **bc1q4th3** was funded in block 782863 (block confirmation time: 2023-03-28 08:23:46) in a transaction b28e2f58c5.... The analysis of the correlation between the STARTING ADDRESS and the DESTINATION ADDRESS did not reveal any direct connections between them (see Fig. 7). It can also be noted that the funding of the DESTINATION ADDRESS occurred immediately, in the very next block after the transfer to the STARTING ADDRESS was confirmed.

On the date of the article's completion the analyzed mixer was still available at its original web address.

C. Sinbad Mixer

The minimum amount of bitcoins that can be mixed in a single transaction at sinbad.io is 0,001 BTC. The fee charged

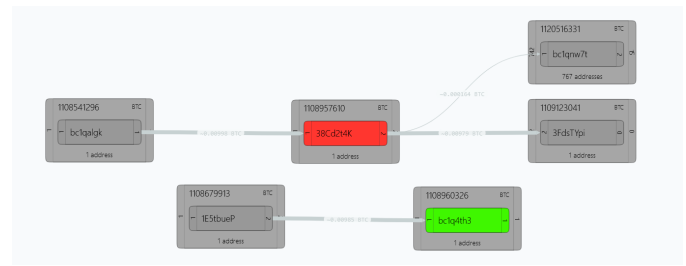


Fig. 7. UniJoin.io correlation simple analysis; source [G].

by the service for the mixing operation can be set by the user within the range of 0,5% to 2,5%, and the mixing time can be set between 0 and 168 hours. The service allows users to define mixing operations for up to eight destination addresses. The authors of the service also assure that they do not store logs or IP addresses. (see Fig. 8).

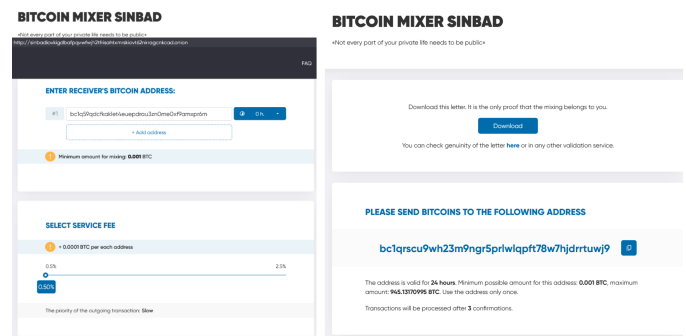


Fig. 8. Sinbad.io mixer screenshots.

The mixer indicated the STARTING ADDRESS **bc1qrscu**. As of the day after the research was conducted and on the day of finalizing this article, this address belongs to a multi-address cluster (06ed2a84ea7a1bd2⁶) that includes 19 addresses. Funds were deposited into the STARTING ADDRESS in block 784815 (block confirmation time: 2023-04-10 21:01:15) in a transaction 5262997dc0..., and they were transferred from it in block 789801 (block confirmation time: 2023-05-15 03:55:18). The DESTINATION ADDRESS **bc1q59qd** was funded in block 784818 (block confirmation time: 2023-04-10 21:30:23) in a transaction 52e90c8366.... The analysis of the correlation between the STARTING ADDRESS and the DESTINATION ADDRESS did not reveal any direct connections between them (see Fig. 9). It can also be noted that the funding of the DESTINATION ADDRESS occurred immediately, specifically in the third consecutive block after the transfer to the STARTING ADDRESS was confirmed.

Note: A follow-up check of the service after 9 months revealed that its operation had been blocked by the prosecuting authorities (see Fig. 10).

D. Coinomize Mixer

In the mixer available at coinomize.biz, you can mix an amount ranging from 0,03 BTC to 5 BTC in a single transac-

⁵<https://www.walletexplorer.com/wallet/3103323b2884ce93/addresses>

⁶<https://www.walletexplorer.com/wallet/06ed2a84ea7a1bd2/addresses>

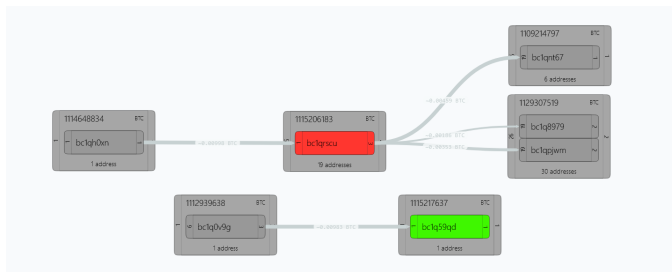


Fig. 9. Sinbad correlation simple analysis; source [G].



Fig. 10. Screenshot showing the blocked Sinbad website.

tion. The fee charged by the service for the mixing operation can be set manually between 1.5% and 5%, while the mixing time can be adjusted between 0 and 72 hours. The service allows you to provide up to five destination addresses and assures users that it does not collect transaction logs or IP addresses (see Fig. 11).

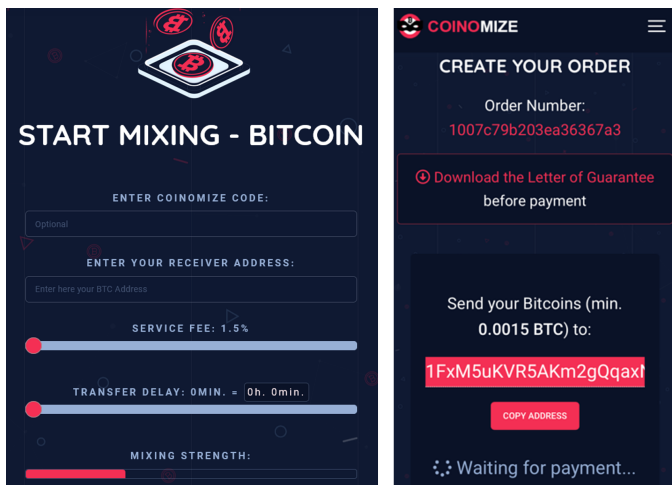


Fig. 11. Coinomize mixer screenshots.

The mixer provided the STARTING ADDRESS **1Fxm5uKV**. This address (as of the day after the research was conducted and on the day this article was finalized) belongs to a multi-address cluster (41647b47a8f311a7⁷) that includes 4

⁷<https://www.walletexplorer.com/wallet/41647b47a8f311a7/addresses>

addresses. The funds, after being deposited to the STARTING ADDRESS in block 782864 (block confirmation time: 2023-03-28 08:41:25) in the transaction 5a5d78fe22..., were transferred out after a few hours in block 782881 (2023-03-28 11:02:54). The DESTINATION ADDRESS **bc1qhg58** was funded in block 782865 (block confirmation time: 2023-03-28 08:51:59) in the transaction 3cdb88303d.... The analysis of the correlation between the STARTING ADDRESS and the DESTINATION ADDRESS did not reveal any direct connections between them (see Fig. 12). It can also be observed that the funding of the DESTINATION ADDRESS occurred immediately, in the very next block after the transfer to the STARTING ADDRESS was confirmed.

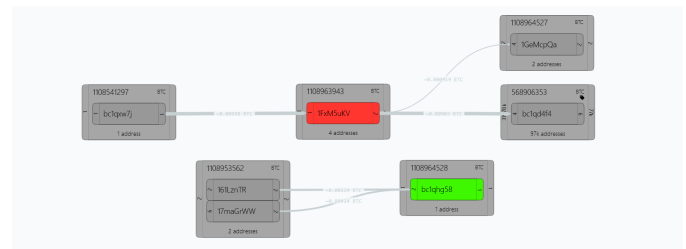


Fig. 12. Coinomize correlation simple analysis; source [G].

On the date of the article's completion, 18 months after the research began, the analyzed mixer was no longer available at its original web address. The last available snapshot on The Internet Archive is dated on July 2024⁸.

E. MixBTC Mixer

In the mixer available at mixbtc.online, the minimum amount that can be mixed is 0,005 BTC. The fee charged by the service for mixing ranges from 1% to 5%, while the mixing time can be set between 1 minute and 24 hours. The service allows only one DESTINATION ADDRESS to be provided, with no option to specify multiple addresses. According to the information in the service's FAQ section, it does not store any data about completed transactions (see Fig. 13).

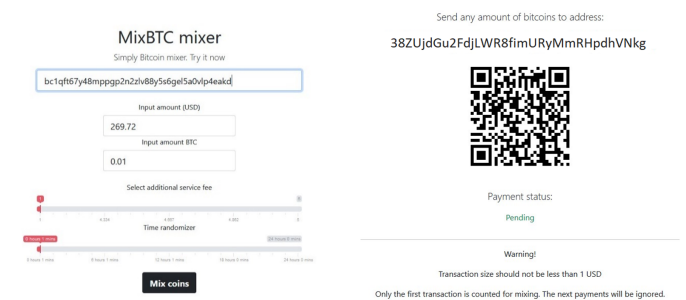


Fig. 13. MixBTC mixer screenshots.

The mixer provided the STARTING ADDRESS **38ZUjdGu**. This address (as of the day after the research was conducted and on the day this article was finalized) belonged to a

⁸<https://web.archive.org/web/20240710213133/https://coinomize.biz/>

multi-address cluster (0bd768fbb5834e85⁹) that included 36 addresses. The funds, after being deposited to the STARTING ADDRESS in block 782863 (block confirmation time: 2023-03-28 08:23:46) in the transaction 18c3c4b17d..., were transferred out after several days in block 783448 (2023-04-01 11:04:04). The DESTINATION ADDRESS **bc1qft67...** was funded in block 782865 (block confirmation time: 2023-03-28 08:51:59) in the transaction 6113a6c5d1.... The initial analysis of the correlation between the STARTING ADDRESS and the DESTINATION ADDRESS did not reveal any connections between them. It was also observed that the funding of the DESTINATION ADDRESS occurred immediately, in the second consecutive block after the transfer to the STARTING ADDRESS was confirmed. Once again, after 9 months, the analysis of the correlation between the STARTING ADDRESS and the DESTINATION ADDRESS did not reveal any direct connections between them. However, correlations between these addresses do occur over time through other addresses, as shown in the graph (see Fig. 14).

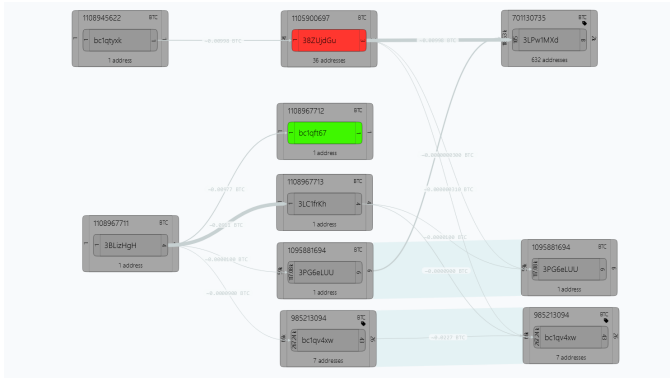


Fig. 14. MixBTC correlation simple analysis; source [G].

On the date of the article's completion the analyzed mixer was still available at its original web address.

F. CryptoMixer Mixer

In the mixer available at cryptomixer.io, the minimum amount that can be mixed is 0.001 BTC. The fee charged by the service ranges from 0,5% to 3%, plus a fixed fee of 0,0005 BTC, while the mixing time can be set between 0 and 96 hours. The service allows you to provide up to 10 destination addresses and, interestingly, enables you to specify the percentage amount for each destination address. According to the information on the website, the service has a reserve of 2000 BTC and does not collect data about its users, with all logs being routinely deleted (see Fig. 15).

The mixer provided STARTING ADDRESS **3BUWhVVmI...**. This address (as of the day after the mixing operation was completed) did not belong to a multi-address cluster (02d83ac660220714¹⁰), then 9 and 18 months later this cluster consists, up to now, of 89 addresses. The funds, after being deposited to the STARTING ADDRESS in block 783646 (block confirmation time: 2023-04-02 18:19:46) in the transaction

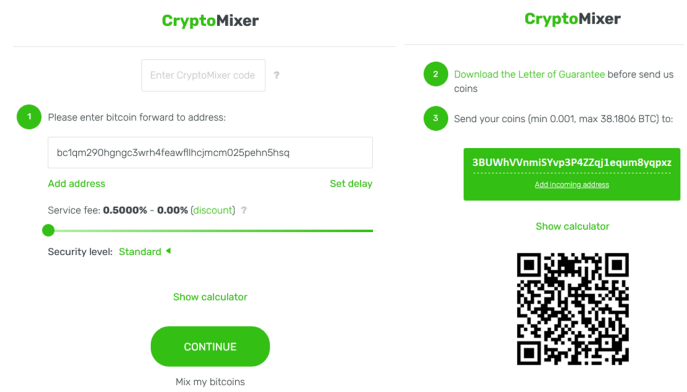


Fig. 15. CryptoMixer mixer screenshots.

6a60944600..., were transferred out after approximately 2 months, in block 792926 (2023-06-05 05:18:23). The DESTINATION ADDRESS **bc1qm290** was funded in block 783671 (block confirmation time: 2023-04-02 22:09:40) in the transaction a235258c01.... The initial analysis of the correlation between the STARTING ADDRESS and the DESTINATION ADDRESS did not reveal any connections between them, as the funds remained continuously on the starting address. Once again, after 9 months, the re-analysis did not show any direct connections between them. However, correlations between these addresses do occur through other addresses, as demonstrated in the graph (see Fig. 16).

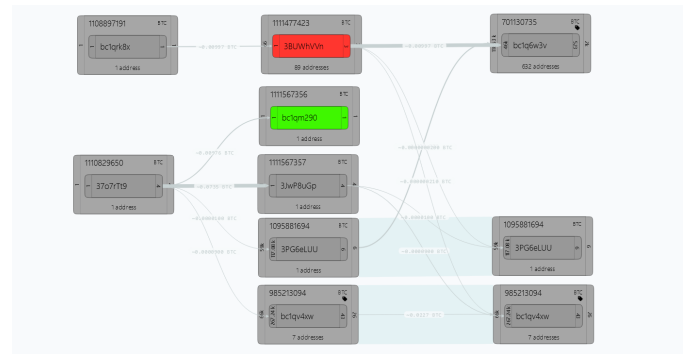


Fig. 16. CryptoMixer correlation simple analysis; source [G].

On the date of the article's completion the analyzed mixer was still available at its original web address.

VI. CONCLUSIONS

Research conducted on several cryptocurrency mixers demonstrated that identifying the use of a mixer based on transaction history is not always feasible.

Only in the first analyzed case, for the UniJoin mixer, the funds from the starting address were transferred to an intermediary address that participated in a transaction characteristic of the CoinJoin mixing technique. A similar situation was observed for the destination address as well. Although the origin of the funds is obscured, as it is impossible to definitively establish a correlation between a specific input address and

⁹<https://www.walletexplorer.com/wallet/0bd768fbb5834e85/addresses>

¹⁰<https://www.walletexplorer.com/wallet/02d83ac660220714/addresses>

output address, the noticeable and almost indisputable fact of mixing usage remains. This may be significant for law enforcement agencies.

For three of the examined mixers, namely YoMix, Sinbad, and Coinomize not only was there no evidence suggesting that a mixer had been used, but the starting addresses also had no connections to the destination addresses. For some of these mixers, the funds remained unspent for an extended period. Two of the analyzed mixers, MixBTC and CryptoMixer, only later revealed a (non-direct) correlation between the starting and destination addresses.

It is also worth noting that out of the seven mixers originally selected for the study, only three are still operational on the Internet.

VII. LIMITATIONS

The adopted research method comes with several limitations. First, relatively small amounts (0,01 BTC) were mixed, which may significantly affect the mixing procedure employed by the services. In particular, for such small amounts, these services may, as research has shown, utilize "their own" funds. The issue of attempting to mix larger quantities, such as several hundred bitcoins, remains open. Second, the study was limited to the mixing services' settings involving immediate mixing of funds. Their "behaviour" when this parameter is modified, for instance, to several days, could yield different conclusions.

In future research, there are plans to expand the study to include a broader range of input parameters, such as larger sample sizes (including more than one mixing procedure per mixer), varying mixing periods, and different mixing BTC amounts.

VIII. ACKNOWLEDGMENTS

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IX. APPENDIX. LIST OF BTC ADDRESSES AND TRANSACTIONS

List of all BTC addresses mentioned in the article:

1Fxm5uKVR5AKm2gQqaxNvhzhjV44gJEhon
38Cd2t4KM3ABtm6hNfRfDkWJJmCnhvGMQ8
38ZUjdGu2FdjLWR8fimURyMmRHpdhVNkga
3BUWhVVnmisiSYvp3P4ZZqj1equm8yqpzxze
bc1q0e5dg6m7mu9q1llumx3lp35qr525493kphm52g0
bc1q4th3mjx7pdkj3pjvmvu48zkhx27mxpeqp4d27x
bc1q59qdcfkaklet4euepdrau3zn0me0xf9amxpr6m
bc1qft67y48mppgp2n2zlv88y5s6ge15a0vlp4eakd
bc1qhg58mqz6cu2jngmmuhaz9z7vy9ydv8c3n57dx
bc1qm290hgngc3wrh4feawfllhcjmcm025pehn5hsq
bc1qrqk8mqwqlsq04utgk8t4wtldlzyjswkq7n37az9
bc1qrscu9wh23m9ngr5prlwlqpft78w7hjdrrtuwj9

bc1qxayz4fd6r50v87qvuyxt0mdjr64rl6myqc30nx

List of all BTC transactions mentioned in the article:

0f7f513101ce9a8b80b19ece396d77bd20f9ab9ca46267240086bc9e4bd82042
18c3c4b17d3714aa236427f27fd99b9e4bcc34da3e829f403ecbcaed5c9a5e80
2ef421c646bd4c80b854be87fe2f6fc91399ec9e5974582a3addaa32f95d1efc
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