

ELLIPTIC REPORT 2023

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# The State of Cross-chain Crime



**ELLIPTIC**

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# → Executive summary

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In October 2022, Elliptic released its landmark report into the state of cross-chain crime – namely, the laundering of illicit crypto by “hopping” to other assets or blockchains using services which don’t apply know-your-customer (KYC) checks. That report found that \$4.1 billion of illicit or high-risk funds had been laundered through decentralized exchanges, cross-chain bridges and coin swap services.<sup>1</sup>

Since then, Elliptic has released its Holistic-powered blockchain analytics capabilities – an industry first – that allows the programmatic and at-scale screening, tracing, monitoring and investigation of activity across multiple blockchains and assets concurrently.<sup>2</sup>

This next-generation blockchain analytics capability has allowed us to unearth new insights into the true scale of cross-chain crime.

**\$7  
billion**

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Cross-chain and cross-asset services have been used to launder \$7 billion worth of illicit or high-risk funds.

## This report has identified the following key findings:

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Cross-chain and cross-asset services have been used to launder \$7 billion worth of illicit or high-risk funds, indicating that cross-chain crime is accelerating faster than predicted.

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There is evidence to suggest that professional money laundering groups and crypto over-the-counter (OTC) brokers – processing funds originating from romance scams and North Korean hacks – are systematically engaging with cross-chain typologies.

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Criminals are using more complex cross-chain methods – such as derivatives trading and limit orders – to obfuscate their laundering activities.

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The sources of cross-chain financial crime risks are continuing to diversify. Sanctioned and terrorist entities now hold over 80 different assets across more than 26 blockchains.

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The Lazarus Group – a North Korean cyberhacking organization – is singularly the largest source of all illicit funds laundered through cross-chain bridges and the third largest source of all cross-chain crime overall, having laundered over \$900 million through cross-chain methods.

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Cross-chain terrorist financing risks are also on the rise. Elliptic has observed the routine use of decentralized exchanges by wallets associated with the Islamic State, Hamas, Hezbollah and the Palestinian Islamic Jihad.

This 2023 update informs virtual asset services, law enforcement and government entities of the current state of play, including case studies and insights into the latest typologies of cross-chain crime. We look at how cross-chain crime has evolved, examine new origins of risk and reveal how Elliptic's Holistic blockchain analytics solutions can be leveraged to mitigate cross-chain criminal activity.

# → Introduction

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Cross-chain crime refers to the conversion of cryptoassets from one asset to another to obfuscate their illicit origin. These conversions are often initiated in rapid succession, a tactic known as “asset-hopping” or chain-hopping”, depending on whether assets move within or across blockchains.

Cross-chain crime is a growing typology of cryptoasset-based money laundering. Based on current trends, it is likely to become the dominant method of obfuscating funds. Elliptic’s inaugural “State of Cross-chain Crime” report – published in October 2022 – found that \$4.1 billion worth of illicit crypto had been laundered through illicit cross-chain or cross-asset services. We predicted then that this figure would rise to \$6.5 billion by the end of 2023 and \$10.5 billion by 2025.<sup>3</sup>

However, our latest revision as outlined in this report – which utilizes Elliptic’s Holistic-powered blockchain analytics capabilities to unearth new cross-chain methodologies and cases – indicates that \$7 billion worth of illicit funds have now been laundered through cross-chain and cross-asset services. This figure – accurate up to and including July 2023 – suggests that cross-chain crime is accelerating at a pace surpassing our original estimates, despite the ongoing bear market.

There are a number of reasons why cross-chain crime is on the rise, and is on course to become the dominant means of laundering illicit cryptoassets:

- Bitcoin is no longer the only cryptoasset available, and tens of thousands of other cryptoassets now exist. Many have features particularly attractive to criminals, such as being anonymous (privacy coins such as Monero) or stable in value due to being pegged to government-backed currency (stablecoins such as Tether (USDT) or DAI).
- The state of crypto crime indicates that an increasing proportion of illicit funds are being generated in assets other than Bitcoin, such as the proceeds of crypto scams and hacks of decentralized finance (DeFi) protocols.<sup>4</sup>
- Cross-chain and cross-asset services – excluding compliant centralized exchanges – do not typically require ID verification to use.
- Enforcement actions – such as sanctions and seizures – are increasingly targeting traditional frontiers of crypto crime, including mixers and non-compliant exchanges. This is leading to a “crime displacement” effect where criminals are resorting to cross-chain crime as an alternative.<sup>5</sup>
- Crucially, mainstream blockchain analytics solutions do not have the capabilities to monitor and detect illicit cross-chain activity. Criminals know this, and therefore aim to make their activities difficult to trace by engaging in prolific asset- or chain-hopping.

It is worth noting that illicit actors and entities engaging in crypto crime correlate to a wide range of predicate offences – ranging from small-scale scams to large-scale crypto heists. The cross-chain crime phenomenon therefore affects all types and levels of virtual asset services and law enforcement.

## The cross-chain problem

As developers and protocols across the crypto space continue to innovate, exchanges across blockchains and assets become more seamless. That brings with it new opportunities for criminals that must be fully understood, managed and mitigated in the face of growing regulatory scrutiny.

Our initial report focused on the cross-chain and cross-asset swaps made possible by three main types of virtual asset services providers – excluding centralized exchanges. These will remain the focus of this report, and they are:

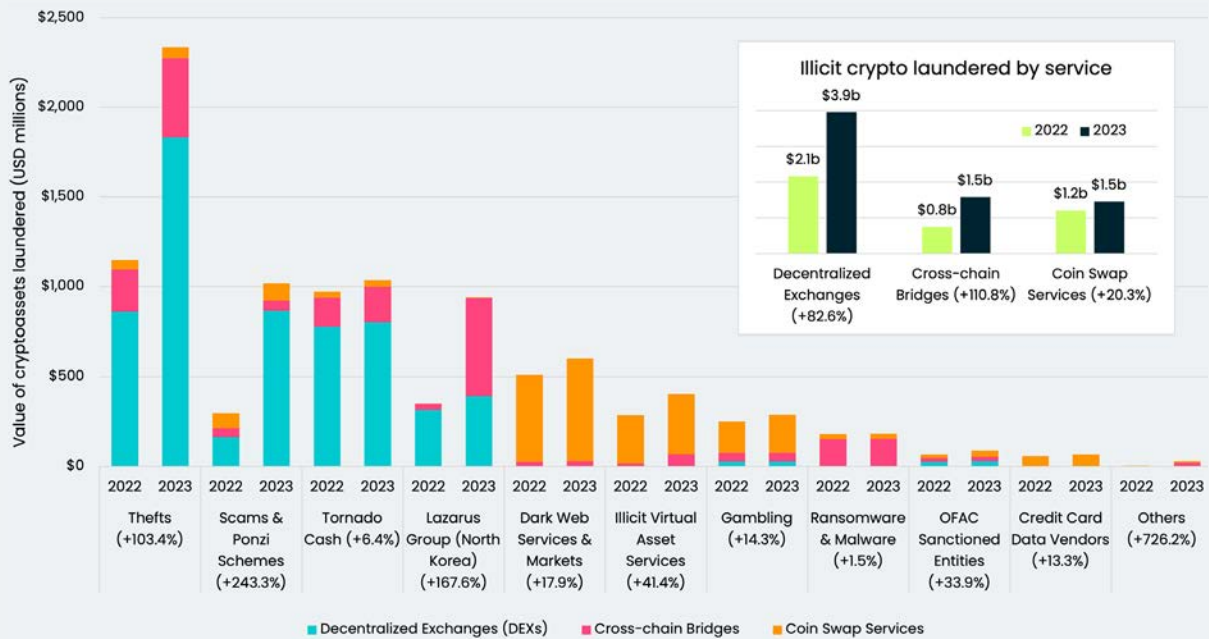
1. **DEXs:** decentralized services – often running on smart contracts – that allow cross-asset swaps on the same blockchain. In this report, we will focus on some of the new features that are being leveraged by criminals.
2. **Cross-chain bridges:** services that are typically decentralized that allow cross-chain swaps across assets on different blockchain platforms. In our previous research, we established that RenBridge was the largest bridge used by criminals. However, being funded by Alameda Research, it was as a result singularly affected by the FTX collapse and we will explore which services that criminals subsequently turned to.
3. **Coin swap services:** centralized and typically anonymous services that allow exchanges between different assets without the need to create an account or submit identity verification. Many are based in Russia and cater to a cybercriminal audience.

It must be emphasized that the vast majority of these services – with the possible exception of coin swap services – are used for legitimate activities, such as DeFi-based investing, trading and gaming. However, these services rarely if ever collect any ID information from users – thus posing a financial crime risk.

As previously mentioned, these three types of services have processed \$7 billion of illicit funds, up to and including July 2023. In relation to our previous estimate of \$4.1 billion in July 2022, this includes (a) new cross-chain crime occurring since then and (b) any cross-chain crime we have since identified that has taken place before then. See the “Methodology” section at the end of this report for more details about how we measure cross-chain crime.



The state of cross-chain crime by predicate offence and service used, according to our previous and current estimates



*Disclaimer: '2022' covers our estimates up to and including July 2022, '2023' covers our updated estimates up to and including July 2023. They do not refer to annual levels of cross-chain crime in these years. See our "Methodology" section to find out more. Tornado Cash and the Lazarus Group are shown separately to "OFAC sanctioned entities" to underscore their significant cross-chain crime exposure.*

The biggest rise of cross-chain crime is apparent in the field of crypto thefts (+103.4% since July 2022), scams and Ponzi schemes (+243.3%) and illicit laundering perpetrated by the Lazarus Group (+167.6%). This outfit alone is now responsible for approximately 1/7th of all cross-chain crime we are tracking.

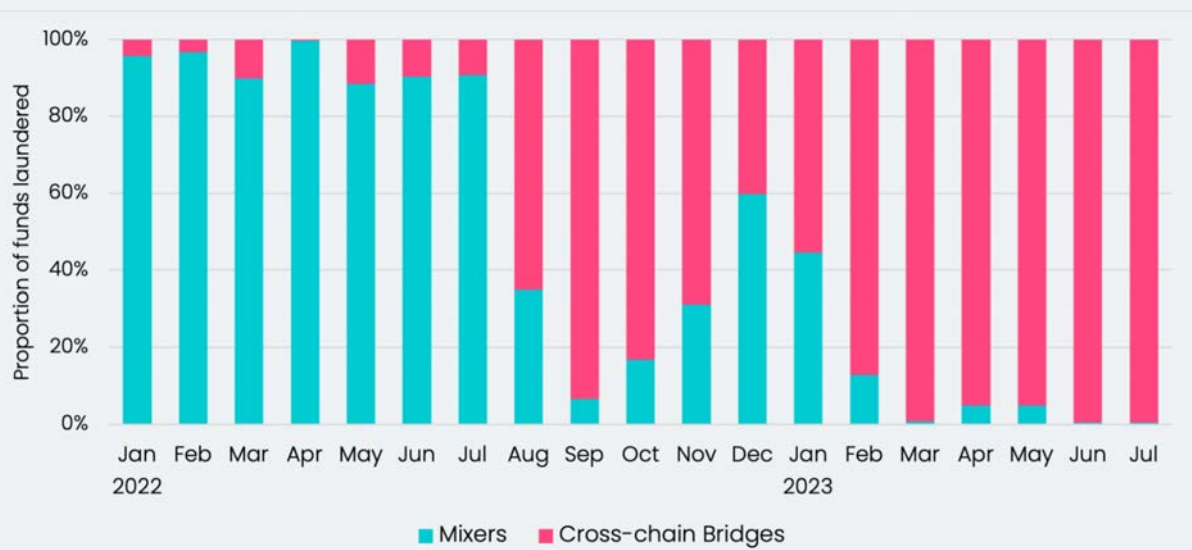
## The notion of cross-chain crime displacement

The movement of Lazarus – and numerous other criminal groups – to cross-chain crime underscores the issue of crime displacement. Namely, this refers to the fact that their existing preferred laundering methods – such as using the now-sanctioned crypto mixer Tornado Cash – have been rendered ineffective by enforcement actions. The Lazarus Group’s prolific use of bridges now contributes the majority of the 111% increase in illicit funds we have identified flowing through such services on top of our 2022 figures.



Similar drivers to cross-chain crime are being observed across numerous other illicit actors and activities, such as thefts from DeFi services and crypto scammers. Again, the typical go-to laundering method of choice for such criminals prior to August 2022 was Tornado Cash or other mixers, which have since been either sanctioned or seized by law enforcement operations.<sup>6</sup> Bolstered also by the reduced capability of legacy blockchain analytics solutions to trace their activities, perpetrators are increasingly turning to cross-chain crime as an alternative way of laundering their funds.

Proportion of illicit funds sent through mixers and cross-chain bridges



*Note: only shows illicit funds originating from 0, 1, 2 or 3 intermediary wallets (hops) away from the bridge/mixer.*

The above chart demonstrates the gravitation towards cross-chain crime – specifically that which is facilitated by cross-chain bridges – from mixers. Elliptic’s data shows that the first major adoption of bridges in place of mixers occurred in August 2022 – the month in which Tornado Cash was sanctioned by the United States. They then briefly declined after Ren – one of the most popular Bitcoin-Ethereum bridges – was “sunset” after its main financier Alameda Research collapsed along with FTX.<sup>7</sup>

Part of the surge in illicit bridge use after the Tornado Cash sanctions was caused by criminals switching their assets to Bitcoin for laundering through major Bitcoin mixers that still remained operational, such as ChipMixer. The latter was eventually seized in March 2023 – corresponding to the significant subsequent displacement of mixers by bridges.<sup>8</sup>

# → About this report

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The rapid displacement of criminals to cross-chain methodologies – which has surpassed our previous estimates and has continued despite the crypto bear market – exemplifies the need for virtual asset services and investigators to maintain effective solutions that can programmatically detect this sort of activity. The range of predicate offences emphasises that all services and law enforcement agencies – despite the nature of risk they predominantly deal with – are affected by this phenomenon.

To this effect, this report provides a series of updated typologies, trends and case studies relating to recent cross-chain crime cases that have emerged since our inaugural report in October 2022. We also provide an overview of Elliptic’s Holistic blockchain analytics capabilities in the final chapter of this report, as part of key considerations necessary to address the compliance and investigative challenges of responding to cross-chain crime. Before this, the next three chapters will discuss the three cross-chain or cross-asset services of interest in more detail, beginning with decentralized exchanges (DEXs).

Keep an eye out for the following resources throughout this report.



## **Red flags and warning signals**

Warnings describe significant issues and trends in criminal behavior that are worth highlighting and can indicate suspicious activity. Red flags are indicators of risk that might not clearly pinpoint illicit activity as a standalone.



## **Diagrams and flowcharts**

Illustrations, diagrams, graphs and charts are included throughout to help you visualize the nature and scale of blockchain activities of discussed entities and, where possible, give a relative view.



## **Case studies**

This is predominantly a case study-driven report, highlighting the evolution of cross-chain crime since our inaugural report. You will find case studies involving both major and small-scale illicit activity and learn how cross-chain crime relates to them all.



## **Key controls and best practices**

A guide of lessons learned and key recommendations for maintaining sanctions compliance and robust anti-money laundering and counter-terrorist financing processes that can detect and mitigate the risks of cross-chain crime.



## **Elliptic’s blockchain analytics**

A look into how our industry-first, next-generation blockchain analytics tools are able to identify and visualise cross-chain and cross-asset criminal activity, to help compliance professionals or law enforcement investigators counter this new era of cross-chain crime.

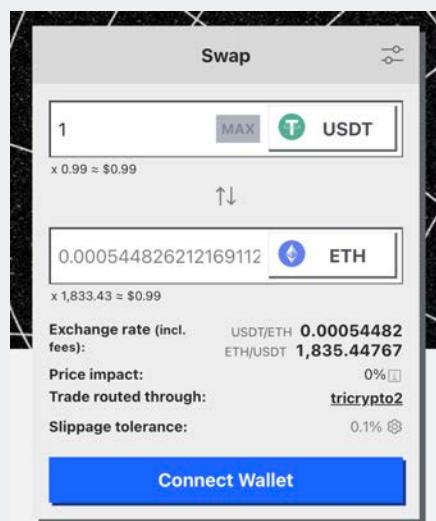
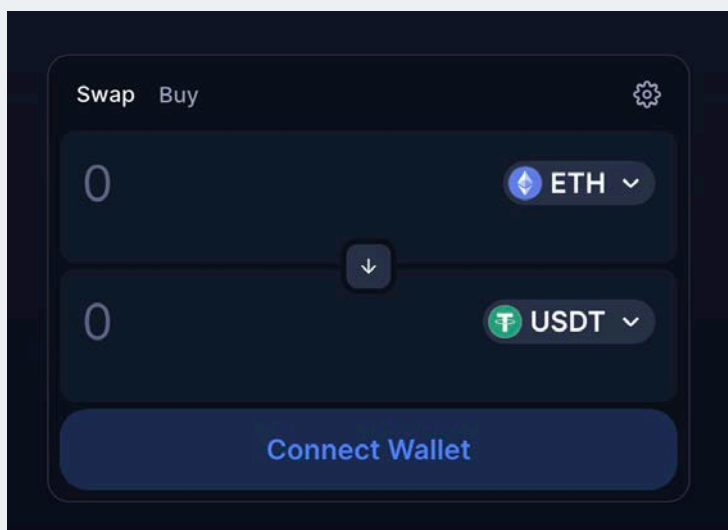
→ Decentralized  
exchanges (DEXs)

# → What is a DEX?

DEXs are decentralized applications (dApps) running as smart contracts on blockchains like Ethereum. These smart contracts provide a peer-to-peer exchange mechanism that allows users to trade tokens without relying on an intermediary. The terms of the trade are defined and automatically executed by code, as well as being recorded on the blockchain. Unlike bridges, their exchange capabilities only extend to assets on the same blockchain, although these lines are increasingly being blurred with new services now offering cross-asset swaps natively, as we discuss later in this report.

DEXs are also referenced as automated market makers (AMMs), referring to their ability to automatically execute buy and sell orders on their platform using smart contracts.

This is in stark contrast to centralized exchanges (CEXs), which control the security, pricing and execution of trades as well as taking custody of assets being traded during the transaction. DEXs are therefore considered to be safer, as users always retain custody of assets being traded. However, they cannot offer conversions to fiat currencies, which CEXs do.



*DEX interfaces for Uniswap (left) and Curve Protocol (right).*

## DEXs and crypto crime

In Elliptic's 2022 "State of Cross-Chain Crime" report, we analyzed crypto thefts from DeFi protocols and centralized exchanges. Out of approximately \$3.3 billion of funds stolen across more than 80 individual exploits, more than a third (\$1.18 billion) were swapped to other tokens using DEXs. Our analysis also showed that the most used service was 1inch, with over \$322 million flowing through its contracts.

Since their inception up to and including July 2023, DEXs have processed almost \$4 billion of illicit funds, more than cross-chain bridges or coin swap services. These funds mainly originate from thefts from DeFi protocols, scams, Ponzi schemes and sanctioned activity – including North Korean crypto heists. As our previous report identified, DEXs are attractive to criminals for three main reasons:

1. **Evading asset freezes:** they can be used to convert freezable assets – including the USDT and USDC stablecoins – to non-freezable assets, such as the DAI stablecoin.
2. **Preparing for onward laundering:** they can convert obscure assets into more mainstream assets like ETH, which are accepted by other laundering services, such as mixers or cross-chain bridges.
3. **Evading post-theft value fluctuations:** typically after a crypto theft, a criminal may obtain highly specific assets related only to the entity that was victimized. The thief will likely use a DEX immediately to swap to more mainstream assets, evading a significant expected drop in asset value after markets react to the news of the theft.

Since last year's report, Elliptic's researchers have used our enhanced Holistic blockchain analytics capabilities to uncover more complex and technical criminal use cases of DEXs. We have recently observed the following trends:

- The Tornado Cash sanctions have impacted the use of DEXs to convert assets into ETH to deposit into Tornado Cash's various pools. Current trends appear to point to a move towards stablecoins – particularly DAI – which already was the second most popular asset these funds were converted to as the only major stablecoin, which holding accounts can not be frozen at contract level. Recent trends also show that DAI is often subsequently converted to USDT for use on Tron in particular.
- The FTX collapse took RenBridge down with it, the latter of which was primarily funded by Alameda Research. As a result, the third most popular asset for DEX swaps identified in our last report – namely renBTC – is no longer being used in any significant way by criminals.

The next three case studies will explore three recently-observed crime trends involving DEXs, including the use of limit orders, crypto derivatives and swaps made by wallets associated with terrorist groups.

## The use of DEX limit orders

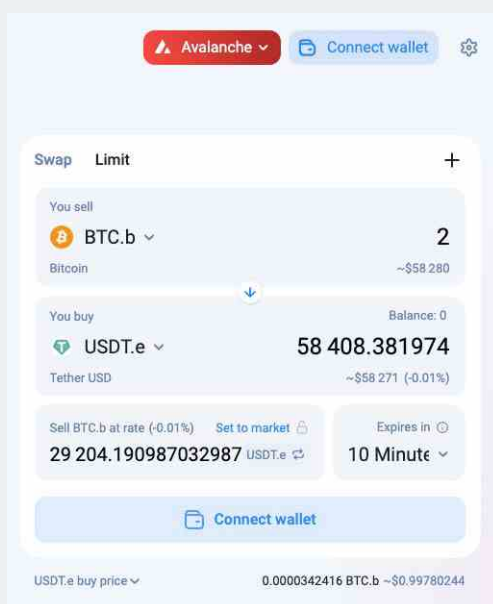
A limit order is an order to buy or sell certain assets for predetermined prices and timeframes. Orders are automatically executed by a smart contract if and when these price and timing conditions are met.

Elliptic's investigators have identified a specific criminal use of linch's Limit Order Protocol, which highlights the ways that cybercriminals can exploit developments geared towards optimizing the user experience for DeFi users to conceal flows of illicit funds.

### Case study 1: Lazarus using linch limit orders on Avalanche

linch launched in 2019 and now operates as a decentralized finance service provider on Ethereum and other popular EVM-compatible layer one and layer two solutions such as Arbitrum, Optimism, Polygon, Avalanche, Gnosis, Binance Smart Chain, Fantom, Klaytn and Aurora.

In 2021, linch launched its Limit Order Protocol, which was upgraded in 2022 and allows users to place orders with specified price and time range limits. These orders can be filled by anyone and an order can be filled by multiple parties.



*linch dApp panel showing setup of limit order.*

Elliptic researchers have seen the systematic use of linch limit orders by North Korea's Lazarus Group (APT38) in 2023. After bridging BTC into Avalanche as BTC.b, they then sought to swap the BTC.b for USDT.e, an Avalanche wrapped version of USDT.

On February 12th 2023, we tracked 52.1 BTC.b transferred to an account 0x505, which then set a limit order for the sale of all the BTC.b for USDT.e using linch. This resulted in 33 individual transactions filling the order, including three from the linch aggregation protocol. Filling the entire order took approximately 49 minutes, and a new recipient account was provided as part of the order to receive the purchased USDT.e.

Txn Hash	Age	From	To	Value	Token
0x0c0a01444e1b2201...	164 days 5 hrs ago	0x5058100ac5294126...	0x0c0a01444e1b2201...	0.051917	Bitcoin (BTC.b)
0x0a8348a2b0c4119e...	164 days 5 hrs ago	0x5058100ac5294126...	0x0a8348a2b0c4119e...	1.05647505	Bitcoin (BTC.b)
0x347186d72a4d8112...	164 days 5 hrs ago	0x5058100ac5294126...	0x0a8348a2b0c4119e...	0.11673962	Bitcoin (BTC.b)
0x010a047159c16007...	164 days 5 hrs ago	0x5058100ac5294126...	0x010a047159c16007...	1.00012921	Bitcoin (BTC.b)
0x010a047159c16007...	164 days 5 hrs ago	0x5058100ac5294126...	0x010a047159c16007...	1.00012642	Bitcoin (BTC.b)
0x11371719c07a1939...	164 days 7 hrs ago	0x5058100ac5294126...	0x010a047159c16007...	1.00014148	Bitcoin (BTC.b)
0x010a047159c16007...	164 days 7 hrs ago	0x5058100ac5294126...	0x010a047159c16007...	1.00015001	Bitcoin (BTC.b)
0x0222f9c110cc2993...	164 days 7 hrs ago	0x5058100ac5294126...	0x010a047159c16007...	1.00013142	Bitcoin (BTC.b)
0x020a010f10a4d0c6...	164 days 7 hrs ago	0x5058100ac5294126...	0x010a047159c16007...	1.00019985	Bitcoin (BTC.b)
0x010a047159c16007...	164 days 7 hrs ago	0x5058100ac5294126...	0x010a047159c16007...	1.00016243	Bitcoin (BTC.b)
0x010a047159c16007...	164 days 7 hrs ago	0x5058100ac5294126...	0x010a047159c16007...	1.00016287	Bitcoin (BTC.b)
0x7185547e71122e...	164 days 7 hrs ago	0x5058100ac5294126...	0x010a047159c16007...	13.76748162	Bitcoin (BTC.b)
0x020a047159c16007...	164 days 7 hrs ago	0x5058100ac5294126...	0x010a047159c16007...	1.00014274	Bitcoin (BTC.b)
0x010a047159c16007...	164 days 7 hrs ago	0x5058100ac5294126...	0x010a047159c16007...	1.00016789	Bitcoin (BTC.b)
0x010a047159c16007...	164 days 7 hrs ago	0x5058100ac5294126...	0x010a047159c16007...	1.00016034	Bitcoin (BTC.b)
0x010a047159c16007...	164 days 7 hrs ago	0x5058100ac5294126...	0x010a047159c16007...	1.00017822	Bitcoin (BTC.b)
0x0277737907044904...	164 days 7 hrs ago	0x5058100ac5294126...	0x010a047159c16007...	1.00018636	Bitcoin (BTC.b)
0x010a047159c16007...	164 days 7 hrs ago	0x5058100ac5294126...	0x010a047159c16007...	1.00014082	Bitcoin (BTC.b)
0x010a047159c16007...	164 days 7 hrs ago	0x5058100ac5294126...	0x010a047159c16007...	0.03118203	Bitcoin (BTC.b)
0x010a047159c16007...	164 days 7 hrs ago	0x5058100ac5294126...	0x010a047159c16007...	1.00023716	Bitcoin (BTC.b)
0x180110d050e22f...	164 days 7 hrs ago	0x5058100ac5294126...	0x010a047159c16007...	1.00023056	Bitcoin (BTC.b)
0x010a047159c16007...	164 days 7 hrs ago	0x5058100ac5294126...	0x010a047159c16007...	1.00023413	Bitcoin (BTC.b)
0x010a047159c16007...	164 days 7 hrs ago	0x5058100ac5294126...	0x010a047159c16007...	1.00033861	Bitcoin (BTC.b)
0x11371719c07a1939...	164 days 7 hrs ago	0x5058100ac5294126...	0x010a047159c16007...	1.00027285	Bitcoin (BTC.b)
0x010a047159c16007...	164 days 7 hrs ago	0x5058100ac5294126...	0x010a047159c16007...	1.00024366	Bitcoin (BTC.b)
0x010a047159c16007...	164 days 7 hrs ago	0x5058100ac5294126...	0x010a047159c16007...	1.00016258	Bitcoin (BTC.b)
0x010a047159c16007...	164 days 7 hrs ago	0x5058100ac5294126...	0x010a047159c16007...	1.00019561	Bitcoin (BTC.b)
0x010a047159c16007...	164 days 7 hrs ago	0x5058100ac5294126...	0x010a047159c16007...	1.00020136	Bitcoin (BTC.b)
0x010a047159c16007...	164 days 7 hrs ago	0x5058100ac5294126...	0x010a047159c16007...	1.00019405	Bitcoin (BTC.b)
0x010a047159c16007...	164 days 7 hrs ago	0x5058100ac5294126...	0x010a047159c16007...	1.00022724	Bitcoin (BTC.b)
0x010a047159c16007...	164 days 7 hrs ago	0x5058100ac5294126...	0x010a047159c16007...	1.00023606	Bitcoin (BTC.b)
0x010a047159c16007...	164 days 7 hrs ago	0x5058100ac5294126...	0x010a047159c16007...	1.00020293	Bitcoin (BTC.b)
0x010a047159c16007...	164 days 7 hrs ago	0x5058100ac5294126...	0x010a047159c16007...	1.00017179	Bitcoin (BTC.b)
0x010a047159c16007...	164 days 7 hrs ago	0x5058100ac5294126...	0x5058100ac5294126...	52.1	Bitcoin (BTC.b)

Avalanche Explorer Snowtrace showing the BTC.b orders (not exhaustive).







## Case study 2: Wormhole exploiter use of derivatives protocol Synthetix

On January 14th 2023, the exploiter behind the \$325 million hack of the Wormhole Protocol bridged stolen funds from Solana into Ethereum as USDC.<sup>9</sup> A total of 218,064.64 USDCet (Wormhole wrapped USDC) were burnt in one transaction using Wormhole.

The screenshot shows a transaction on the Solana blockchain. At the top, the transaction ID is 2ELdyRbjX3aq3SdDNEcmrKGCZMJwXy6fda1kHDFyeQrZL6BfyxETb3yG5xdnw3zMDu3aUJYPrGPQiNq2V8uftGiG. Below it is the transaction hash # 172479253. The transaction is dated 3 months ago, specifically January 14, 2023 at 17:37:08 +UTC. The status is 'Success' and 'Finalized (MAX confirmations)'. The transaction involves two addresses: 5XiqTJQBTZKcGjcbCydZyf9NzhE2R3g7GDx1yKHxs8jd and HaAsUw7axZtExBAqbzsHMPvKbP6azt2y65BnDCWMgxVP. The transaction amount is 0.00001 SOL. The transaction is labeled 'Interact with program Wormhole Program'. The transaction details show three actions: 1. Transfer from 5XiqTJ...Hxs8jd to 9bFNrX...eintHy for 0.0000001 SOL. 2. Transfer from 5XiqTJ...Hxs8jd to HaAsUw...WMgxVP for 0.00247776 SOL. 3. Burn 218,084.64 USDC.

The corresponding 218,084.641209 USDC were then minted on Ethereum into the exploiter's address.

The screenshot shows a transaction on the Ethereum blockchain. The transaction ID is 0x8184Ef7A6e54C72F56577a45ADC5aED68037Af51, labeled as 'Wormhole Network Exploiter 2'. The transaction is dated 3 months ago, specifically January 14, 2023 at 17:37:08 +UTC. The status is 'Success'. The transaction involves two addresses: 0x8184Ef7A6e54C72F56577a45ADC5aED68037Af51 (Wormhole Network Exploiter 2) and 0x3ee18B2214AFF97000D974cf647E7C347E8fa585 (Wormhole: Portal Token Bridge). The transaction is labeled 'From Wormhole: Portal Token Bridge To Wormhole Network Exploiter 2 For 218,084.641209 (\$218,084.64) USD Coin... (USDC...)'. The transaction amount is 218,084.641209 USDC.

The exploiter then in very short order conducted one asset swap to convert 218,288.629649 USDC into ETH using Curve's SynthSwap contract. In the first transaction, the USDC was traded for sUSD, which was traded for sETH. In fact, the trade just locked in a price for ETH using sETH and an NFT was issued to represent the trade.

0x8184Ef7A6e54C72F56577a45ADC5aED68037Af51 (Wormhole Network Exploiter 2)

0x58A3c68e2D3aAf316239c003779F71aCb870Ee47 (Curve Finance: SynthSwap)

- From Wormhole Network Exploiter 2 To Curve Finance: SynthSwap For 218,288.629649 (\$218,249.56) USD Coin... (USDC...)
- From Curve Finance: SynthSwap To Curve.fi: Swap Router For 218,288.629649 (\$218,249.56) USD Coin... (USDC...)
- From Curve.fi: Swap Router To Curve.fi: sUSD v2 Swap For 218,288.629649 (\$218,249.56) USD Coin... (USDC...)
- From Curve.fi: sUSD v2 Swap To Curve.fi: Swap Router For 217,927.419795216815446874 **\$218,363.27** Synth sUSD... (sUSD...)
- From Curve.fi: Swap Router To 0x2e0a48...70ae5408 For 217,927.419795216815446874 **\$218,363.27** Synth sUSD... (sUSD...)
- From 0x2e0a48...70ae5408 To Null: 0x000...000 For 217,927.419795216815446874 **\$218,363.27** Synth sUSD... (sUSD...)
- From Null: 0x000...000 To 0x2e0a48...70ae5408 For 141.718598485368745141 (\$271,119.02) Synth sETH... (sETH...)
- From Null: 0x000...000 To Synthetix: Fee Address For 217.927419795216816675 **\$218.36** Synth sUSD... (sUSD...)



ERC-721 Token ID [13416357591883... ] Curve SynthS... (CRV/SS...)

From Null: 0x000...000 To Wormhole Network Exploiter 2

This transaction took place at 5:42:59pm (UTC), when the ETH price was circa \$1,550.07 and at 7:03:23pm (UTC) a second transaction was confirmed, burning the issued NFT to initiate a transfer of 141.776 ETH back to the exploiter at an ETH price of circa \$1,537.75.

0x8184Ef7A6e54C72F56577a45ADC5aED68037Af51 (Wormhole Network Exploiter 2)

0x58A3c68e2D3aAf316239c003779F71aCb870Ee47 (Curve Finance: SynthSwap)

- Transfer 141.776268801230825515 ETH From Curve.fi: ETH/sETH Pool To Curve.fi: Swap Router
- Transfer 141.776268801230825515 ETH From Curve.fi: Swap Router To Wormhole Network Exploit...

- From 0x2e0a48...70ae5408 To Curve.fi: Swap Router For 141.718598485368745141 (\$270,865.34) Synth sETH... (sETH...)
- From Curve.fi: Swap Router To Curve.fi: ETH/sETH Pool For 141.718598485368745141 (\$270,865.34) Synth sETH... (sETH...)



ERC-721 Token ID [13416357591883... ] Curve SynthS... (CRV/SS...)

From Wormhole Network Exploiter 2 To Null: 0x000...000

The exploiter then in very short order conducted one asset swap to convert 218,288.629649 USDC into ETH using Curve's SynthSwap contract. In the first transaction, the USDC was traded for sUSD, which was traded for sETH. In fact, the trade just locked in a price for ETH using sETH and an NFT was issued to represent the trade.

## The use of DEXs by terrorist organizations

As Elliptic’s “Terrorist Financing and Cryptoassets in 2023” report details,<sup>10</sup> terrorist organizations that use cryptoassets now overwhelmingly do so using Tether (USDT) rather than Bitcoin. This includes Hezbollah, Hamas, the Palestinian Islamic Jihad and money exchangers facilitating illicit remittances located in Palestine and Gaza.

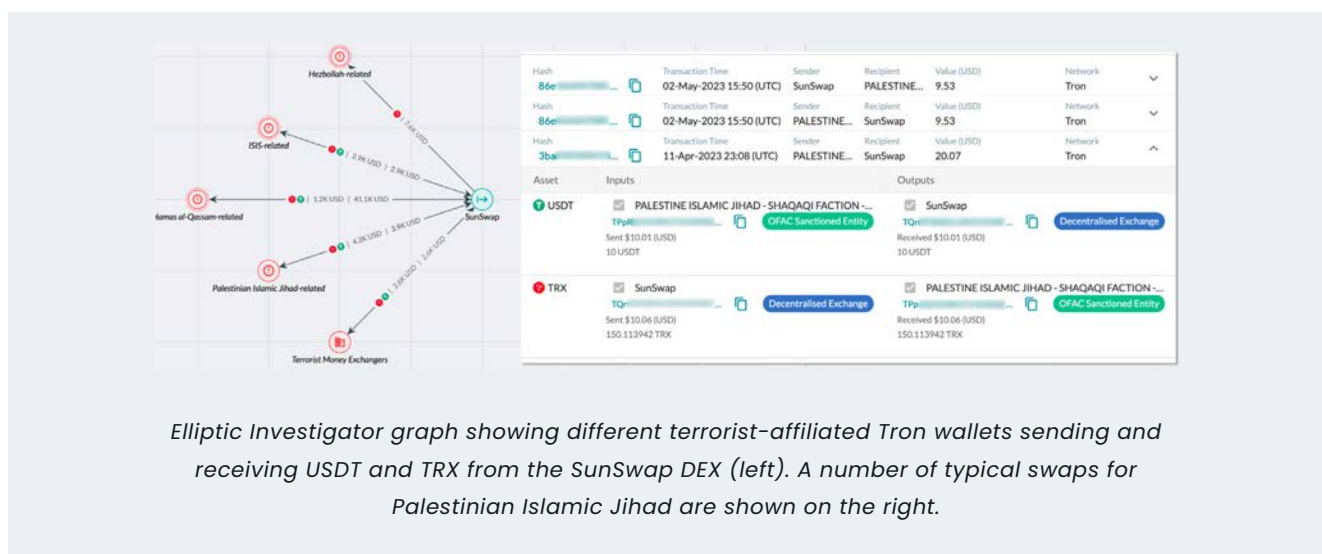
Wallets affiliated with such organizations are most widely in the form of Tron. An analysis of wallets identified by Israel to be associated with the Palestinian Islamic Jihad, for example, has shown that the group has apparently engaged with USDT on the Tron blockchain to the tune of \$94 million. This use of non-native assets has resulted in such organizations using DEXs to finance their on-chain activity.

### Case study 3: using DEXs to finance terrorist transactions

Unlike Bitcoin, USDT is not a native asset on a blockchain, and thus a user needs to hold a certain amount of a blockchain’s native asset in order to pay USDT transaction fees. In the case of Tron, the native asset is TRX.

Elliptic’s analysis has identified the use of SunSwap – a Tron-based DEX – as the medium where terrorist organizations obtain the necessary TRX to facilitate USDT transactions. In some cases, unused TRX is converted back to USDT.

The Elliptic Investigator graph below shows how these interactions can be viewed holistically by incorporating both TRX and USDT assets on the same visualization. Elliptic’s transaction viewing tool also indicates how most of these transactions are small but frequent – typically converting only \$10 or so worth of USDT/Tron in each swap. Transaction fees are significantly lower on the Tron blockchain than other mainstream counterparts, potentially explaining its attractiveness to terrorists.



*Elliptic Investigator graph showing different terrorist-affiliated Tron wallets sending and receiving USDT and TRX from the SunSwap DEX (left). A number of typical swaps for Palestinian Islamic Jihad are shown on the right.*

# → Summary: decentralized exchanges

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The first two case studies indicate that DEXs are continuously innovating and providing new functionalities that are beneficial for their at-large user base. However, crypto-savvy criminals have already begun exploiting them to launder their funds. Cross-chain tracing functionalities are therefore becoming increasingly essential to visualize and monitor any criminality associated with these complex transactions.

DEXs are also being caught in the unfortunate crossfire of other crypto crime trends. The increased use of Tether USDT on Tron by terrorist organizations, for example, has resulted in a reciprocal terrorist financing risk for DEXs that offer USDT-TRX liquidity pools. These new trends all have implications for the sanctions evasion, terrorist financing and money laundering risks borne by DEXs, and centralized services that process funds originating from them.

Despite certain assets – such as renBTC – falling out of fashion due to developments between late 2022 and 2023, other trends with DEXs remain consistent with findings from our previous report. Namely, DEXs continue to be widely used by perpetrators of DeFi thefts for the purpose of converting obscure protocol-specific tokens to more mainstream ones. They also continue to be used by thieves to convert freezable assets to non-freezable ones. Thus, while new and more complex criminal use cases of DEXs have emerged, their traditional use cases for money laundering remain intact.

All these risks can be addressed and mitigated through a cross-chain Holistic Screening and investigative approach. Before discussing these strategies in depth, the next section discusses recent trends identified with cross-chain bridges.

→ Cross-chain  
bridges

# → What is a cross-chain bridge?

A cross-chain bridge – commonly referred to just as a bridge – is a type of service that allows users to exchange tokens on one blockchain to tokens on another. They operate with varying degrees of centrality, with most making use of smart contracts to facilitate exchanges. More recently, bridges have started accommodating other forms of cryptoassets – including NFTs and metaverse-related assets.

When “bridging” an asset A to asset B on another blockchain, the service locks the converted asset A and issues the exchange equivalent of asset B to the user. Asset B is itself issued from a reserve of locked assets accumulated from previous conversions in the other direction. This is called “lock-and-mint” – the most common operating mechanism for cross-chain bridges.

Some bridges also allow users to convert an asset A to a tokenized – or “wrapped” form of it on another blockchain. For example, a user can bridge BTC from the Bitcoin blockchain to BTC.b on Avalanche or WBTC on Ethereum. In 2022, cross-chain bridges handled over \$45.1 billion in Wrapped BTC (wBTC) – worth the same amount – on the Ethereum blockchain. Users can then use their wBTC for Ethereum-based services, such as DeFi investments or NFT purchases.

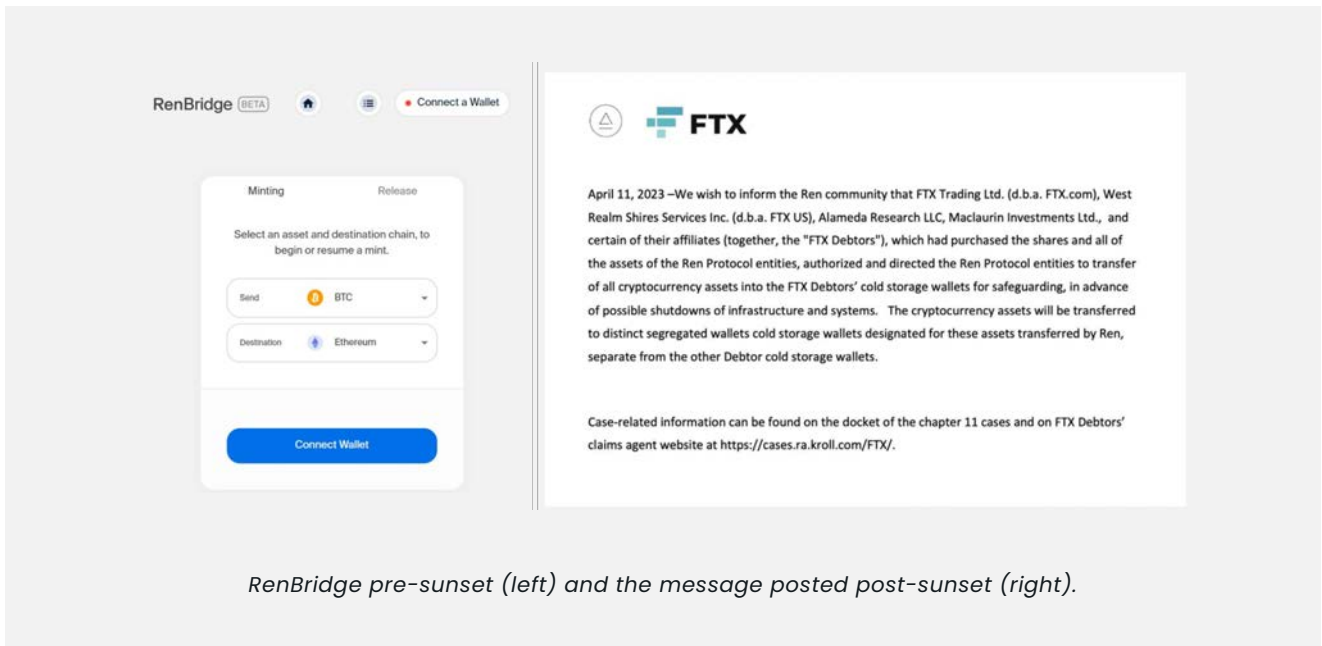
## Recent developments

Until December 2022, “Ren” was one of the most dominant bridges. In our last report, we identified over half a billion dollars worth of illicit cryptoassets being laundered through Ren, which swapped between Bitcoin and Ethereum.<sup>11</sup> Having been funded by Alameda Research, Ren was “sunset” towards the end of 2022 after the former’s high-profile collapse along with FTX. As a result, the service no longer operates at the scale it used to pre-FTX collapse.<sup>12</sup>

What our research has identified, however, is that other decentralized bridges have replaced RenBridge as a method of choice for cybercriminals to move assets cross-chain. It is worth recalling that, just as Ren was not designed for the laundering of illicit finance, nor are those other bridges. Their main attractiveness to criminals is their anonymous and decentralized method of converting assets, which makes them preferable to KYC-compliant centralized exchanges.

**\$45.1  
billion**

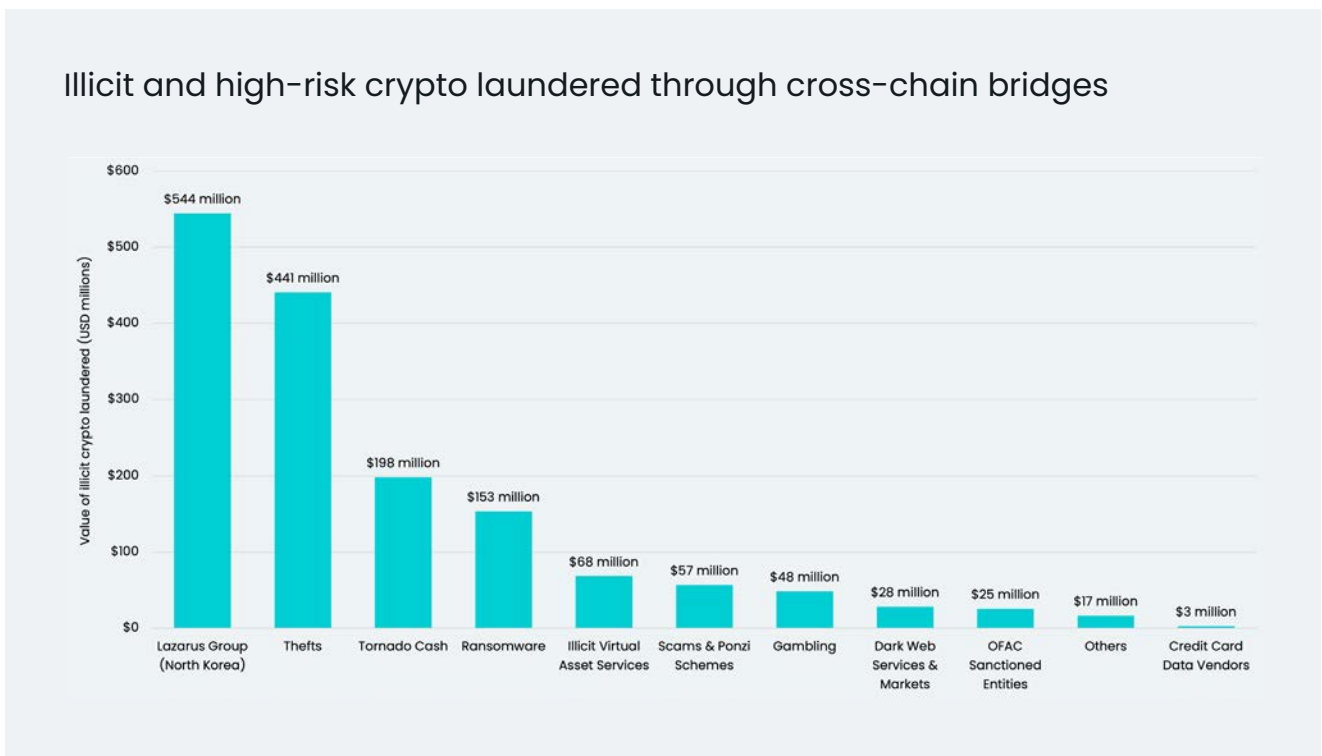
In 2022, cross-chain bridges handled over \$45.1 billion in Wrapped BTC (wBTC) – worth the same amount – on the Ethereum blockchain



*RenBridge pre-sunset (left) and the message posted post-sunset (right).*

As the chart below shows, the single biggest criminal origin of bridged cryptoassets is now the Lazarus Group – North Korea’s state-backed cybercrime organization. Taking just Bitcoin, theft perpetrated by the Lazarus Group makes up more than half of all illicit funds sent through bridges, and with other thefts, almost seven times the amount sent through by perpetrators of ransomware or malware – the next most dominant category.

The majority of the Lazarus Group’s funds originate from exploits of centralized and decentralized cryptoasset services. As mentioned previously, their increased use of bridges stems from the enforcement actions levied against their former laundering tool of choice: Tornado Cash. The specific crypto theft that led to the Lazarus Group resorting to cross-chain bridges – namely the June 2022 Harmony Horizon Bridge hack – is discussed in more detail in case study 4.<sup>13</sup>

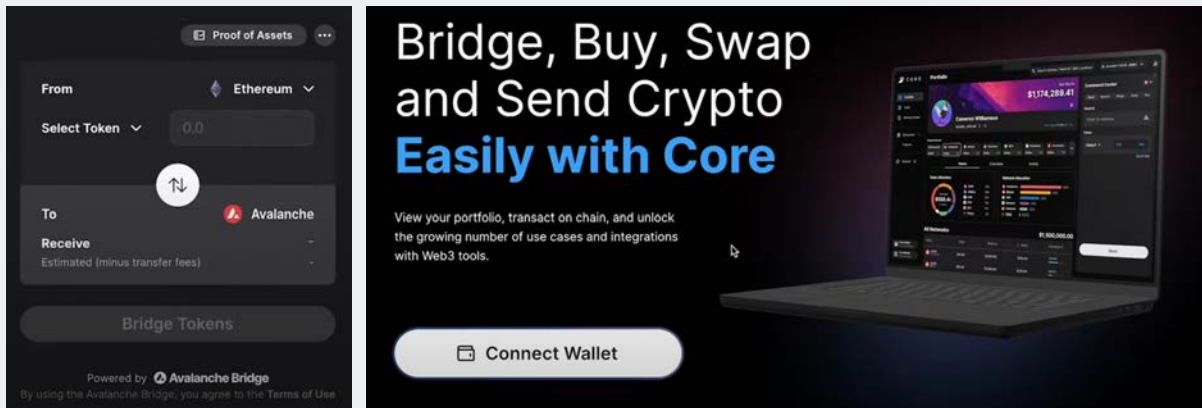






## Case study 4: the Avalanche Bridge and North Korea

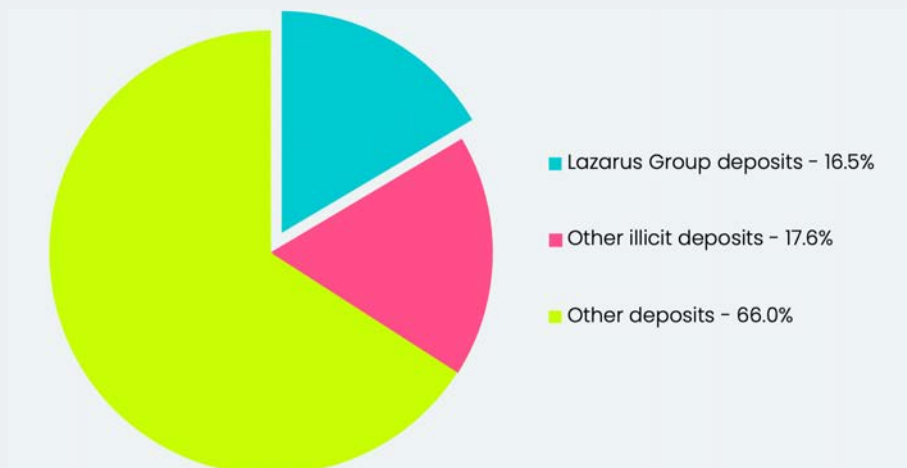
The Avalanche Bridge was launched in 2021 to support the bridging of assets between Avalanche and Ethereum and now also supports the bridging of assets between Avalanche and Bitcoin. Like RenBridge, it is a decentralized bridge, with no central authority to validate bridging of assets and/or assume control of them during bridging events.



*The Avalanche Bridge.*

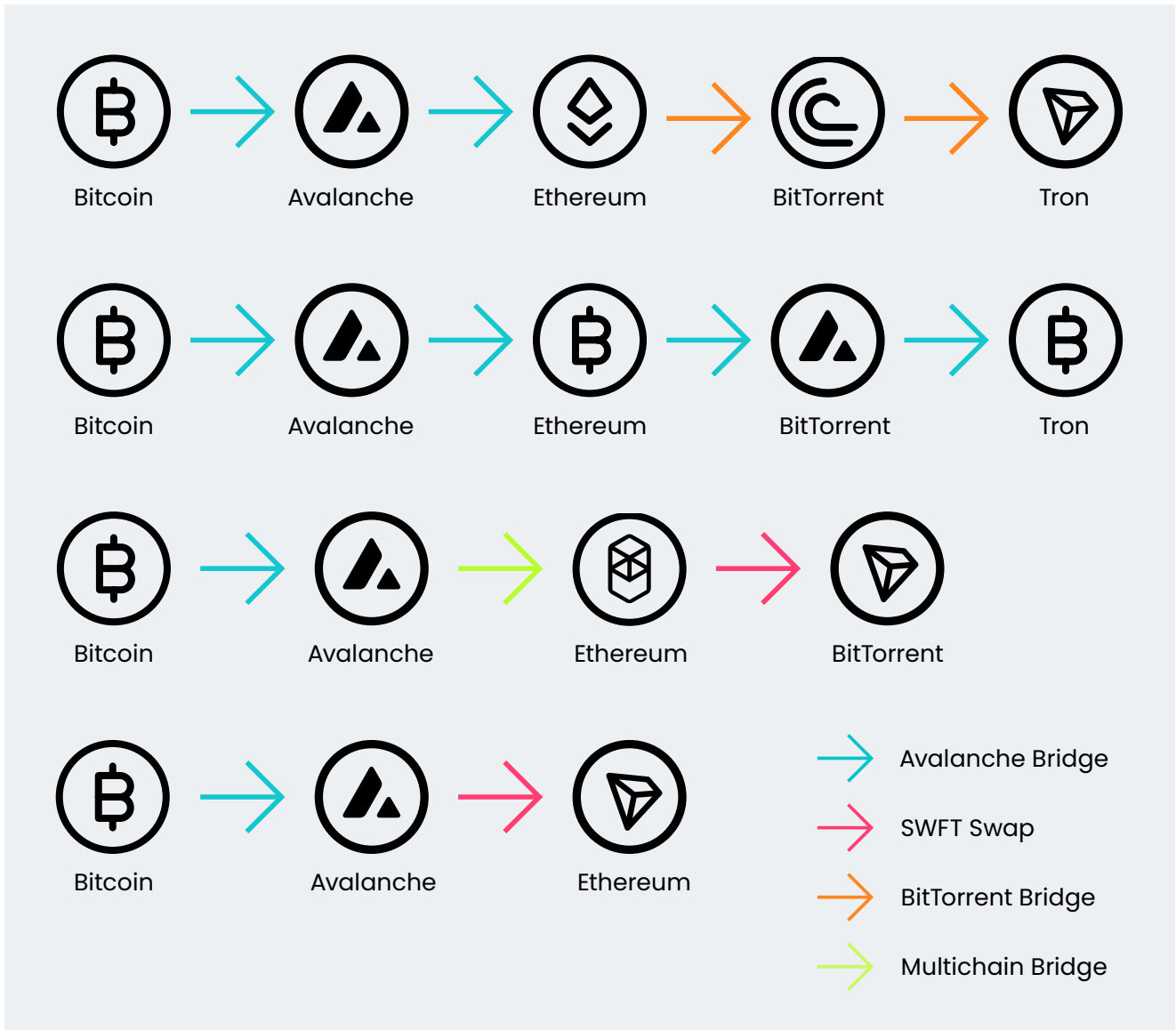
At time of writing, over 58,000 BTC had been deposited into the Avalanche Bridge Bitcoin address, of which just under 20,000 BTC were identified by our research as from illicit sources or mixing services, dating back to 2016. Of these, more than 9,500 BTC were attributed by our investigations team to Lazarus Group hacks, as shown in the below chart.

### Nature of Bitcoin deposited into Avalanche Bridge





Our research has identified some of the cross-chain paths used specifically by the Lazarus Group to move some of its stolen funds, consolidated in BTC across to Tron in USDT. These combine the use of the Avalanche Bridge with other bridging services, such as SWFT Swap, Multichain and BitTorrent Bridge. Over \$100 million has been moved by Lazarus via SWFT. The graphic below shows some of the cross-chain combinations used by Lazarus to launder its funds. As is evidenced by the assets ending up on the same blockchain on numerous occasions, these transactions have no legitimate business purpose other than to obfuscate their origin.



These cross-chain and cross-swaps are designed to defeat legacy blockchain solutions. However, since our October 2022 report, Elliptic has introduced Holistic visualization capabilities to Investigator, which allows for the tracing of funds regardless of asset or chain.

Indeed, leveraging our cross-asset and cross-chain investigation solutions, Elliptic researchers were able to alert exchanges to Lazarus Group funds being processed through accounts on their platform, leading to \$1.4 million of funds stolen during their June 2022 Harmony Horizon Bridge exploit being seized.<sup>14</sup> This exploit was initiated following a successful social engineering operation.



## Use of bridges by scammers and professional launderers

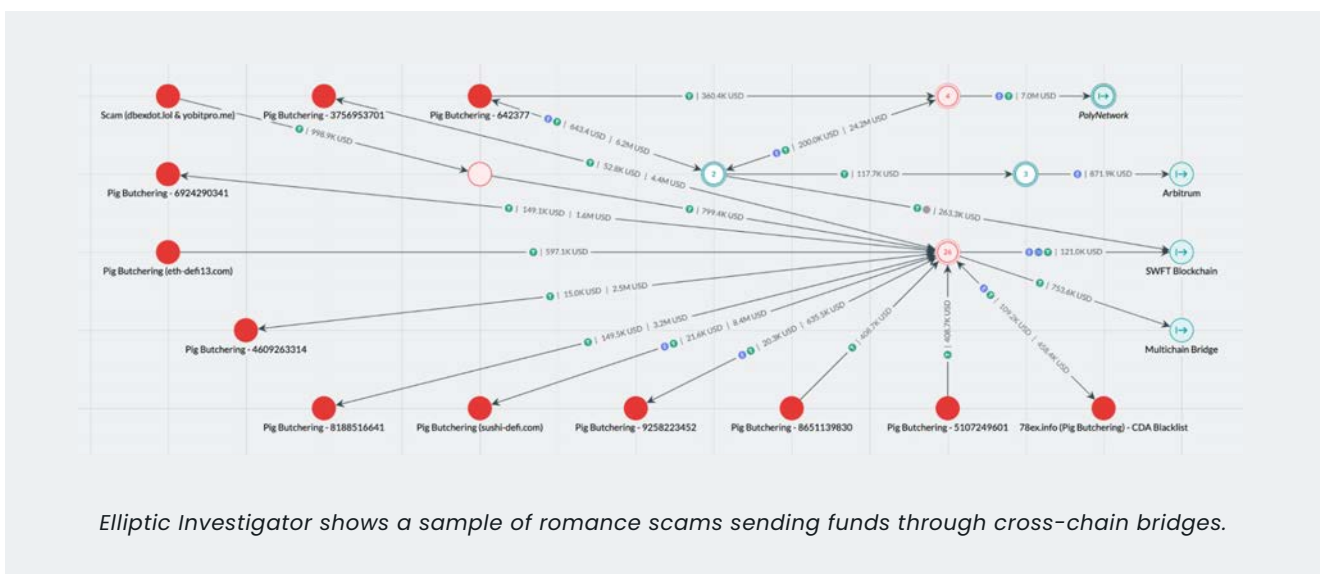
The Lazarus Group example points to the increasing use of cross-chain solutions by professional money launderers and brokers. North Korean hackers are not the only beneficiaries, however. Elliptic's researchers have identified that similar services – even ones that have also been used by Lazarus – are also used to launder proceeds from several crypto romance (“pig butchering”) scams.



### Case study 5: pig butchering proceeds being laundered through bridges

One significant criminal trend that has rapidly gained prominence in recent years is romance scams, otherwise known as “pig butchering”. This fraudulent activity involves perpetrators – based predominantly in south-east Asia – engaging in conversations with victims, forming a close personal bond. The scammer then pretends to have made significant amounts of money through crypto investments. The victim will be encouraged to deposit money to a fake investment website, which will eventually stop processing withdrawals and steal their funds.<sup>15</sup>

Many pig butchering proceeds are laundered through centralized exchanges based in south-east Asia. However, a considerable amount of these funds are first laundered through cross-chain bridges. The Elliptic Investigator graph below shows pig butchering proceeds being sent through major bridges, including SWFT, PolyNetwork and Avalanche Bridge.



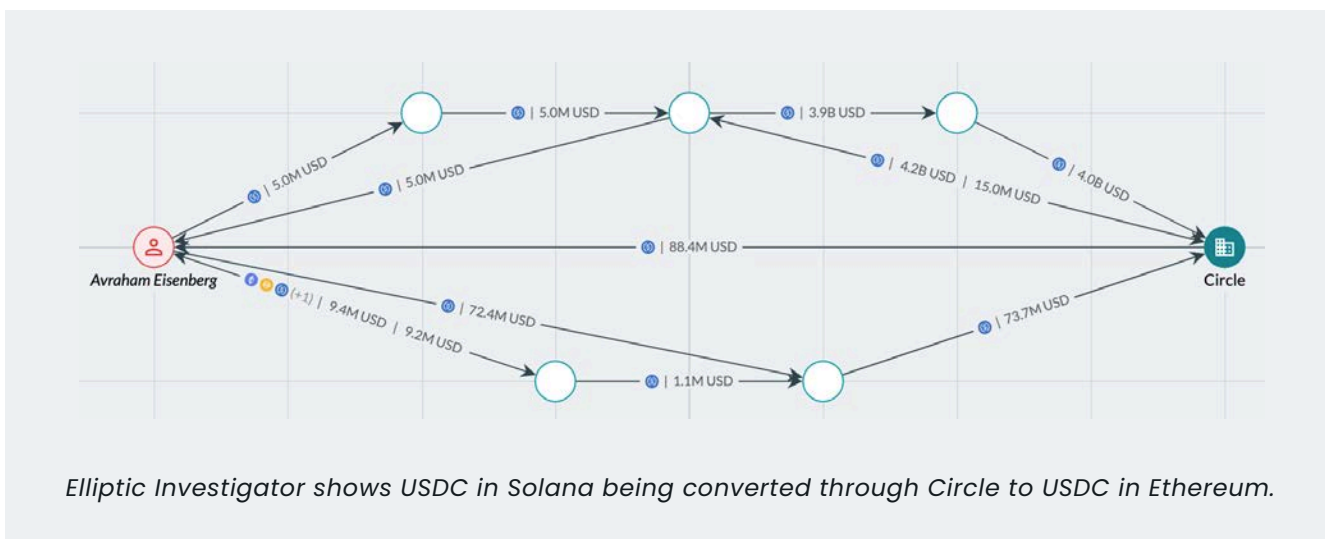
After being transferred to other blockchains such as Tron, BSC or Arbitrum, funds typically then end up in centralized KYC-compliant exchanges.<sup>16</sup> This suggests that criminals are hoping that the use of a bridge has successfully obfuscated the illicit origin of the funds, though tools such as Investigator are able to confirm otherwise.

This graph also indicates that the laundering strategies for many of these scams – some of which will indeed be perpetrated by the same organized crime group – are very much interlinked and sophisticated. They make use of transaction hopping and other obfuscation patterns before depositing into the bridge. Such behavior indicates that professional crypto money laundering services are likely to be involved.<sup>17</sup>

## Case study 6: bridging using centralized services

Solana protocol Mango Markets was exploited in October 2022, for which Avraham Eisenberg was later arrested by the FBI.<sup>18</sup> Over \$116 million in assets were stolen during the hack.<sup>19</sup>

On October 11th 2022 at 11:27pm (UTC), 7,519,769.62 USDC from the exploit on Solana were sent to the Circle treasury – issuer of the USDC token – on multiple blockchains and at 11:28pm (UTC) on the same day, 7,500,000 USDC were sent directly by Circle to an account on Ethereum attached to ENS domain ponzishorter.eth, which has been attributed to Eisenberg.



*Elliptic Investigator shows USDC in Solana being converted through Circle to USDC in Ethereum.*

In total, 30 million USDC from the exploit were moved from Solana to Ethereum in that manner, which mirrors the use of other centralized services such as exchanges to conduct cross-assets or cross-chain swaps off-chain. In consistency with a typology we identified in our previous October report, these 30 million USDC were swapped for 30 million DAI. In all likelihood, this was to prevent Circle freezing these tokens once becoming aware of their source. Unlike the USDT or USDC stablecoins, DAI cannot be frozen.

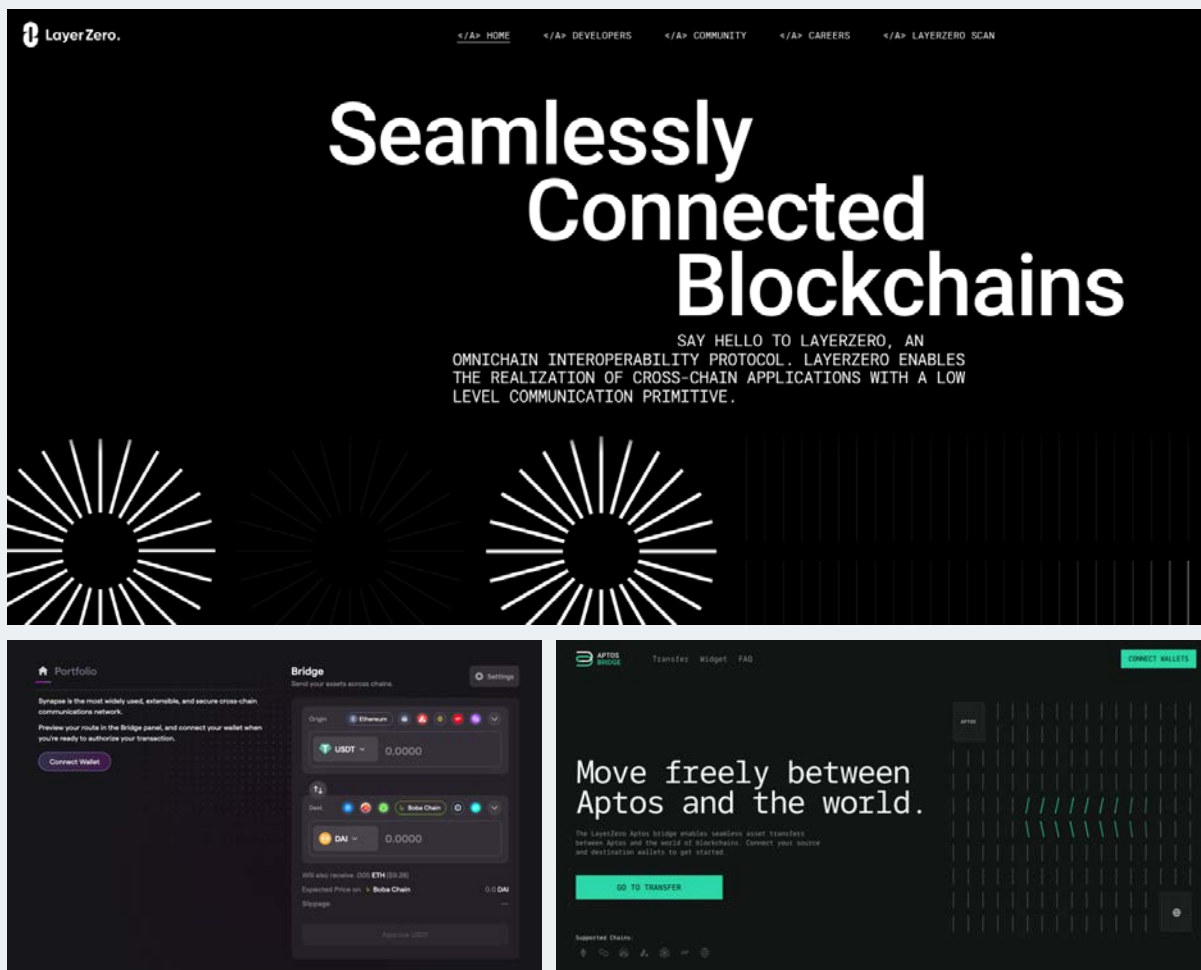
Nevertheless, the Elliptic Investigator graph above shows that Holistic investigative capabilities are able to successfully trace and intercept these funds real-time even through a centralized service, as they did also when identifying and facilitating the seizure of the \$1.4 million in Lazarus Group Horizon Bridge funds discussed in case study 4.

## The next generation of cross-chain bridging

Cross-chain bridges are constantly innovating to improve security, cost-effectiveness and the ability to directly initiate cross-asset swaps across blockchains. While bridges such as Avalanche and Ren create wrapped versions of native assets to support bridging across native and non-native chains for that asset, newer services are enabling the swapping of native to native assets on different chains.

Synapse, Stargate and SWFT are some examples of these, which simplify the experience for users. Synapse is a decentralized protocol that is active on 18 layer one and layer two solutions and claims to have bridged billions of dollars in asset value. Our research shows that it was used to bridge over \$4.5 million from a June 2021 exploit of a DeFi protocol named Eleven Finance.

Many newer bridges offer cross-chain gateways to LayerZero, an interoperability protocol that allows different blockchains to connect and communicate with each other more efficiently. Users include the Stargate Finance all-in-one protocol and Aptos Bridge, which links Aptos, which is a blockchain that rose out of Facebook's Diem project and Trader Joe – a popular DEX.



*The LayerZero interoperability protocol (top) and the Synapse (bottom-left) and Aptos Bridges (bottom-right).*

# → Summary: cross-chain bridges

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The cross-chain bridging of assets is a continuously developing sector within the wider decentralized finance industry. For legitimate users, such developments are hugely beneficial in making cross-chain swaps more efficient. However, inadvertent opportunities for money laundering and other forms of financial crimes remain. The diversification of assets that can now be swapped across bridges – as well as the integration of bridges with other DeFi services – can allow criminals to further anonymize their cross-chain activity and streamline their laundering schemes.

As the Lazarus Group case study in particular has shown, bridging back-and-forth for the sake of obfuscation – i.e. “chain-hopping” – is now a recognized money laundering typology. It also underscores that, while some criminals are dependent on cross-chain swaps to cash-out DeFi-related obscure tokens, others use it willingly and optionally as an additional obfuscation technique. Transactions that swap assets back and forth to the same asset have no legitimate business purpose other than to obfuscate the proceeds.

The criminal use of cross-chain bridges is likely to get easier and cheaper with new innovations. Holistic blockchain analytics capabilities are therefore becoming increasingly crucial to ensure that such activities can be effectively traced and mitigated where illicit funds are involved. As the case of the Lazarus Group has shown, these capabilities have already been leveraged to seize \$1.4 million of funds stolen by North Korea.

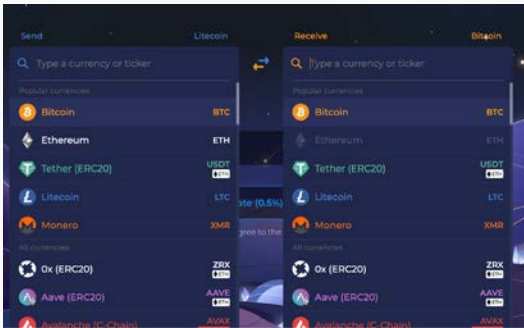
→ Coin swaps

# → What is a coin swap service?

A coin swap service is a centralized entity that allows the exchange of cryptoassets to other mediums of value. These can be (a) other cryptoassets, (b) other forms of digital currency or (c) cash. They are sometimes also referred to as “instant swap exchanges”.

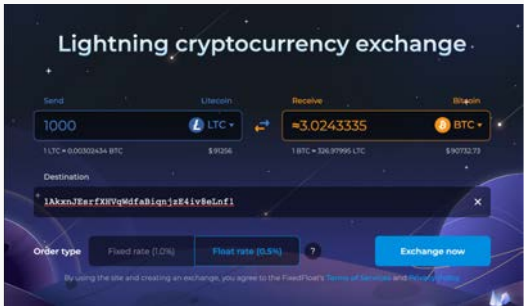
A coin swap service differs from a typical centralized cryptoasset exchange service in a number of ways. Firstly, they do not require a user to open an account to use them. This means that, where KYC would be implemented by compliant exchanges, a coin swap service relies on little, if any, anti-money laundering (AML) checks. Users can therefore use such services anonymously, but usually pay higher commissions on average in return.

A typical “coin swap” proceeds as follows. As can be seen, at no point in the process does the user disclose their identity:

A screenshot of a coin swap service interface. The screen is split into two columns: 'Send' on the left and 'Receive' on the right. Both columns have a search bar at the top and a list of cryptocurrencies below. The 'Send' column shows Bitcoin (BTC), Ethereum (ETH), Tether (ERC20), Litecoin (LTC), Monero (XMR), Ox (ERC20), and Aave (ERC20). The 'Receive' column shows Bitcoin (BTC), Ethereum (ETH), Tether (ERC20), Litecoin (LTC), Monero (XMR), Ox (ERC20), and Aave (ERC20). A central arrow points from the 'Send' column to the 'Receive' column.


### 1. Select trading pair

The user selects the currency they want to convert from and to. Based on liquidity, most coin swap services will place a limit on the amount that can be exchanged. Most coin swap services deal at least with Bitcoin, Tether and Monero.

A screenshot of a coin swap service interface titled 'Lightning cryptocurrency exchange'. It shows a 'Send' section with '1000' LTC and a 'Receive' section with '3,024,3335' BTC. Below the amounts, there are fields for 'Destination' and 'Order type' with options for 'Fixed rate (1.0%)' and 'Float rate (0.8%)'. An 'Exchange now' button is visible at the bottom right.

### 2. Inputting amounts

The user then decides how much they want to convert. They will get an instant quote – including commission. At this stage, most coin swap services will ask for the user’s recipient wallet address (or bank account).

A screenshot of a coin swap service interface showing the final step. It displays '1000.0 LTC' being converted to '3.02180632 BTC'. A QR code is shown on the right side of the screen. Below the QR code, there is a 'Receiving address (BTC)' field with a long alphanumeric string.

### 3. Sending & receiving funds

The service generates an address for the user to send funds to. Within minutes, the converted funds will be sent to the recipient account/address provided at the previous stage. More illicit services will likely use a manned operator on Telegram at this stage.



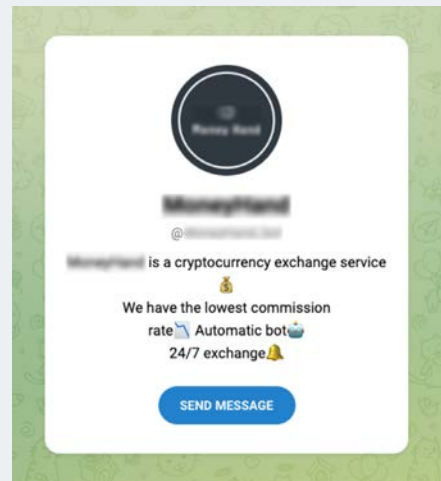
**Note:** in this section, we take care to not name any coin swap service when disclosing any Elliptic internal analysis or non-public information about them. This is to prevent any inadvertent interference with law enforcement investigations. Details of these anonymized services are available to law enforcement readers on request. You can reach out to [government@elliptic.co](mailto:government@elliptic.co).

## The money laundering risks of coin swap services

Coin swap services can be either legitimate-facing or illicit-facing. The table below shows how they compare.

	<b>Legitimate-facing</b>	<b>Illicit-facing</b>
<b>Liquidity</b>	Large	Limited given niche audience.
<b>Interface</b>	Websites	Websites, Telegram and other messaging apps, including direct messaging function on illicit forums.
<b>Target base</b>	Privacy-conscious users, DeFi traders unwilling to disclose investment strategies, small-scale criminality.	Predominantly a criminal audience, including scammers and dark web vendors.
<b>Advertising</b>	Widespread	Almost exclusively on dark web Russian-speaking cybercrime forums.
<b>Trading pairs</b>	Typically only cryptoassets, including privacy coins.	Combinations involving cryptoassets, privacy coins, virtual money (e.g. Sberbank accounts) and cash.
<b>AML/KYC</b>	Some anti-financial crime procedures, such as freezing deposits with high illicit exposure and information-sharing with law enforcement.	None - wallet exposure screening tools only used to ensure assets are sufficiently "clean" before sending to clients as part of their laundering service.

give away	You receive	Reserve
bitcoin bitcoin	bitcoin bitcoin	77.38636071
Ethereum ETH	Ethereum ETH	703.36200629
Ethereum Classic ETC	Ethereum Classic ETC	115713694024
Litecoin LTC	Litecoin LTC	124762398901
Tron TRX	Tron TRX	84319915000381
DASH DASH	DASH DASH	5058.67951497
Dogecoin DOGE	Dogecoin DOGE	93252778.225087
Monero XMR	Monero XMR	867725
Waves WAVES	Waves WAVES	12098.458
Solana S.O.L.	Solana S.O.L.	155863.94485456



An example of an illicit-facing coin swap service as a website (left) and Telegram bot channel (right).

## Analyzing the (illicit) use of coin swap services

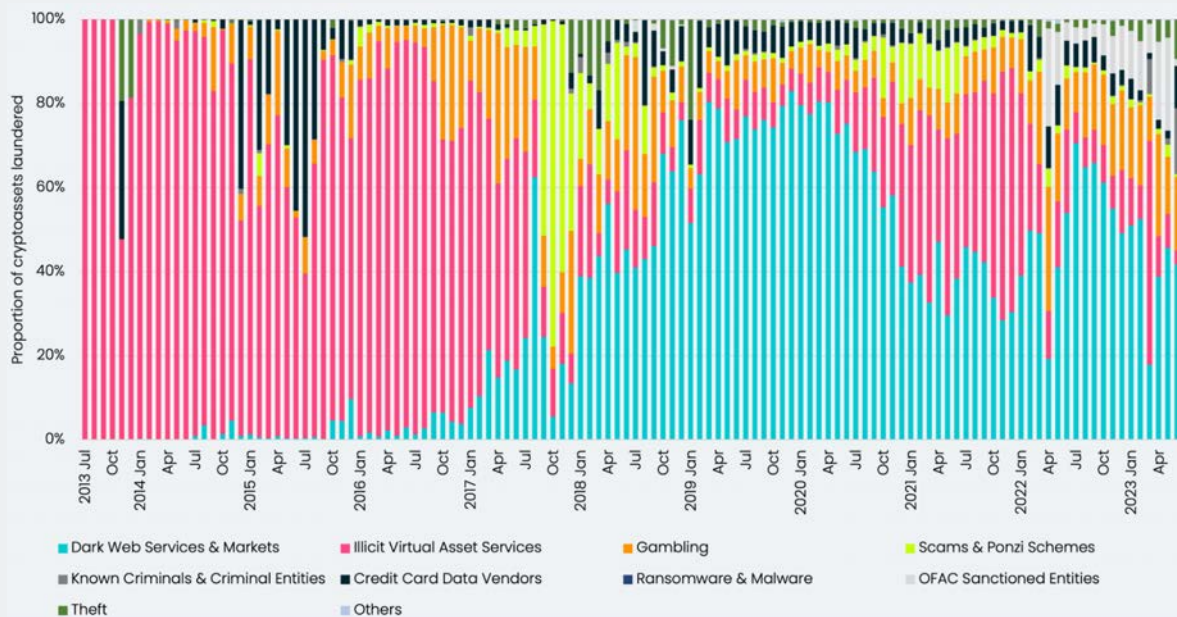
Unless they are legitimate-facing, coin swap services are typically “nested” services, meaning that their liquidity is derived from accounts held by their operators at larger exchanges. Sanctioned Russian exchange Garantex is one such exchange that allows scores of illicit-facing coin swap services to use its infrastructure to provide liquidity.

The holding of significant coin swap liquidity in parent exchanges makes it difficult to estimate the volume of (illicit) funds they process. However, Elliptic’s internal analysis is still able to provide some insights into their on-chain operations. The chart overleaf shows the distribution of criminal Bitcoin being laundered through coin swaps over a 10-year period up to and including June 2023.

Early illicit usage of coin swap services almost exclusively involved illicit virtual asset services such as BTC-e, a now-defunct exchange itself accused of laundering funds originating from cybercrime. Illicit payment processors, used heavily by credit card data vendors in particular, continue to launder funds prolifically through coin swaps – suggesting both their popularity and potential criminal connections throughout the wider illicit money service industry.

The heaviest usage of coin swap services, however, has been from vendors of illicit goods and services on dark web markets. Elliptic’s internal research suggests that users of Hydra – the biggest dark web market of its time – was the single largest source, amounting to almost a third of illicit funds being deposited into coin swap services until it was sanctioned and seized in April 2022.<sup>20</sup>

## Proportion of illicit Bitcoins being laundered through coin swap services by criminal origin, July 2013 to June 2023



## The Illicit-facing coin swap ecosystem

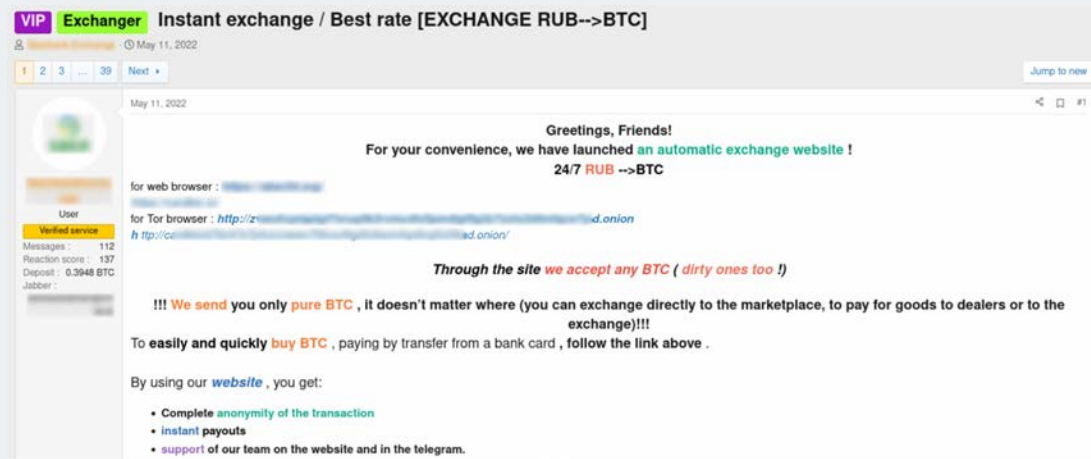
The vast majority of illicit-facing coin swap services are headquartered in Russia. However, many of them offer cash deposit or couriering services throughout many regions of the world to service cash-to-crypto or crypto-to-cash trading. Some also provide “treasure” services, where the operator buries cash in a predetermined location for the client to dig up later.

Couriers advertise their areas of operation to be most cities of Russia and/or Ukraine, as well as many prominent international airports and large global cities. US dollars are the most popular cash currency for couriering, followed by the Russian ruble (RUB), euros (EUR) and the Ukrainian hryvnia (UAH).

- Treasure or courier with cash 60 minutes after payment
- Treasures in cities: Moscow, St. Petersburg, Novosibirsk, Sochi, Pyatigorsk, Yekaterinburg, Perm
- Delivery to other cities of the Russian Federation when paying for tickets to the courier in both directions within 24 hours

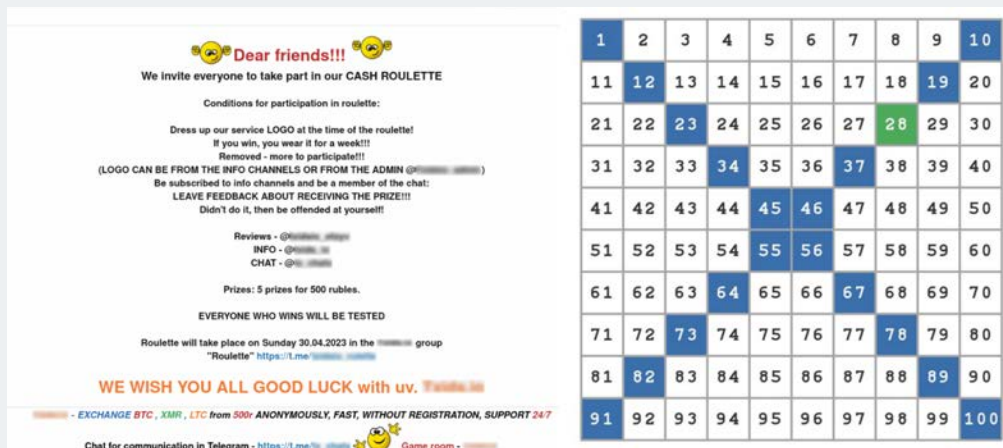
*Advertisements from a coin swap service offering couriering and treasure services.*

As seen in the example coin swap advertisement on a cybercrime forum below, most illicit-facing services do not aim to hide their business aim of laundering illicit funds while exchanging them. Many of these advertisements are posted on the same forums that advertise dark web markets and ransomware-as-a-service. They are thus embedded in the wider cybercriminal ecosystem.



A coin swap service advertises itself on a Russian cybercrime forum, explicitly stating that it can exchange dirty crypto transactions directly from dark web marketplaces.

Many operators not only advertise their services via illicit forums, but also use them to recruit couriers and develop a loyal user base. They will often host lotteries among users that comment, rate or use their service in a given period of time – rewarding a lucky winner with cryptoassets. Others will hold competitions and games among their clients. This is a strategy also used by many dark web markets to entice users and increase brand loyalty.



Examples of games and competitions hosted by coin swap operators on dark web forums.

Лучшие курсы на рынке  
 Быстрая обработка заявок  
 Чат-поддержка онлайн 24/7  
 Высокие лимиты по обменам  
 90% Новых клиентов остаются с нами

You are already an experienced wolf, you work as a treasurer and you are tired from work?  
 Eternal nervousness and thoughts about this and that?  
 There is an exit!  
 [REDACTED] has a vacancy "Courier of the exchange office" in St. Petersburg.

**Responsibilities:**

- Receive cash by anonymous transfer. (more details in a personal dialogue after making a deposit)
- Using cash to complete tasks to replenish bank cards of our customers.

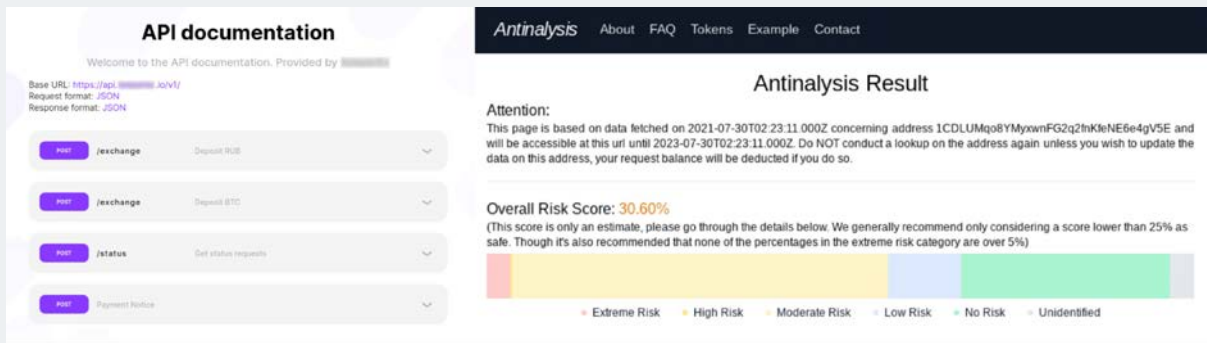
**Requirements:**

- Intelligence. Punctuality. **ATTENTIVENESS!** (very important to you, remember this)
- Availability of collateral. (at the moment from 1 million rubles)
- Experience in hoarding. (preferably a recommendation from the shop where they worked). This item will be a plus, because. a person already knows the minimum security measures.

*A coin swap service advertises a courier position on a dark web forum.*

Illicit-facing coin swap services will also offer a number of additional services beyond typical crypto conversion. One service, for example, offers cash counting services with armed protection within the ring road of Moscow. Elliptic’s dedicated coin swap services briefing note has more information about this operator and others that offer such unique services. You can download it via the QR code at the end of this section.

In addition, many services will offer a direct API integration for users and illicit services to make payments through their own user interfaces. They may also provide rudimentary “AML screening” reports for the crypto they send to clients after conversion to prove that it is “clean”. Many coin swap services pledge that incoming crypto will have a risk score of “below 25%”, but charge higher commission for even “cleaner” funds. The dark web blockchain analytics tool “Antanalysis” – a tool that checks cybercriminals’ crypto for whether they are “clean” enough to cash-out through KYC-compliant exchanges – is the likely provider of these reports.<sup>21</sup>



A coin swap service offering API integration (left) and Antinanalysis dark web wallet screening tool (right).

Illicit-facing services will offer conversions on a number of different platforms besides their own websites or Telegram. Jabber addresses and direct messaging their user accounts on illicit forums are two other common ways to initiate a conversion. Some also operate through WhatsApp. Many of their websites will typically share a similar template. The design is offered by external providers, which build the front-end website and provide a script for the service.



A Coin Swap UI script provider showcasing their website designs.



## Liquidity and assets

A number of Russian-speaking coin swap aggregators provide details of their reserves and usage, which emphasizes the highly competitive nature of this illicit industry. One aggregator – namely “Bestchange” – tracks close to 300 “reliable” coin swap services holding a combined \$16.3 billion in reserves across cryptocurrency, cash and electronic money at the time of writing.

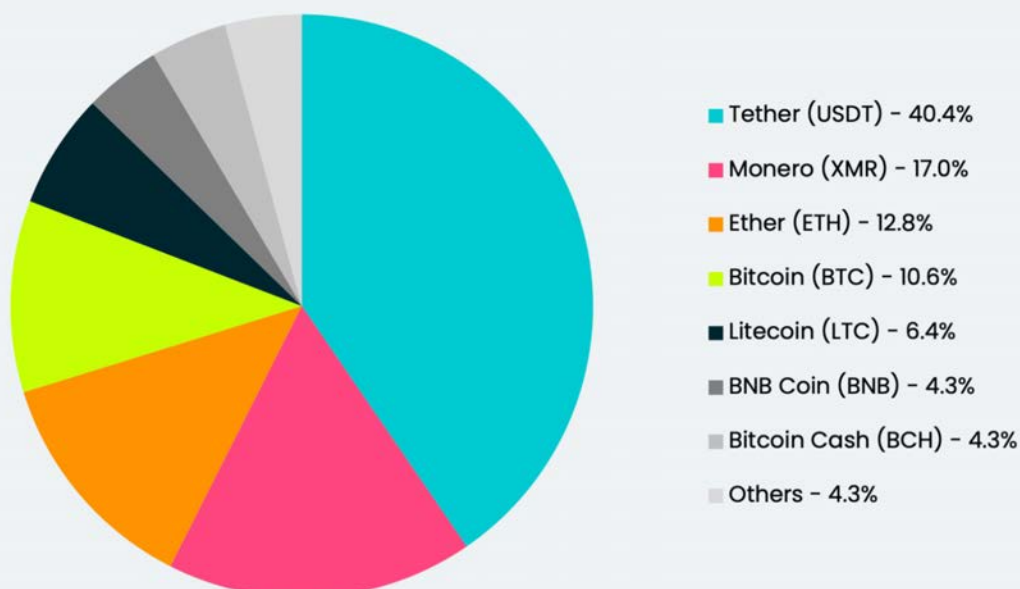
Based on data aggregated by Bestchange – there is no one major player that has a monopoly in the illicit-facing coin swap ecosystem. According to their exchange popularity data, the most popular service constituted just 3% of overall usage.

Breaking down reserves by electronic currency reveals that Tether (USDT) constitutes the largest reserves, across the Tron, Ethereum, Binance Smart Chain and Solana blockchains. The privacy coin Monero constitutes the second largest, while Bitcoin only comes third.

Coin swap services are arguably the most effective way for criminals to obtain Monero without revealing their identity, which makes their popularity unsurprising. However, Bestchange data on swaps also showed that on a typical day in July 2023, over 30% of all exchanges performed using coin swap services involved Tether on the Tron blockchain as either the input or output asset.

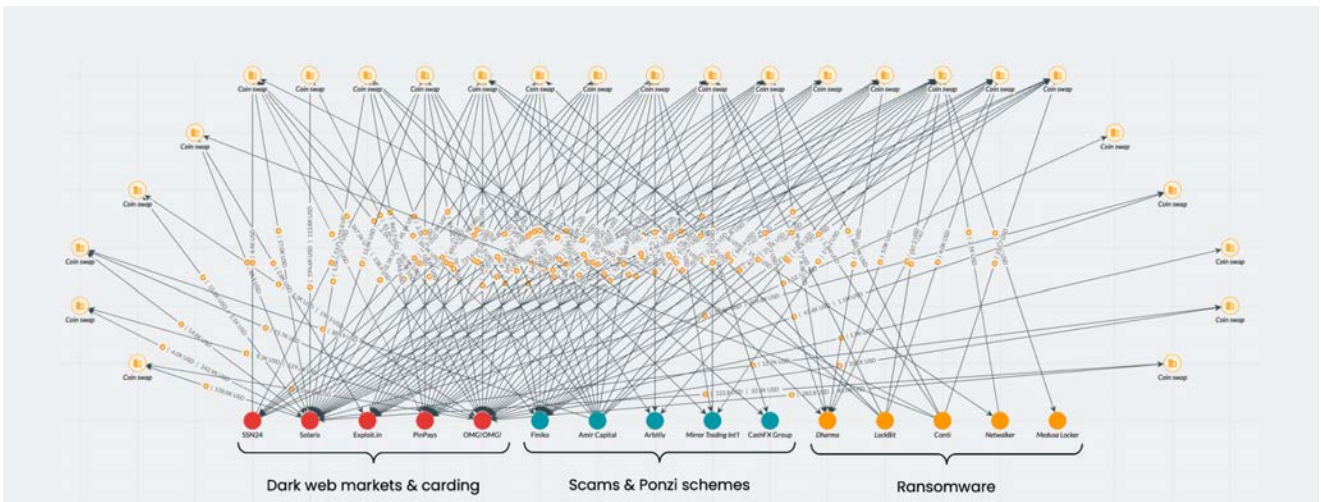
This emphasizes the increasingly diverse nature of crypto crime, as the former dominance of Bitcoin continues to decrease. Factors such as anonymous access to Monero, stable-value assets such as USDT and the ability to convert directly to cash or Russian bank accounts are increasingly becoming major drivers of users to coin swap services.

### Reserves by cryptoasset held by coin swap services tracked by Bestchange

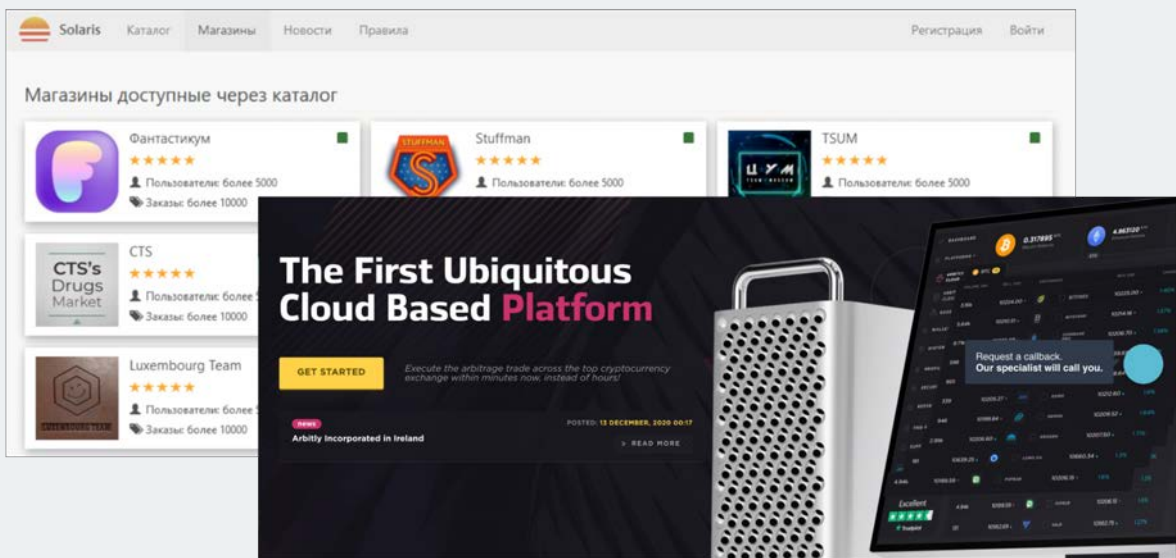


# Criminal use cases

The Elliptic Investigator graph below shows the range of organized crime that has used coin swap services for crypto transactions. Included are a non-exhaustive selection of major dark web markets and stolen credit card vendors (red), scams and Ponzi schemes (blue) and ransomware (orange). As can be seen, some of the biggest-known crypto crime cases have prolifically used coin swap services to launder funds and receive payments – including the \$1.5 billion ponzi scheme Finiko, dark web markets Solaris and OMG!OMG!, and Conti ransomware. The case study overleaf focuses on the use of coin swaps by a specific form of cyber criminality – vendors of child sex abuse material (CSAM).



*Elliptic Investigator shows Bitcoins being laundered through coin swap services by dark web entities, major scams, ponzi schemes and ransomware.*



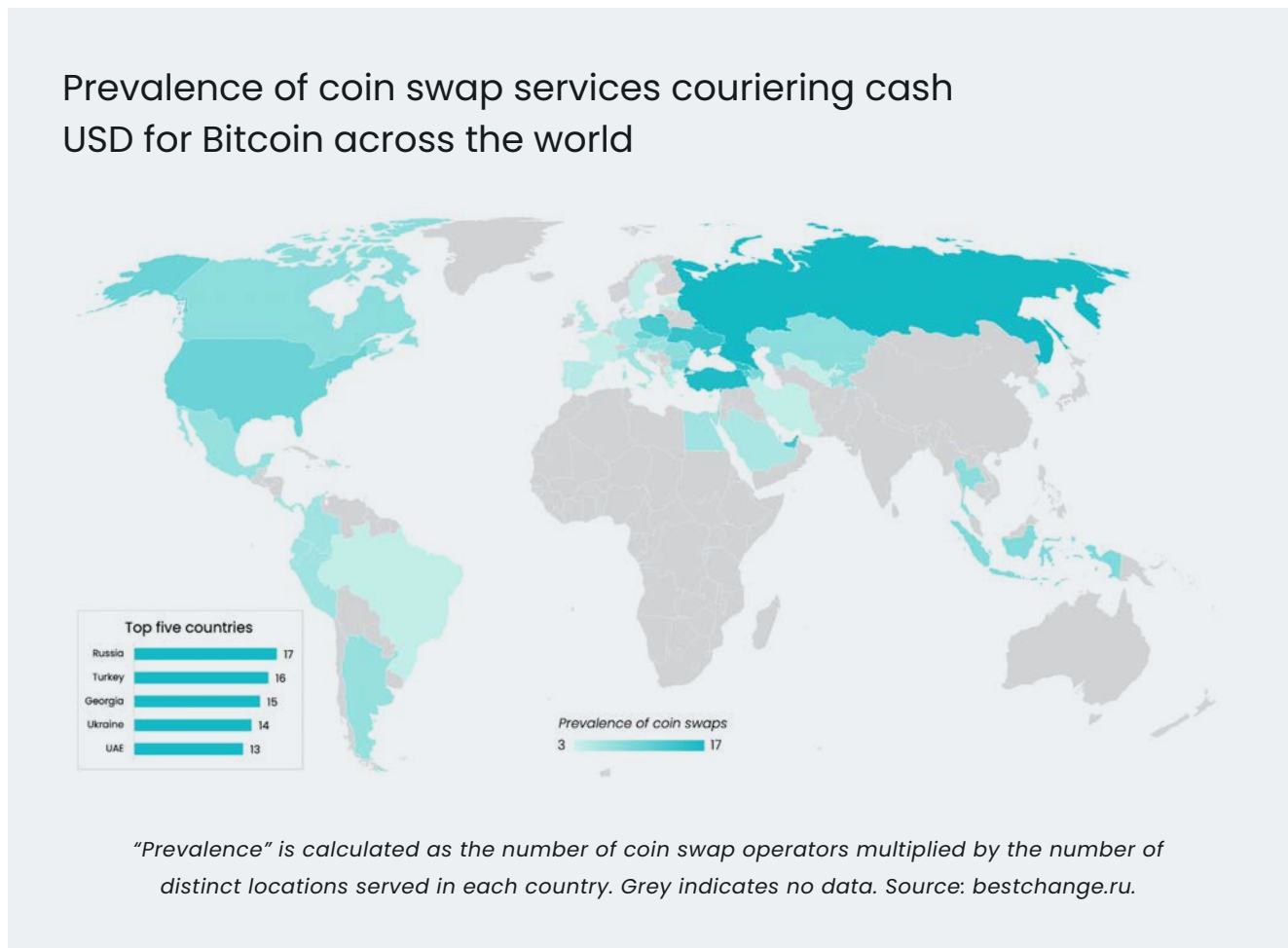
*Solaris Dark Market (left) and the Arbiity Ponzi Scheme (right) – two major criminal enterprises that have significant outgoing crypto exposure to illicit coin swap services.*





## The geographic distribution of coin swap services

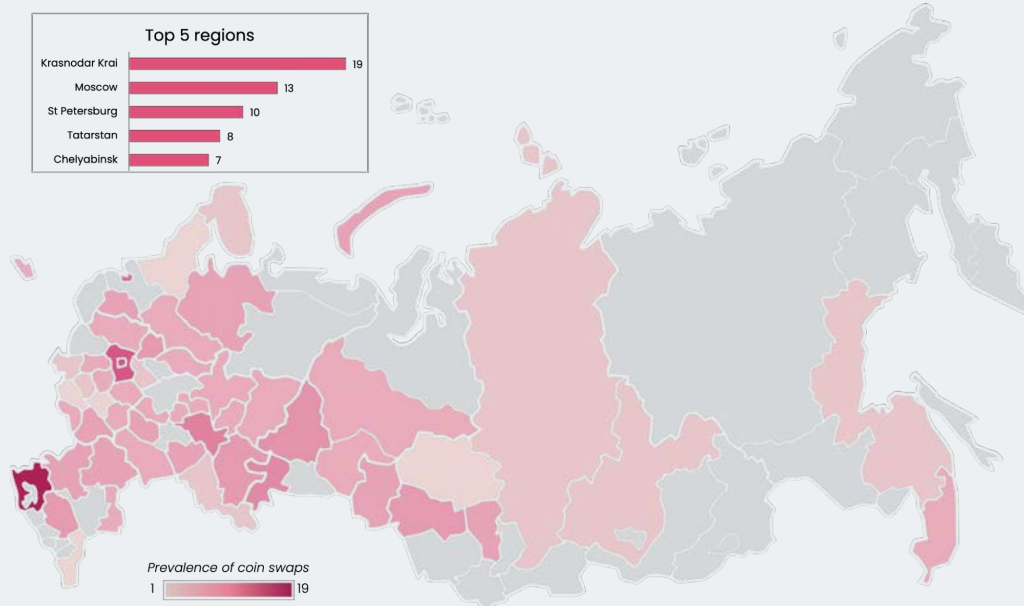
Since many coin swap services deal with cash in addition to cryptoassets, a number of insights can be drawn by analyzing their geographical distribution. Per information obtained from Bestchange, the world map below shows the prevalence of coin swap operators providing cash couriering services for the BTC-to-cash USD pair. Given that they are predominantly Russian-speaking services, Russia unsurprisingly has the largest prevalence of coin swap services.



The global distribution of coin swap cash couriering networks reflect a number of factors. First, areas associated with cyber-enabled organized crime – such as Eastern Europe and Dubai – are serviced by a higher number of operators. Areas with a high general engagement with crypto, good connections through hub airports and with a significant Russian expat presence are also well-served. Examples include Dubai (serviced by 13 operators) and the Turkish cities of Istanbul (15 operators) and Antalya (13 operators). Dubai and Istanbul are global transit hubs, while Antalya is a major Russian tourist destination given the lack of sanctions.

The distribution of coin swap operators in Russia – shown in the forthcoming map – indicates a concentration of operators to the west of the country, where its major population centers are based – including Moscow and St Petersburg.

## Prevalence of coin swap services couriering cash USD for Bitcoin in Russia



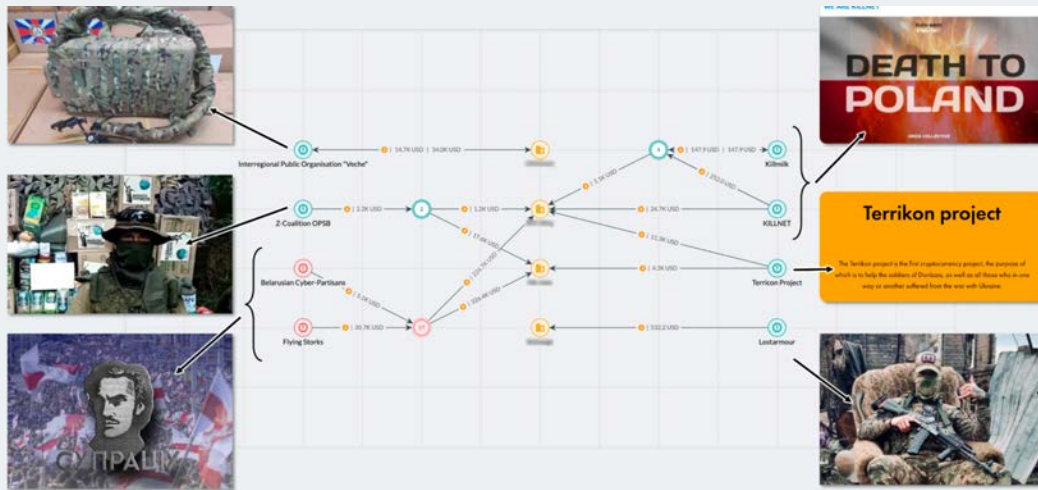
*“Prevalence” is calculated as the number of operators multiplied by the number of distinct locations served in each administrative region. Grey indicates no data. Source: bestchange.ru.*

As indicated by the map, the highest prevalence of coin swap services was identified within the Federal Subject (Krai) of Krasnodar, in the south west of Russia. Krasnodar Krai is home to a number of major cities, including Krasnodar and Sochi. Krasnodar (six operators) is the closest major population center in Russia to the annexed region of Crimea, approximately four hours driving distance to the Kerch Strait Bridge.

This proximity offers a number of advantages for cross-border cash transfers relating to organized crime, being the only way into Crimea between 2014 up until Russia was able to form a land corridor through Mariupol in 2022. The strategic transit advantage that Krasnodar held for eight years is likely to have been a factor affecting the variety of illicit coin swap exchangers in the region, given the crime opportunities enabled.

The ongoing war in Ukraine and the resultant growth of both official and unofficial military procurement campaigns has exacerbated this trend. Many pro-Russian military fundraisers – discussed extensively in Elliptic’s “Crypto in Conflict” report – have sought crypto donations to purchase military equipment for Russian soldiers in Ukraine.<sup>22</sup>

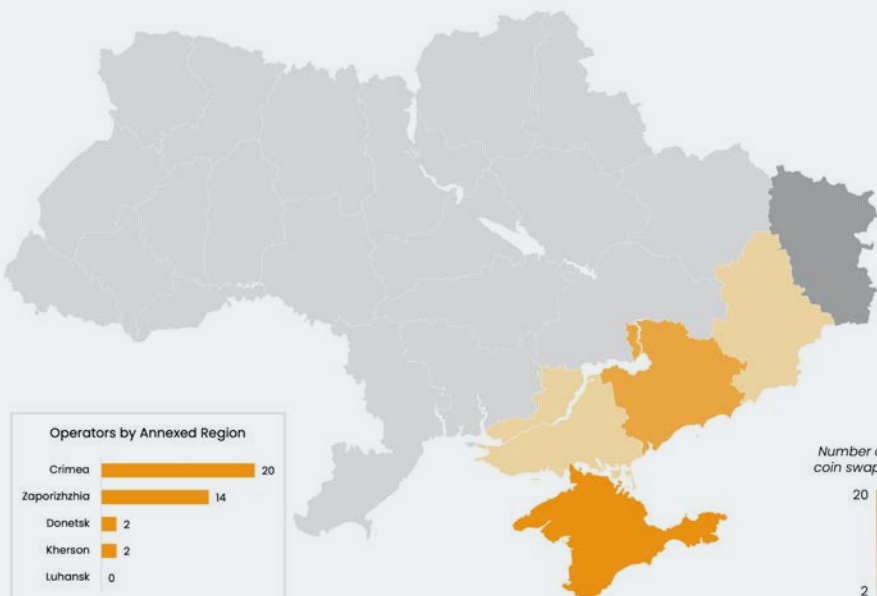
Elliptic’s internal data shows that over \$400,000 worth of crypto donations have been laundered through coin swap services, exemplified in the Elliptic Investigator graph overleaf. The graph also shows that Belarussian opposition dissidents (in red) – who in some cases have engaged in violence – also utilize coin swaps to cash out donations.



See Elliptic's *Crypto in Conflict Report* (QR code on the next page) for more information about these entities.

Per these trends, the Russian-occupied regions of Ukraine are served by a multitude of coin swap services. Crimea – which has been annexed since 2014 as opposed to the other more recently occupied regions – hosts the largest number of operators. This is also likely an indicator of increasing interest in cryptoassets by citizens wishing to hide their wealth due to war-related uncertainty. The regional distribution of coin swap services emphasizes the role of crypto in facilitating continued financial crimes and arms proliferation in the region.

## Number of coin swap operators in the annexed regions of Ukraine



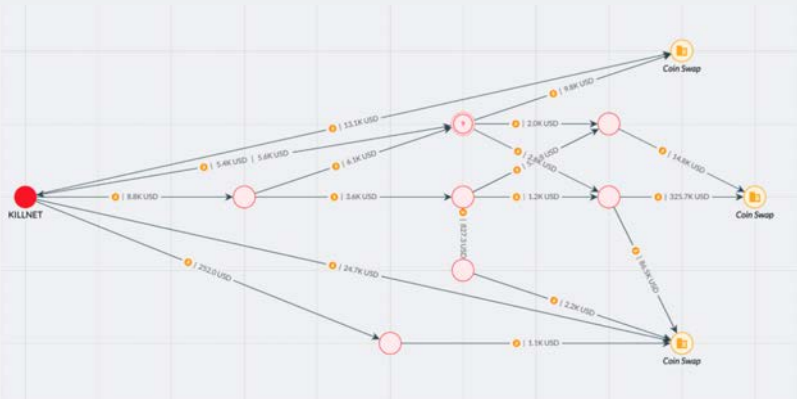
Source: Elliptic Internal Analysis.



## Case study 8: Killnet exchange

Killnet is a pro-Kremlin cybercriminal group run by “KillMilk” – a hacker who has led DDOS attacks against NATO and Ukrainian cyber infrastructure. The group has come under the attention of the Five Eyes intelligence network and has been responsible for the temporary takedown of numerous US government websites.<sup>23</sup> The group also has an organic relationship with the dark web market Solaris, and briefly ran a cybercriminal forum named Infinity, which was a hub for phishing-as-a-service and numerous other scam apparatus.

Both KillMilk and Killnet’s donation wallets have laundered more than a quarter of their crypto – worth approximately \$50,000 – through coin swap services. In addition, Killnet also launched its own Telegram-based coin swap service named “Killnet Exchange” in May 2023, offering exchange, couriering and mixing services. The service suggests that it is able to handle proceeds exceeding \$100,000 at once – indicating significant liquidity.



*Killnet Exchange logo (left) and Elliptic Investigator (right) showing Killnet’s laundering of donated funds through three major illicit-facing coin swap services.*



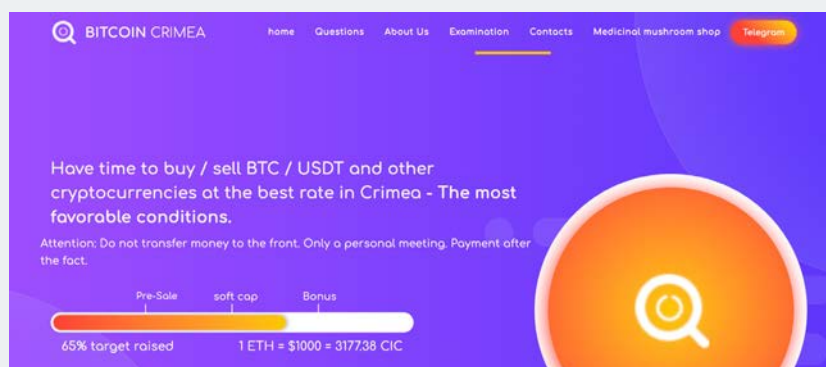
## Coin swap services and sanctions

There are a number of heightened sanctions evasion risks when engaging with coin swap services. These include:

- Their widespread acceptance and distribution of Monero, which is untraceable and thus may unknowingly reflect the proceeds of sanctioned entities.
- Their prolific use of Garantex – a US-sanctioned entity – as a parent exchange.
- Their prolific use by sanctioned entities such as the Hydra dark market, which alone is the source of a third of all illicit funds flowing into coin swap services.
- The large number of operators based in or serving the annexed regions of Ukraine (see previous map), which are subject to sectoral sanctions by the US.
- Their swapping of cryptoassets to and from bank accounts held at sanctioned financial institutions, such as Russia’s Sberbank.

Given these risks, it is important for virtual asset services to ensure that they have a comprehensive sanctions compliance regime and appropriate procedures in place. This will encompass recognizing and detecting the risk of illicit-facing coin swap services and funds originating from them.

Elliptic’s “Sanctions Compliance in Cryptocurrencies” report provides more insights into how these considerations can be reflected in sanctions compliance procedures.<sup>24</sup>



*A coin swap service operating in Crimea – an annexed region of Ukraine subject to US sectoral sanctions. This operator also runs a service named “Bitcoin Kherson” – another annexed region.*





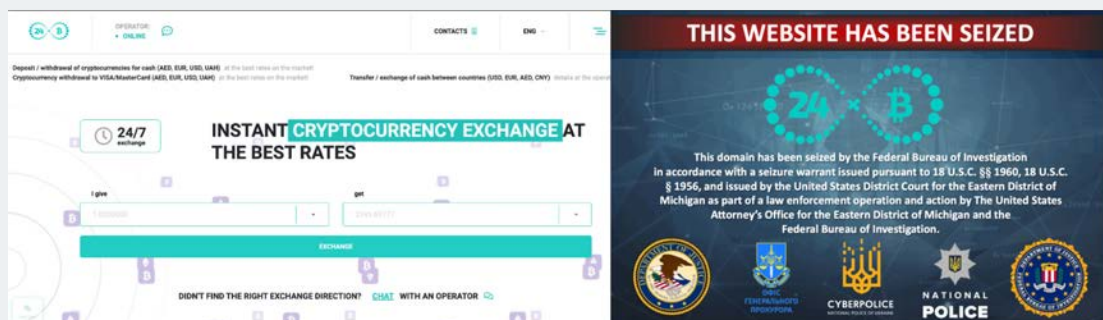
## Disrupting illicit-facing coin swap services

Both Ukraine and the United States have been proactive in initiating seizures against illicit-facing coin swap services. In April 2021, Ukrainian authorities raided a number of properties believed to be held by operators of a coin swap service offering cash-to-crypto conversions to clients in Russia and the Ukrainian regions of Donetsk and Luhansk. The authorities seized over 50 million UAH (\$1.3 million) in cash, along with “830 kilograms of silver, six plots of land and three apartments”.<sup>25</sup>



*Proceeds seized by the Ukrainian authorities from the unnamed coin swap service.  
Source: Office of the Prosecutor General of Ukraine.*

In May 2023, the US Federal Bureau of Investigation (FBI) – in collaboration with the National Police of Ukraine – seized the websites of nine illicit-facing coin swap services: 24xbtc, 100btc, Pridechange, 101crypta, Uxbtc, Trust-exchange, Bitcoin24 Exchange, Paybtc Pro and Owl Gold.



*24xbtc – one of the seized coin swap services – before and after the seizure.*

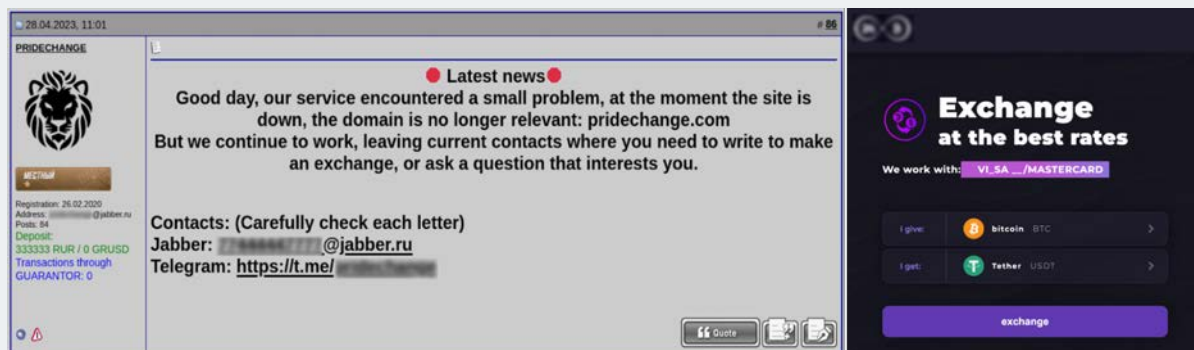
**“Many of these services are advertised on online forums dedicated to discussing criminal activity. By providing these services, the virtual currency exchanges knowingly support the criminal activities of their clients and become co-conspirators in criminal schemes.”**

US Department of Justice press release.<sup>26</sup>

Given that large amounts of coin swap liquidity is held at parent exchanges, it is not possible to estimate the true scale of illicit activity laundered by these seized websites. However, Elliptic’s internal analysis of six of these nine services suggests that more than 60% of the funds they processed were of illicit origin. A smaller portion originated from other obfuscation services such as mixers, which may have been used as an initial step to disguise illicit funds.

However, since both illicit-facing coin swap services and their parent exchanges (such as Garantex) willingly engage with criminal funds, their operations are difficult to disrupt. Seizing the websites of coin swap services does not disrupt their liquidity, since it is held at a parent exchange. This means that these services are likely to resume their operations via Telegram or a new site shortly after.

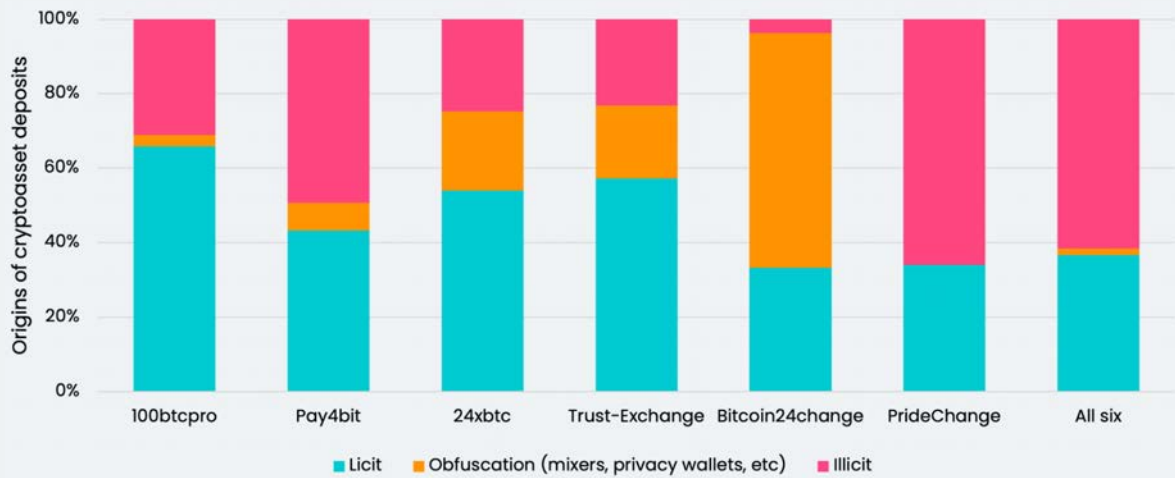
Indeed, many of the seized coin swap services did exactly that – with most of them continuing to operate at the time of writing. All of them blamed the disruption on “technical difficulties”, presumably to reduce the negative publicity associated with a joint American-Ukrainian takedown operation among their predominantly Russian-speaking criminal client base.



*A forum post by Pridechange – one of the seized coin swap services – announcing the continuation of services via Telegram and Jabber (left) and the new website of 24xbtc (right).*

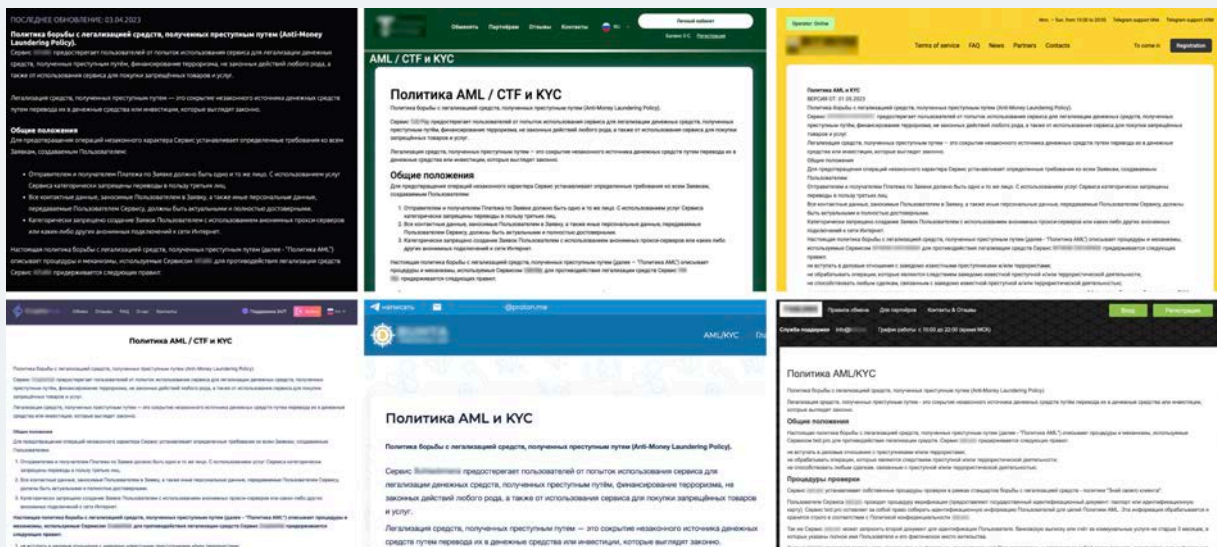


## Origin of funds processed by six of the nine services seized in May 2023



## Maintaining a sense of legitimacy

It is worth noting that common red flag indicators for illicit-facing coin swap services may be difficult to identify by merely looking at their websites. Many, for example, include “AML/KYC” policies to maintain a sense of legitimacy. Closer analysis of many of these policies, however, reveals that they are copied-and-pasted almost verbatim across multiple different illicit-facing coin swap services – as shown in the example image below.



Several coin swap services with near-identical AML/KYC statements.

# → Summary: coin swap services

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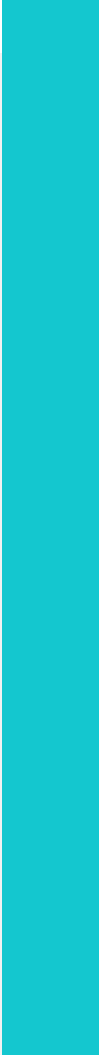
Since the release of Elliptic's report on cross-chain crime in 2022, coin swap services have continued to illicitly service the cash-out needs of the Russian-speaking cybercriminal ecosystems in particular. They have also been increasingly used by parties financing the procurement of military equipment during the Russia-Ukraine war.

While some legitimate-facing coin swap services exist, this section has sought to explore the criminal ecosystems and geographical distribution of illicit operators. The extensive nature of the crypto conversion and cash-out services they offer – ranging from Monero to cash and accounts of sanctioned Russian banks – makes them a considerable financial crime risk. Virtual asset services therefore need to be aware of the implications of interacting with such services both on-and off-chain. Their notable use for laundering illicit cryptoassets also underscores the importance of law enforcement agencies having the capabilities to profile, monitor and trace blockchain activity to and from such services.

Elliptic's Holistic blockchain analytics capabilities – and Holistic Investigator and Discovery in particular – provide the tools necessary to protect virtual asset services against this risk. Using these tools, virtual asset services and law enforcement investigators can profile coin swap services to understand the nature of assets being sent and received by such services.

Crucially, these solutions allow a risk picture to be built through analyzing on-chain flows across all assets with which a coin swap service operates.<sup>27</sup> The value of such capabilities are underscored by the diversification of illicit coin swap usage away from Bitcoin to other assets and blockchains such as Tron-USDT.<sup>28</sup> This is further exacerbated by the growing sanctions scrutiny from regulators in the wake of the Russia-Ukraine war.



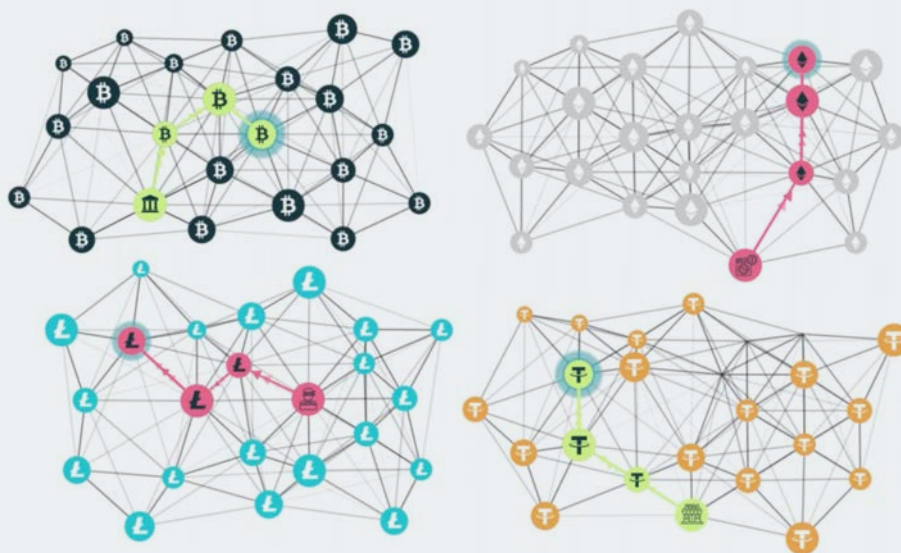


→ Using Holistic technology  
for cross-chain compliance  
and investigations: the next  
generation of blockchain  
analytics

# → Legacy versus holistic blockchain analytics

As discussed, one core reason for why cross-chain crime is a preferred technique for an increasing number of criminals is because they are aware that limited analytics solutions exist to trace their activities programmatically and at-scale.

With “legacy” tools – namely those that do not trace, monitor, visualize or screen transactions for more than one cryptoasset at a time – cross-chain investigations or risk screening will require manual work by compliance professionals and investigators. A criminal using a DEX or a cross-chain bridge a number of times during the laundering process may require many hours of manual tracing using block explorers.



*Legacy blockchain solutions are not able to view the activities of the same entity across separate chains holistically. When screening their movements on separate blockchains, some may come up as illicit or sanctioned, while on others they may appear as low/no risk.*

Holistic-enabled screening and tracing tools are therefore the next generation of blockchain analytics. They are able to screen wallets or monitor transactions for all assets involved concurrently. In the event that a wallet holds hundreds of crypto tokens, this negates the need to screen it hundreds of times one-by-one for each token to check sanctions or criminal risk.

The cost and time savings of holistic solutions are thus considerable. The same advantages exist for investigating multi-asset laundering cases. The visualization of all assets and blockchains used on a single graph can simplify investigations and – in the case of law enforcement – be presented in court.

Elliptic's Holistic Screening and investigative solutions are the first to incorporate these capabilities into its blockchain analytics engine: Nexus. The demonstrations below will showcase how to use these tools to enhance both compliance and investigative capabilities in a multi-asset world.

These demonstrations utilize the following tools from Nexus. All of them are enabled with Holistic analytics capabilities.

Tx 23ae6ed... Tx Risk 10

Triggered Rules
Counterparties
Source of Funds
Notes
Screening History

Direction:

Value (USD):

Value (BTC):

Tx Time:

Asset ⓑ

Customer:

Screened at:

Screened by:

Output Address

Source of funds

●

●

●

●

### Elliptic Navigator

Fully automated real-time cryptoasset transaction monitoring that traces funds across blockchains and assets. Identifies links to illicit activity to deliver leading anti-money laundering compliance and protects your business from financial crime.

Wallet Address 21zEz7F... Wallet Risk 6

Asset ⓑ

Inflow

Outflow

Customer

Screened at:

Screened by:

Source of Funds

Destination of Funds

Entity	Contribution	Value (USD)
Lightning Network	32%	3,462,894

### Elliptic Lens

Screens crypto wallets in real-time and protects your business from financial crime. Uncovers links to illicit activity with holistic risk profiles of a wallet that takes into account all transactions across all major blockchains and assets.

Overview

Value Sent:

Networks:

First Sent:

Last Sent:

Dec333ae6c:  Unknown

FTX:  Exchange

Ethereum

- Dax Stablecoin / ETH
- Ether / ETH
- Compound / ETH

Binance smart chain

- Binance / BNB

### Elliptic Investigator

Conducts single-click investigations across blockchains and assets with ease. Instantly visualizes the flow of crypto funds through wallets, entities and transactions to find meaningful evidence quickly and reduces the time and resources needed to close cases.



## Elliptic Discovery

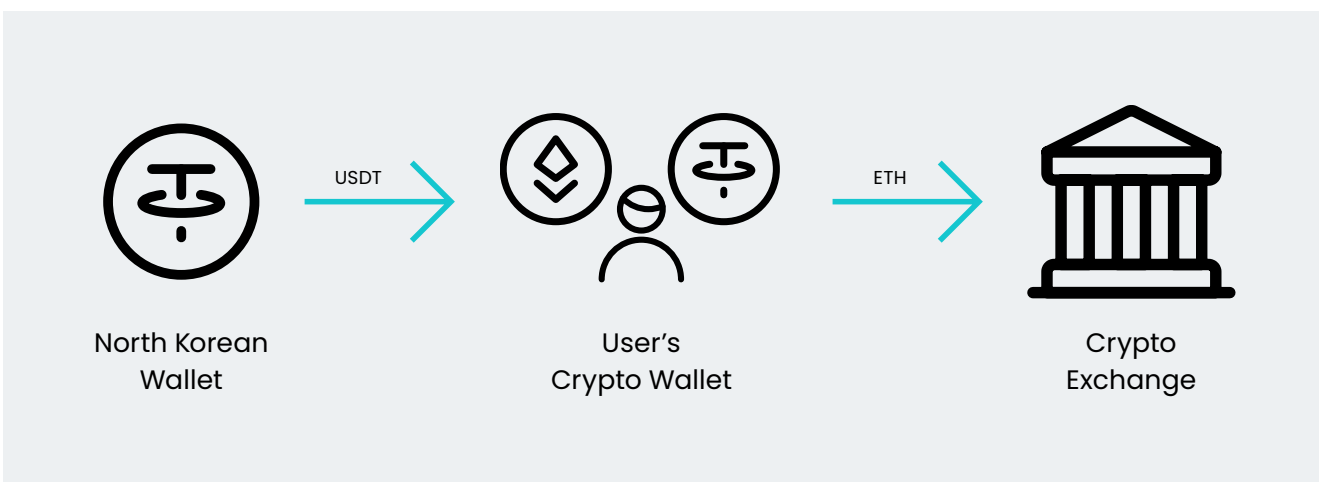
Assesses financial crime risk when engaging with crypto exchanges, custodians, and other cryptoasset businesses. Provides insights into the risk of coin swap services and entities suspected to operate from sanctioned or high-risk jurisdictions, which can assist compliance strategies and law enforcement investigations.

For more information about the above solutions, get in touch with us at: [hello@elliptic.co](mailto:hello@elliptic.co)

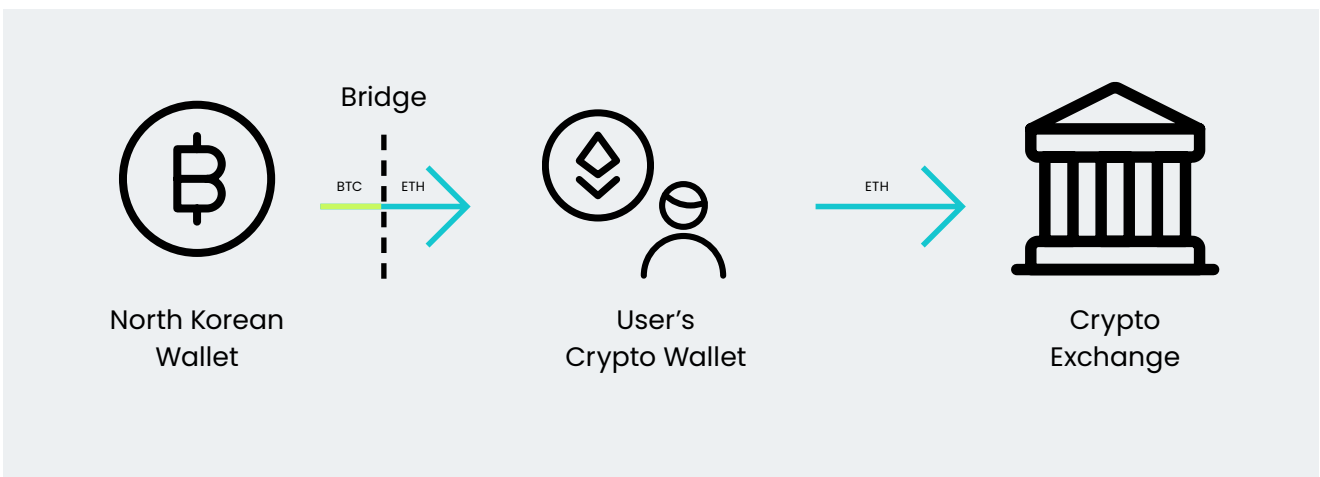
## Key considerations

In the multi-asset ecosystem we face today, compliance professionals and law enforcement investigators will need to make a number of additional considerations when processing transactions for anti-money laundering (AML), countering the financing of terrorism (CFT) and sanctions evasion risk. Three main considerations are:

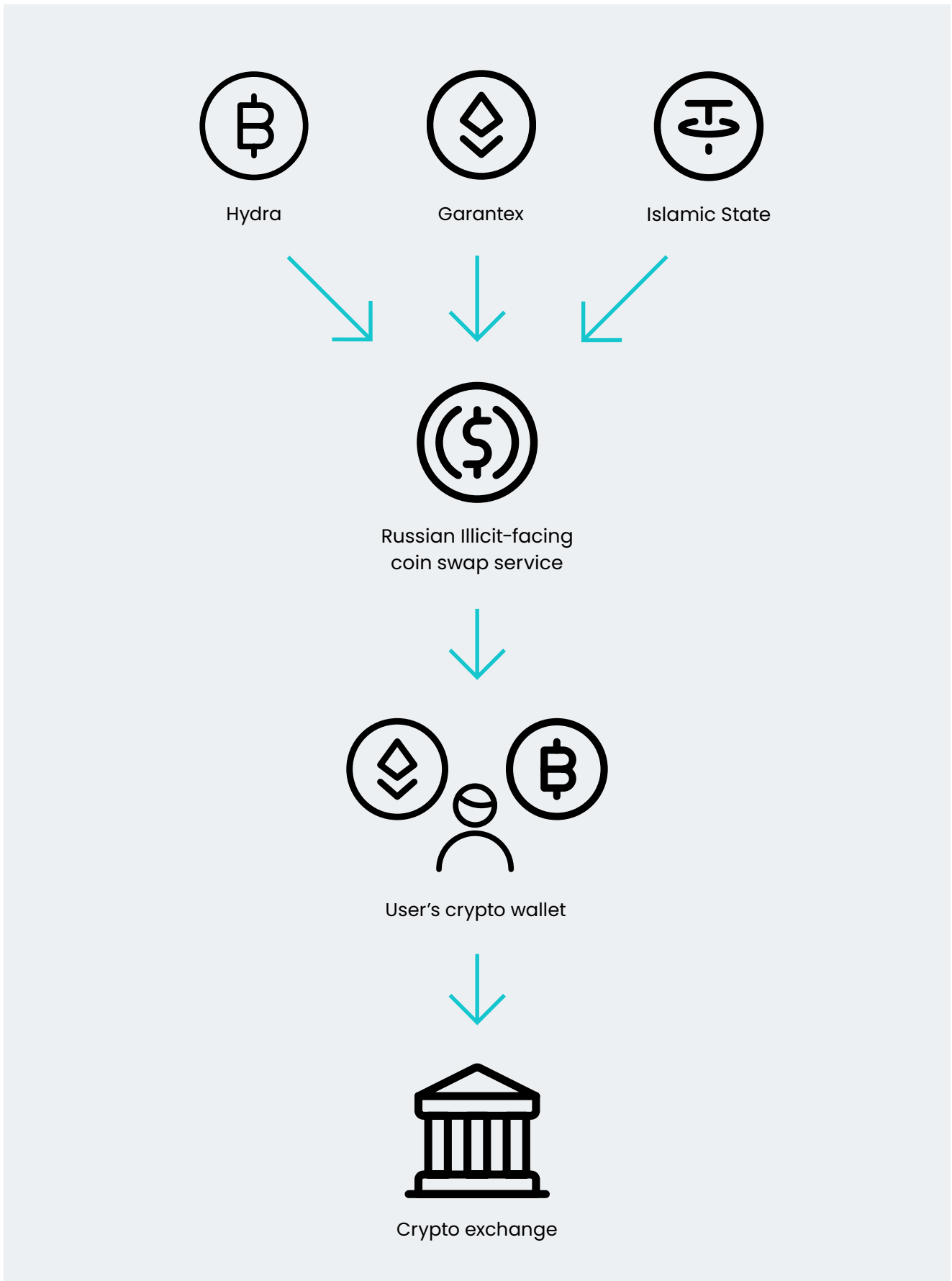
1. **Multi asset risk exposure:** ensuring that all assets – not just the one being transacted – in the wallet sending funds are from legitimate sources within the institution’s risk appetite. The below example shows a crypto exchange accepting an ETH deposit from an address. While the ETH is from a legitimate origin, the wallet also contains Tether originating from North Korea’s Lazarus Group. Screening just for ETH illicit exposure would not have picked up this association.



2. **Cross-chain risk exposure:** ensuring that all assets – not just the one being transacted – that originate from DEXs, cross-chain bridges and coin swap services originally came from legitimate sources. The example below shows illicit Bitcoins originating from the Lazarus Group being bridged to Ethereum before being sent to an exchange.



3. **Entity due diligence:** that all DEXs, cross-chain bridges and – in particular – coin swap services that a wallet has interacted with in the past do not themselves have a nexus to sanctioned or illicit activity outside the institution’s risk appetite.

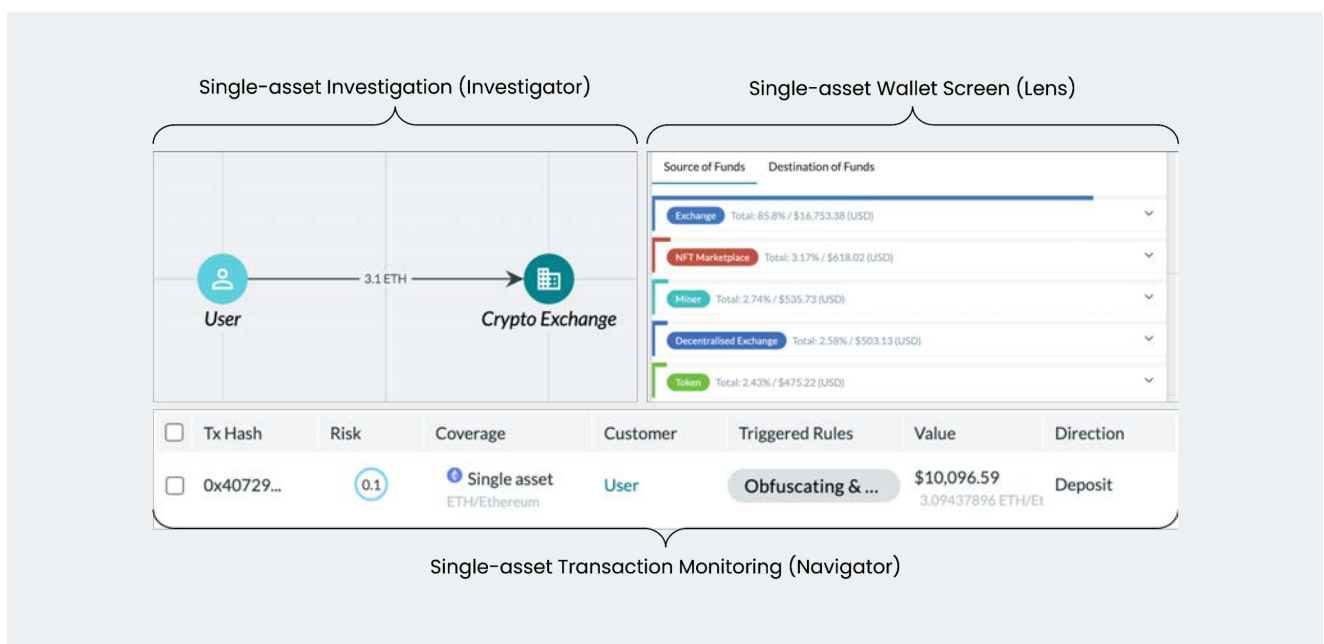




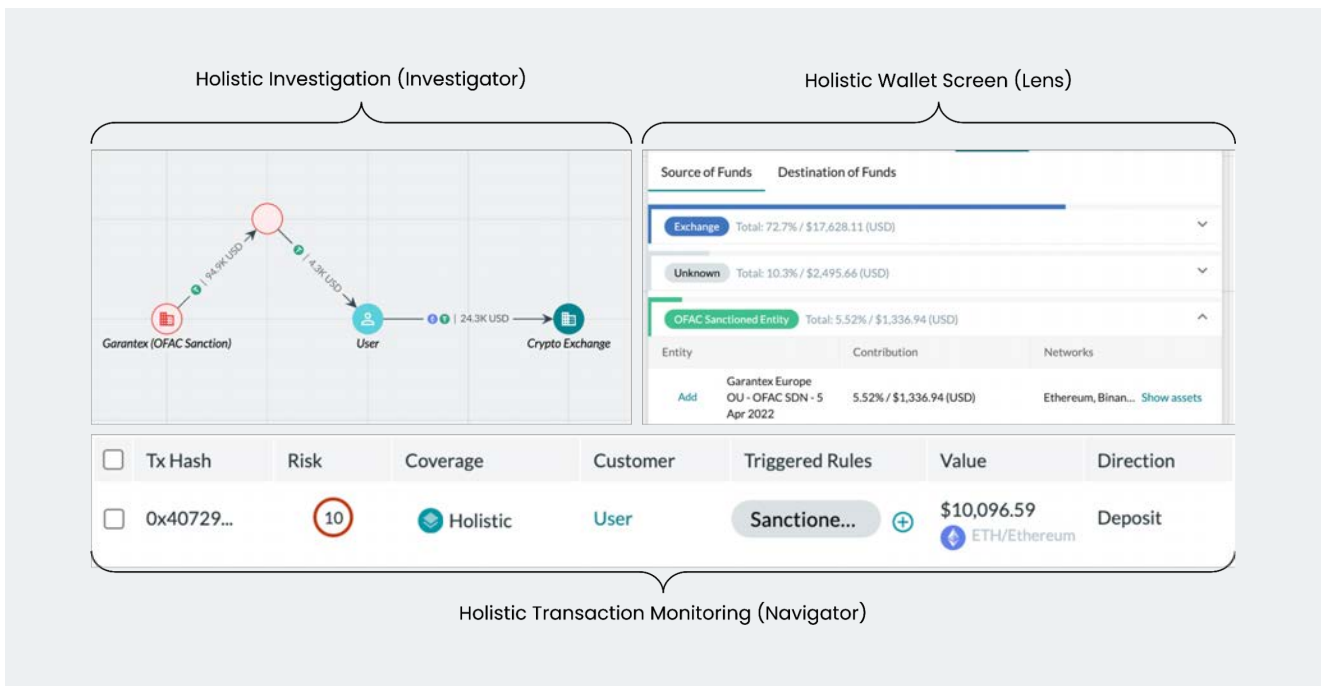
These scenarios – and the relevant capabilities of Holistic-powered blockchain analytics – are elaborated across the following three scenarios.

## Scenario 1: multi-asset risk exposure

Consider, for example, that an account at a crypto exchange receives a deposit of 3.1 ETH (\$10,100 at the time of writing). Analyzing the depositing wallet and specific transaction in a single-asset solution will give the reports below. As shown, there is no major risk associated with the user’s wallet, with the source of funds on Elliptic Lens appearing to be other exchanges, NFT marketplaces and the like. Screening the specific transaction using Elliptic Navigator also flags virtually no risk.

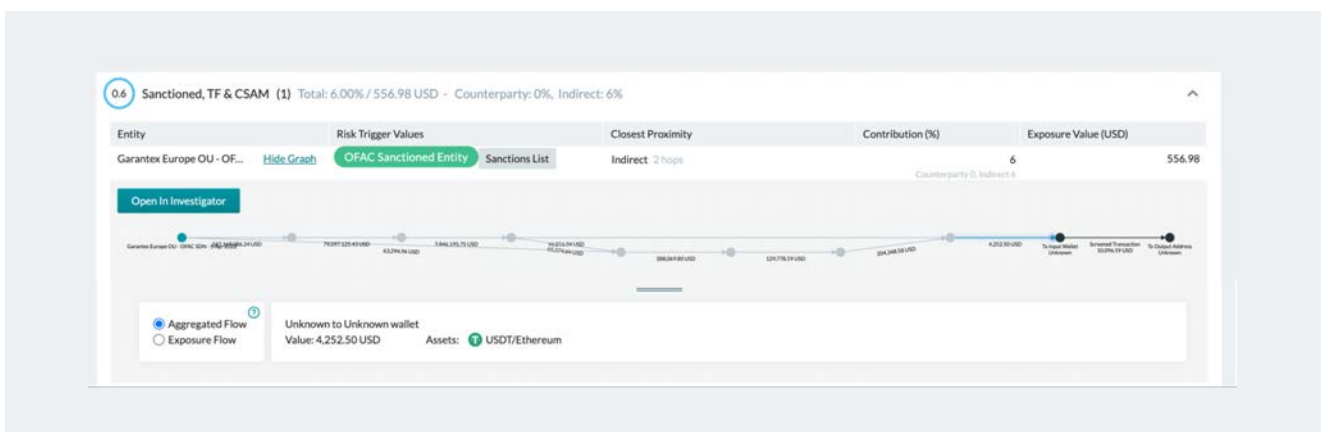


The issue, however, is that single-asset screening only checks for the sources of the ETH that is being deposited at the exchange. It does not factor in the origins of any other assets the user’s wallet holds. A Holistic re-screen of this activity can screen for all assets this user holds all at once, and return a more accurate risk profile – as shown overleaf.



Re-screening with Holistic solutions indicates that, although the deposit into the exchange was in ETH, the user's address has in fact received funds in USDT from Garantex Exchange, an entity sanctioned by the United States. Therefore, the depositing wallet now constitutes a sanctions evasion risk – emphasized by how the risk score of the specific transaction has now risen from a 0.1 on single-asset screening to a 10 (maximum risk).

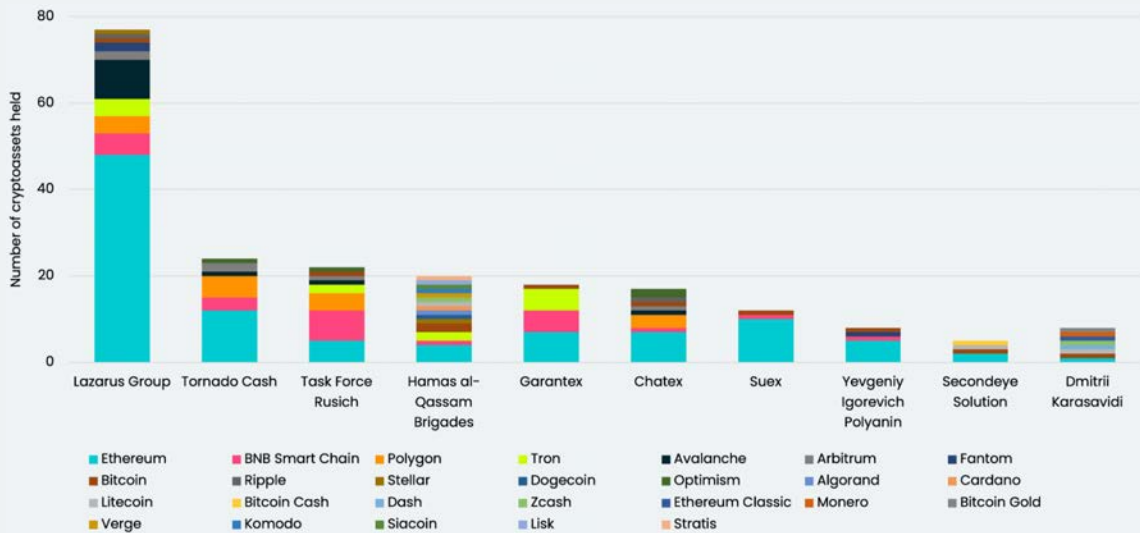
Elliptic's Holistic tools also provide risk graphs and specific risk trigger details to provide an easy overview of where the risk originates. This offers additional insights into factors that may impact risk-based decisions, such as the number of hops between the user and the sanctioned entity.



With legacy (single-asset) blockchain solutions, compliance and law enforcement professionals would have had to screen the above wallet for every single asset it holds, one-by-one. Thankfully, this particular wallet only holds ETH and USDT. However, as mentioned previously, many high-risk wallets hold considerably more. Considering that a typical exchange routinely receives thousands of transactions in short order, singularly screening all of them is unlikely to be feasible.

The chart on the following page shows how many different assets are held in wallets belonging to sanctioned actors or terrorist organizations. Both sanctioned and terrorist funds have now even been observed across more than 26 blockchains in more than 80 assets, including Dogecoin, Stellar, Bitcoin Gold, Ethereum Classic, Lisk, Komodo, Fantom, Siacoin, Optimism, Verge and Stratis.

## Number of assets per blockchain held by sanctioned and/or terrorist wallets

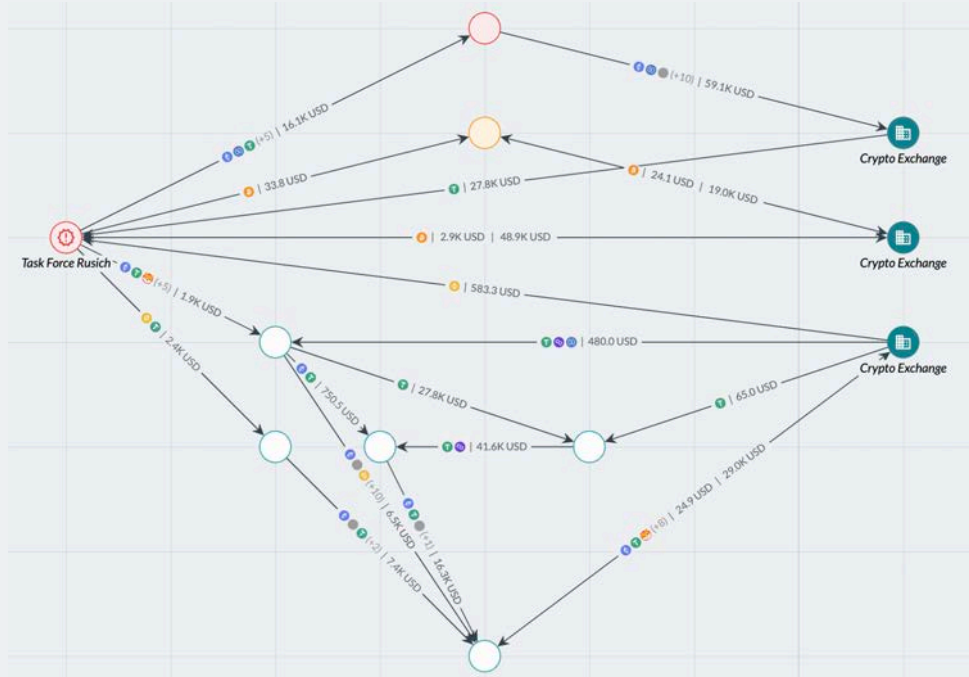


*Top 10 entities shown only. Spam and minimal-value assets are removed, hence Tornado Cash being adjusted from 86 to 24 since our last report.*

The implications of this is that high-risk funds are now increasingly likely to originate from assets traditionally seen as atypical for sanctions or terrorist activity – exemplifying the growing necessity of scalable Holistic Screening and investigative solutions.



*A Hamis-affiliated wallet receives donations and cashes out in five different types of assets through a crypto exchange (Source: Holistic Investigator).*



Task Force Rusich – a sanctioned wing of the Russian mercenary group PMC Wagner – using different crypto exchanges to cash out different assets held across numerous blockchains (source: Holistic Investigator).

## Scenario 2: cross-chain risk exposure

Suppose a decentralized finance (DeFi) protocol has received funds from a user, denoted as “User 2” in the below visualization. A single-asset screen of the transaction and depositing wallet does not flag any risk, and shows funds originating from bridges and a miniscule portion from compliant exchanges.

Single-asset Investigation (Investigator)

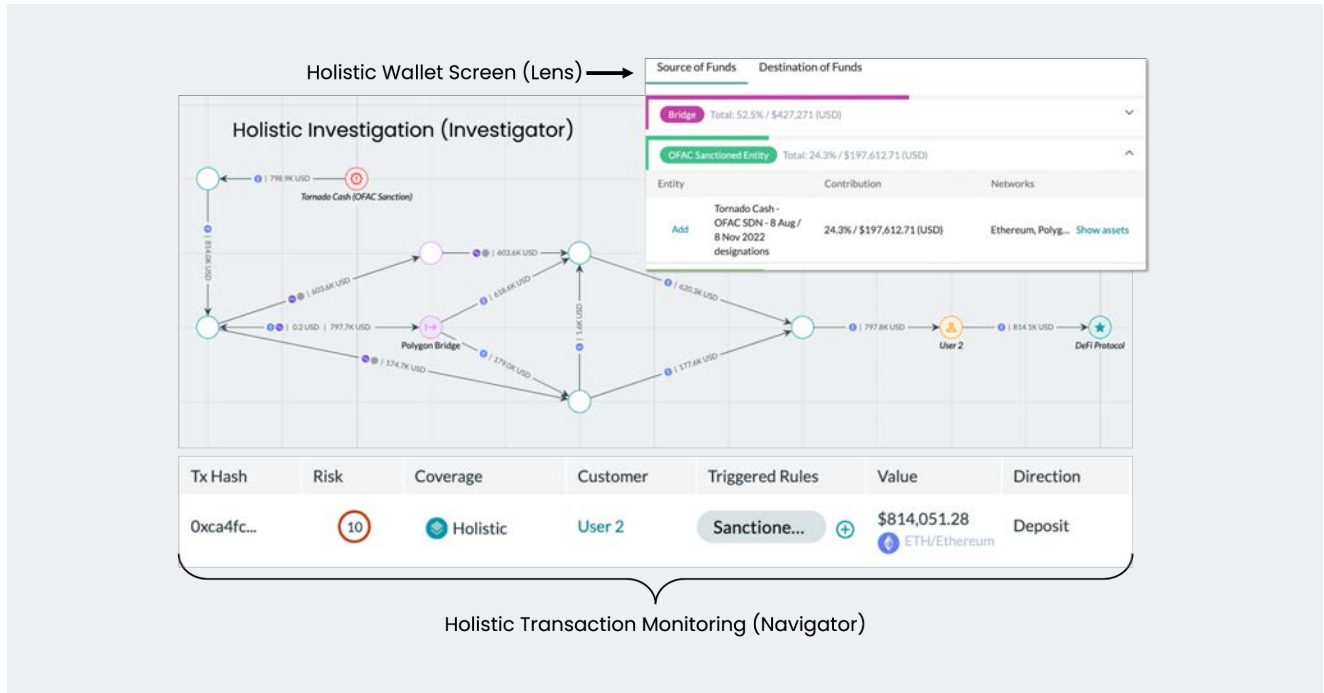
Single-asset Wallet Screen (Lens)

Source of Funds		Destination of Funds	
<b>Bridge</b> Total: 100% / \$813,903.56 (USD)			
Entity	Contribution		
Add Polygon Bridge	96.2% / \$782,774.74 (USD)		
Add Multichain Bridge	3.82% / \$31,128.82 (USD)		
<b>Exchange</b> Total: 0.0182% / \$147.87 (USD)			

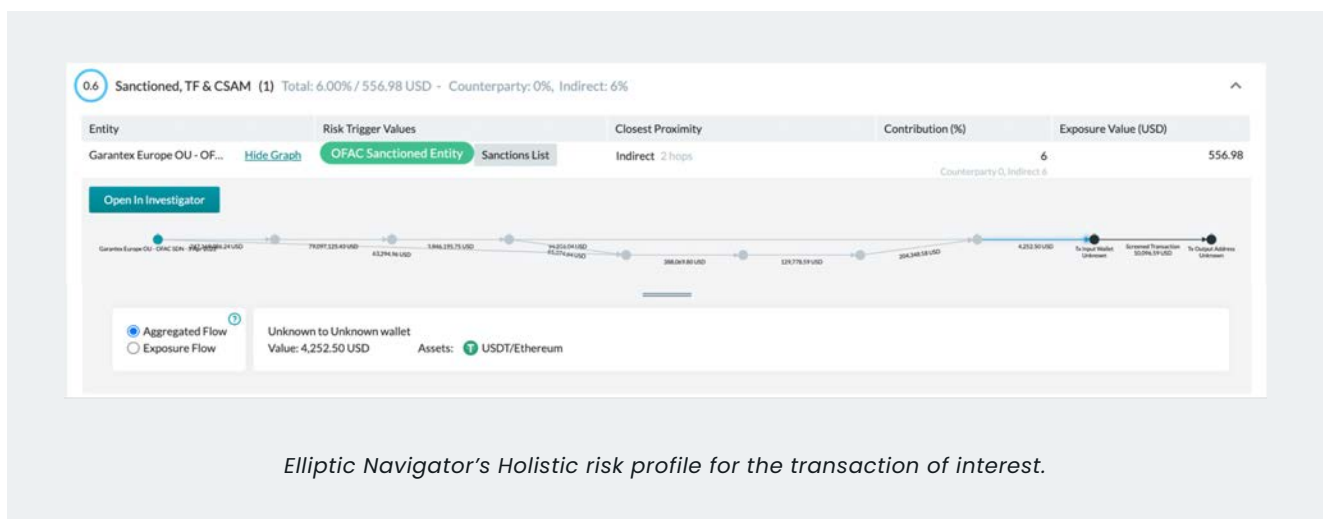
Tx Hash	Risk	Coverage	Customer	Triggered Rules	Value	Direction
Oxca4fc...	N/A	Single asset ETH/Ethereum	User 2		\$814,051.28 500.120587254433	Deposit

Single-asset Transaction Monitoring (Navigator)

However, while single-asset solutions trace back to bridges, they are unable to go beyond and assess where the assets originated prior to being bridged to the asset being screened, in this case ETH. The bridges from which 96% of the assets were converted to ETH – namely Polygon Bridge – indicates that this user has interacted with assets in the Polygon blockchain beforehand. A Holistic re-screen allows us to assess the risk across all blockchains, with results shown below.

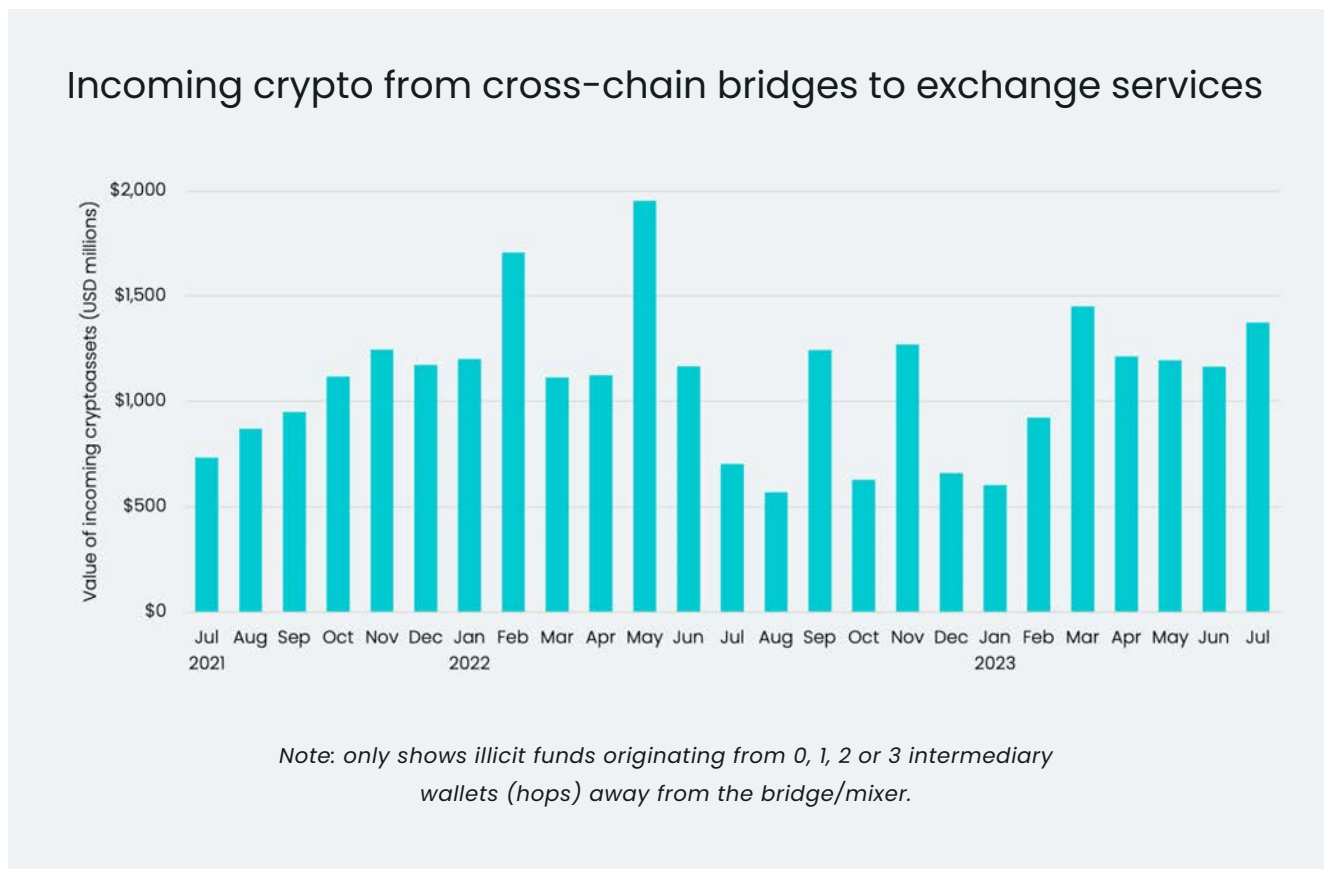


Having traced through Polygon Bridge, the Holistic re-screen finds that User 2 is in fact handling proceeds originating from the sanctioned mixer Tornado Cash, having initially converted it from ETH to Polygon and then back to ETH through the bridge. The sanctions exposure has increased the transaction risk to 10 (maximum). As shown before, a summary of the transaction can be obtained from Elliptic Navigator with relevant insights, such as the number of intermediary hops.



Without cross-chain capabilities, investigators will need to manually trace through bridges to identify the activity of the user of interest across all blockchains on which they have been active. While this may be theoretically possible, it would likely involve many hours of transaction value matching and the use of block explorers. However, the programmatic approach utilized by Elliptic’s Holistic blockchain analytics solutions allows seamless – and in many cases single-click – plotting to visualize cross-chain activity for an investigation.

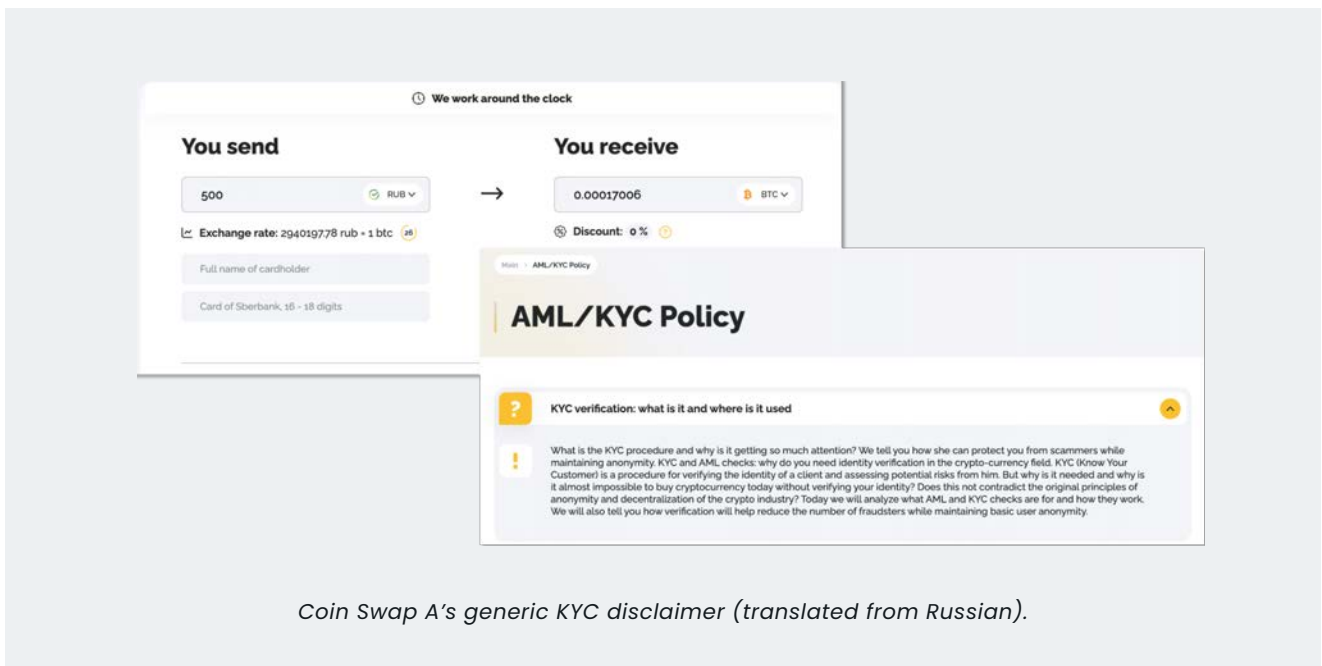
These capabilities have uses for both virtual asset services and law enforcement investigators. Particularly for the former, Elliptic’s internal analysis suggests that exchange deposits from cross-chain bridges have routinely exceeded \$1 billion monthly since July 2021 – as shown by the forthcoming chart.



### Scenario 3: entity due diligence

This scenario pertains to the importance of understanding the nature of the entity that individuals are interacting with, given the potential financial crime and sanctions risks thereof.

Coin Swap A is a Russian service that provides 24-hour exchanges between cryptoassets and a selection of Russian bank cards. Its website has typical AML/KYC-related disclaimers but no actual policies. This is typical for coin swap services aiming to maintain a licit-looking profile.



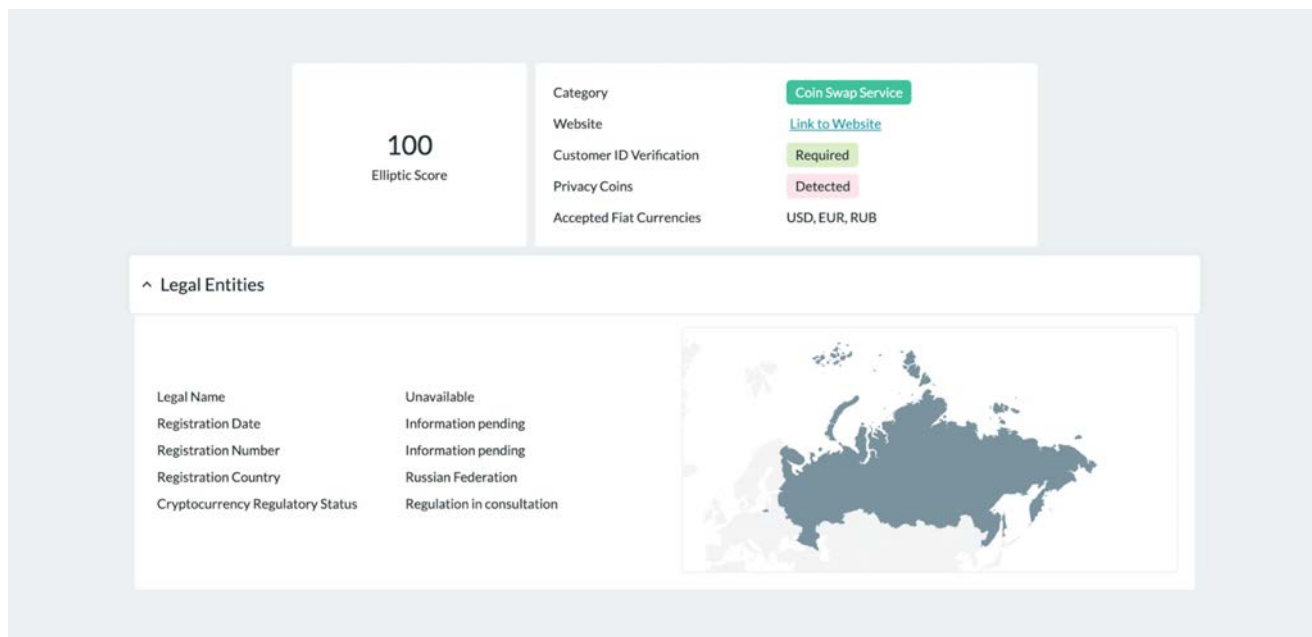
There may be a number of scenarios where you would need to conduct due diligence of this entity:

1. You are investigating suspicious blockchain activity – either as a virtual asset service or law enforcement – and the suspect has sent funds through or has an affiliation with this service.
2. You are a virtual asset business and your customers are receiving deposits into their accounts from this service – or vice versa.
3. You are a virtual asset business and this entity wants to partner with you.
4. You are a financial service and this entity wants to open a bank account with you.

Elliptic Discovery – our entity due diligence tool – can screen this entity for risk factors that will inform any decisions or conclusions relating to the above. Powered by Holistic technology, Discovery can assess risk across all assets that an entity engages with. For instance, it can provide details on:

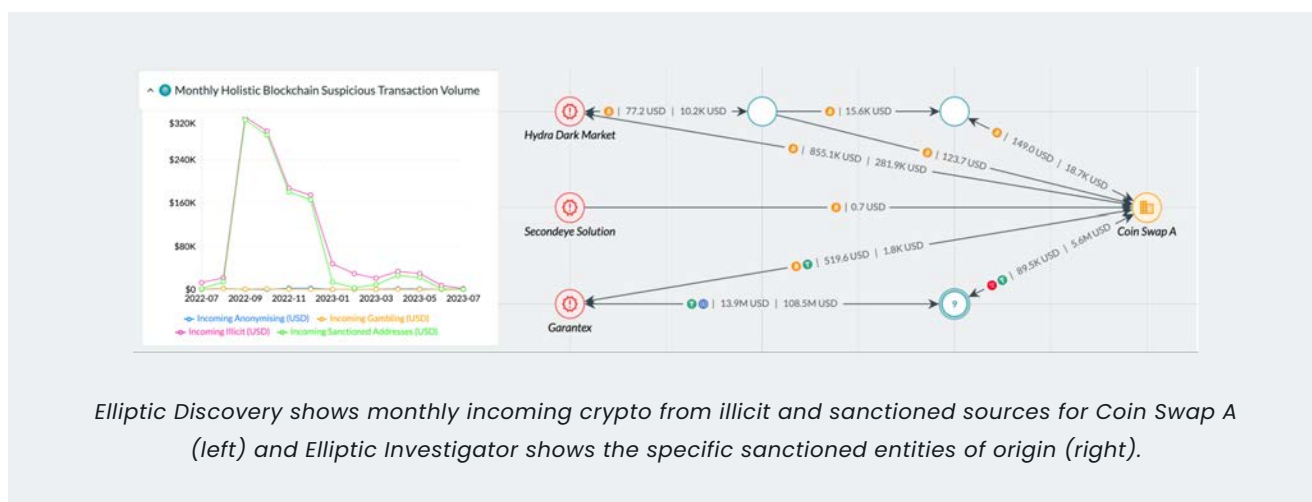
- The jurisdiction in which the entity is based.
- Whether privacy coins are accepted.
- Whether the entity collects KYC information from its users.
- Monthly holistic licit/illicit incoming and outgoing funds.

Screening Coin Swap A in Discovery yields the following information, with an Elliptic score providing an overall assessment of risk:



The screening suggests that – given the lack of registration – the coin swap does not operate as a legal entity but is based out of Russia. It also engages with privacy coins and the Russian ruble, which are heightened risk factors.

Screening Coin Swap A's blockchain activity reveals that it has processed a significant amount of funds originating from both illicit and sanctioned entities. Specifically in September 2022, over \$310,000 of incoming crypto originated from US Treasury-listed addresses – and a similar amount from illicit sources. Elliptic Investigator shows that the sanctioned origins of these funds are Hydra, Garantex and Secondeye Solution (a fake identity seller that aided Russian trolls in interfering in US elections).



*Elliptic Discovery shows monthly incoming crypto from illicit and sanctioned sources for Coin Swap A (left) and Elliptic Investigator shows the specific sanctioned entities of origin (right).*

The insights provided by Elliptic Discovery serve to assess the risks of interacting with services such as Coin Swap A – or identifying more information about suspects that are affiliated with it. In this case, Elliptic's blockchain analytics solutions suggest that interacting with this service constitutes a notable financial crime and sanctions risk across cryptoassets and blockchains.



# Cross-chain investigations for law enforcement

The core function of Holistic Investigator is its ability to initiate one-click plots to show any on-chain links between a wallet under investigation and suspicious activity – regardless of intermediary blockchain or asset changes. The Investigator graph below shows the before-and-after visualization when plotting the links between User 2 (in the second scenario above) and Tornado Cash.

Recall that this association can only be identified by Holistic-enabled tools, as the assets are converted across blockchains before arriving in User 2’s wallet. These assets can be viewed in summary by viewing “show assets”.

The screenshot shows the 'Source of Funds' and 'Destination of Funds' sections. The 'Source of Funds' table includes:

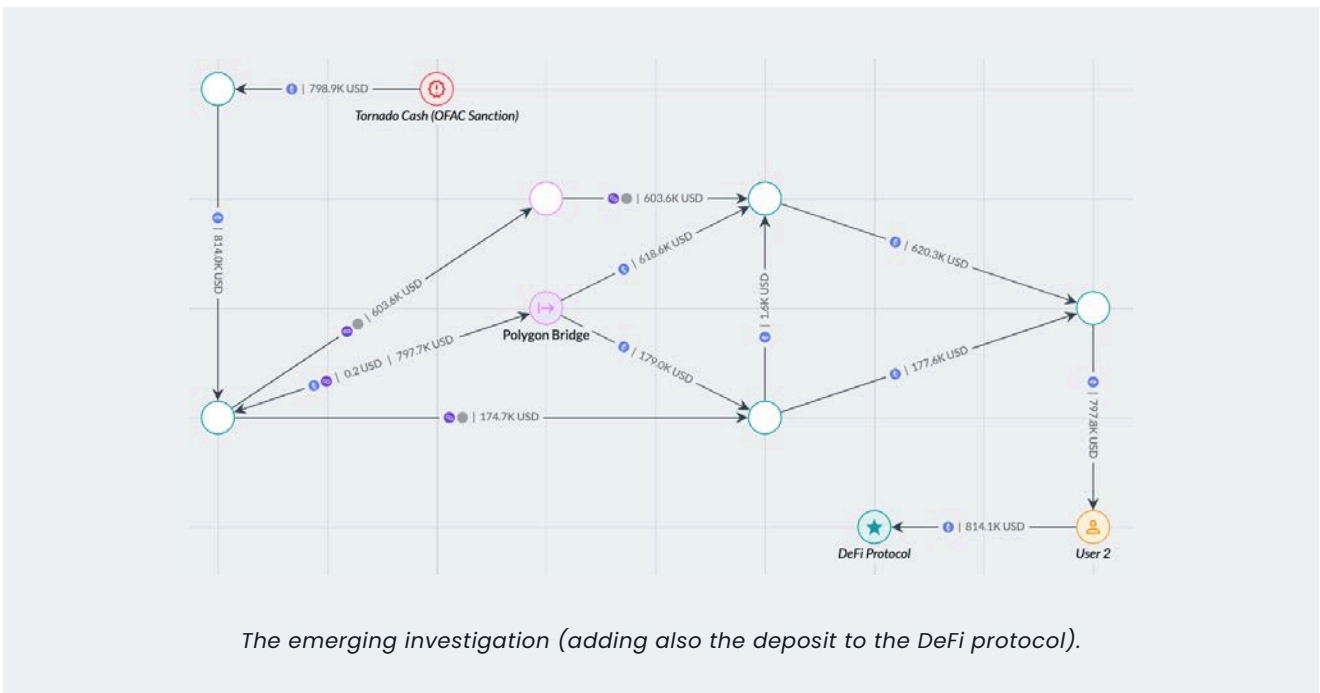
Category	Total
Bridge	52.5% / \$427,271 (USD)
OFAC Sanctioned Entity	24.3% / \$197,612.71 (USD)
Token	23.2% / \$188,991.06 (USD)
Unknown	0.0218% / \$177.46 (USD)

The 'Destination of Funds' table includes:

Entity	Contribution	Networks
Add Tornado Cash - OFAC SDN - 8 Aug / 8 Nov 2022 designations	24.3% / \$197,612.71 (USD)	Ethereum, Polygon

A search dropdown menu is open, showing options for Ethereum (Ether / ETH), Polygon (Polygon / MATIC), and Wrapped Ether / WETH. The 'Add' button is highlighted in the interface.

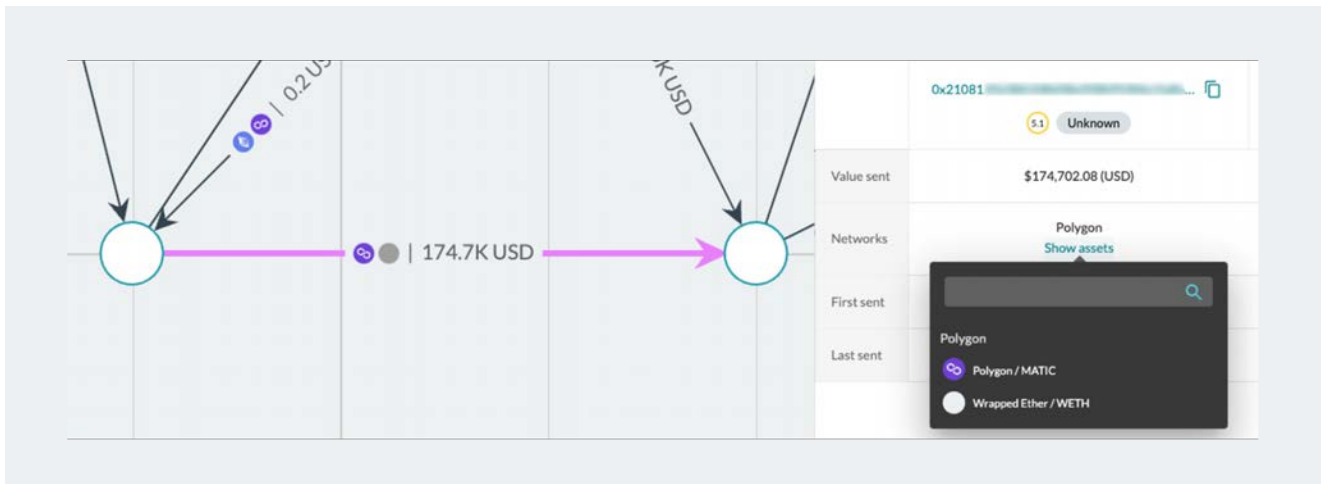
*Clicking "Add" to plot the exposure between User 2 and Tornado Cash.*



Holistic Investigator provides a number of tools to gauge further insights that may be necessary to pursue an investigation, gather evidence or present in a court of law. These are:

- **The ability to view all transacted assets**

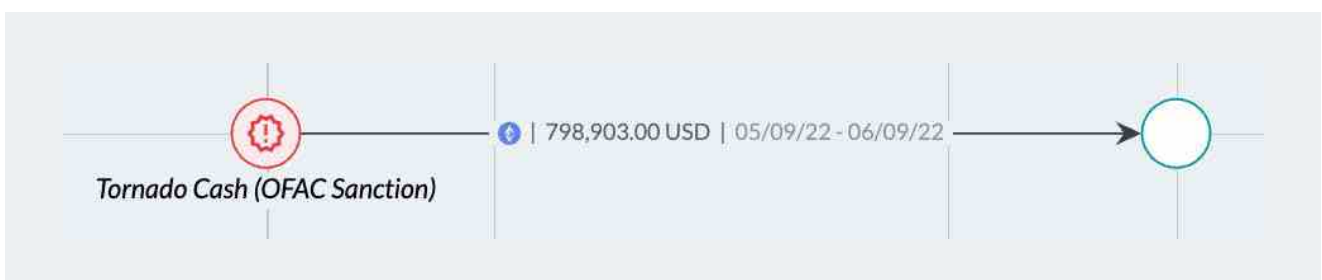
The assets that a wallet has interacted with can be visualized either as a whole, or in terms of transactions that have occurred between it and another wallet. This negates the need to separately investigate transactions for one asset at a time.



- **The ability to view absolute values of transactions and the time frames between the first and last transaction between two wallets on a graph**

The specific values transacted or the dates within which transactions occurred between two wallets may be important based on the context of an investigation. For example, if the suspect's crypto transactions are known to be associated with some off-chain activity that occurred on a certain date or involved a specific amount of money, dates can be used to filter transactions on this basis.

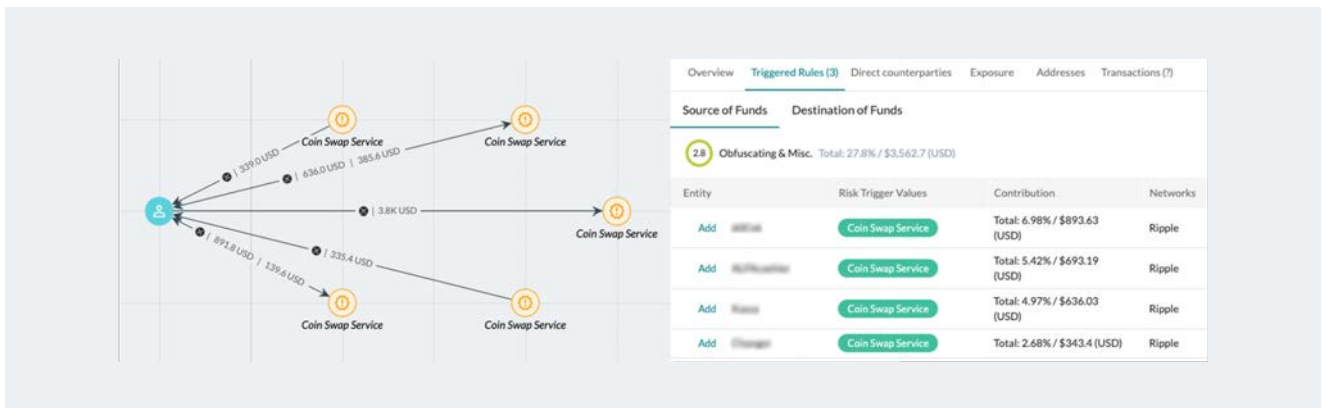
Specific values and dates can be visualized by clicking on a wallet or transaction. However, visualizing this information directly on a graph can make it much quicker to narrow down and omit transactions that do not fall within the pattern of suspicious activity being searched for. Additionally, since the values and dates displayed on Holistic Investigator incorporate assets transacted across all chains, there is no need to cross-reference this information from several individual single-asset graphs.



- **The ability to screen against and plot exposure to entities that are flagged according to an investigator or compliance professional’s specific risk profile**

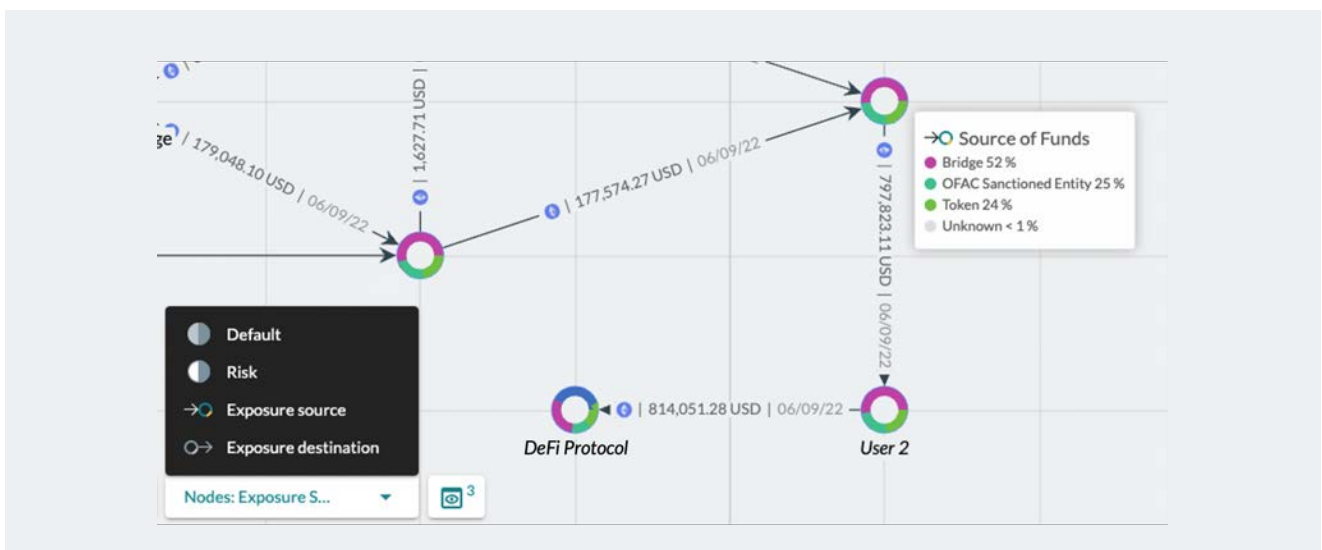
Particularly useful for screening against exposure to illicit-facing coin swap services, users can set their own risk profiles for single-asset or cross-chain crypto investigations. This will allow Investigator to automatically detect and plot on command any exposure a wallet has to an entity falling outside those profiles – based on their activity across all blockchains and assets.

This is a useful functionality for compliance professionals to protect against sanctions or high-risk entities, as per scenario 3 above. It can also make investigations more efficient by automatically determining if a wallet has interacted with a specific profile of a criminal entity.



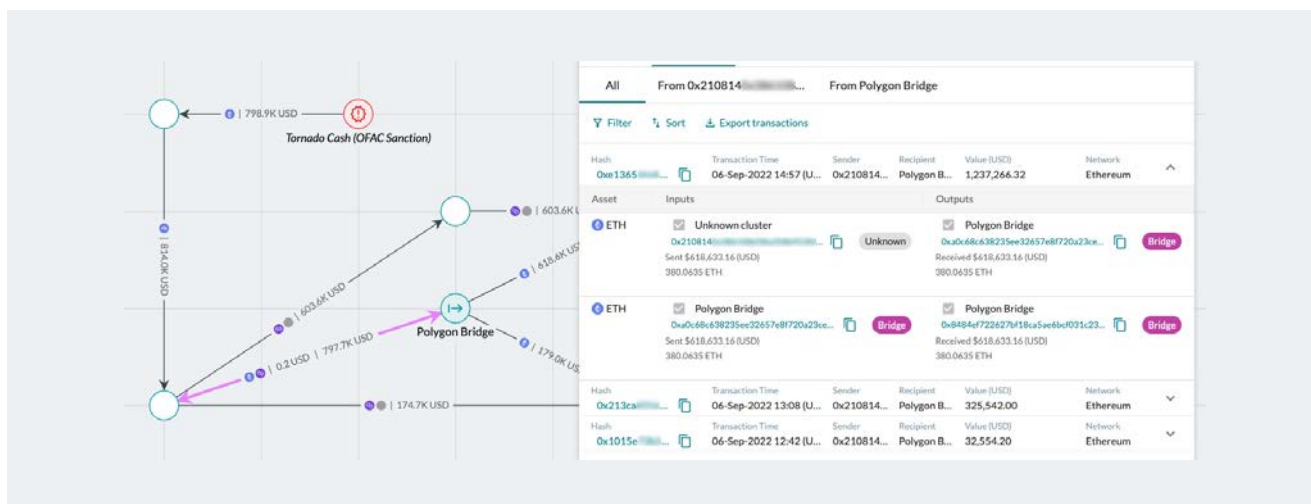
- **The ability to visualize a summary of source and destination exposure of wallets on a graph to gauge a quick risk picture of wallets of interest**

A quick visualization of the risk profile across wallets of interest can inform the best avenues of investigation to follow. Unexpected or suspicious incoming or outgoing flows can be identified at a quick glance without the need to investigate each wallet individually. Beyond investigative efficiency, this function allows for the quicker detection of anomalies and the building of a wider understanding about previously known unknowns in an investigation.



- **The ability to view transactions to and from cross-chain services in detail**

These detailed insights are useful for identifying the laundering patterns of a wallet of interest, or to cross-reference with known activities of suspects. As is the case with Holistic analytics more generally, it also eliminates the need to negotiate multiple block explorers to decode the nature of the suspect's chain or asset-hopping activities. Both the initiation and result of a conversion can therefore be visualized and exported as a CSV in a single transaction explorer.



Using these functionalities, the case of User 2 can be summarized as follows. It is worth emphasizing that the entire investigation can be plotted using Holistic capabilities in one click, despite this user going to great lengths to disguise their Tornado Cash withdrawal through cross-chain typologies:

1. An Ethereum address cashed out 500 ETH from Tornado Cash.
2. The 500 ETH was moved to another Ethereum address.
3. Next, the 500 ETH was transferred via Polygon Bridge into the same address but in the Polygon blockchain as wETH (Wrapped ETH token).
4. From there, the crypto was split into two new Polygon addresses, likely to disconnect funds from the previous address that is present in both Ethereum and Polygon.
5. Next, funds from two Polygon addresses were transferred via Polygon Bridge to a brand new Ethereum address and merged together.

**At this point, legacy blockchain analytics tools would incorrectly flag the funds in this Ethereum address as originating from a legitimate source, namely Polygon Bridge.**

6. The user made a few more hops to finally move these funds into a DeFi liquidity pool.
7. The funds are yet to be cashed out at the time of writing.

# → Conclusion

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This report has sought to harness the power of Holistic blockchain analytics to delve deeper into the complex strategies criminals are now using to engage in all types of financial crime. The case studies presented here include instances of terrorist financing, money laundering, sanctions evasion and arms proliferation financing at all levels. Whether the predicate offense is large or small, simple or sophisticated, cross-chain crime is fast becoming a default technique for all forms of illicit activity.

As traditional entities such as mixers continue to be subject to seizures and sanctions scrutiny, the crypto crime displacement to chain- or asset-hopping typologies is also on the rise. Our figures now indicate that, despite the bear market, cross-chain crime is rising faster than our previous predictions.

For virtual asset services and law enforcement investigators, this has major implications for detecting, tracing and mitigating this new era of crypto crime. This in particular affects cross-chain services, including DEXs and bridges. For developers of such services to continue innovating and playing their crucial part in enhancing the wider decentralized finance ecosystem, these risks need to be addressed and managed.

As demonstrated with Elliptic Nexus in the final section, the tools to programmatically monitor cross-chain activity now exist, and can do so at-scale. This report has shown how this technology can now be leveraged to solve complex cases and detect – often in a single click – illicit activity that would have once been considered highly obfuscated.

As the world's first blockchain analytics provider since 2013, Elliptic is proud to have pioneered this next generation of analytics solutions. These capabilities have already been used to seize crypto stolen by North Korea and bring to light sophisticated money laundering schemes – demonstrating their part in making crypto safer and accessible to everyone.

Find out more about Holistic blockchain analytics solutions at [elliptic.co/holistic](https://elliptic.co/holistic). Our website will also help you get in touch with a specialist for more information or further demonstrations of how these capabilities can help you navigate this new frontier of crypto crime.

# → Methodology

Elliptic’s internal dataset – which has documented crypto crime and expanded since 2013 – was used to calculate the USD value of illicit cryptoassets flowing into decentralized exchanges, cross-chain bridges and coin swap services. Unless otherwise stated, calculations take into account exposure over an unlimited number of “hops” – i.e., even if an illicit entity has sent funds into a cross-chain or cross-asset service through 100 intermediary addresses.

Elliptic calculates the USD value of these transactions according to the exchange rate at the time of their occurrence. All assets covered by Elliptic’s Holistic blockchain analytics capabilities are included in the calculated figures. Elliptic cannot vouch for any data presented from external sources.

The difference between the \$7 billion of cross-chain crime identified in this report and the \$4.1 billion identified in our October 2022 report arises due to:

- The inclusion of more assets and blockchains – and thus criminality occurring on them – due to holistic analytics capabilities.
- Criminality that has occurred prior to July 2022 (the cut-off date for data analysis for our last report) that has only been identified since.
- Criminality that has occurred between July 2022 and July 2023.
- Crypto flowing in and/or out of services and entities that have since been sanctioned, seized or declared criminal by relevant legal agencies.

The breakdown of the above – where a breakdown is possible – and the impact to our figures is as follows:

<b>Original figure (Pre-2022)</b>	<b>Pre-2022 criminality since identified</b>	<b>Criminality in July 2022-23</b>	<b>Pre-2022 activity of entities since designated</b>	<b>Total updated figure</b>
\$4.1 billion	\$63.5 million	\$2.7 billion	\$93.8 million	\$6.9 billion

Part of our figures include activities such as gambling or marijuana vendor shops, which may not be illegal in certain jurisdictions.

We have anonymized some coin swap services in order to not facilitate inadvertent advertising to illicit-facing entities or disrupt any ongoing law enforcement investigations. Law enforcement readers may get in touch at [investigations@elliptic.co](mailto:investigations@elliptic.co) to receive details about the identity of any service discussed in this report.

# → Crypto intelligence at Elliptic

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Elliptic's core aim is to help crypto become a freer, fairer and more accessible medium of finance for everyone. Achieving this rests on virtual asset services and criminal investigators being able to detect, manage and mitigate crypto crime risks through accurate and up-to-date crypto intelligence.

Harnessing expertise from a wide range of sectors, Elliptic's research, intelligence and data functions deploy a multitude of techniques to enrich our dataset of both licit and illicit crypto activity.

Ranging from open source intelligence analysis to machine learning solutions, Elliptic ensures that its formidable dataset informing compliance and investigations can contribute to the safe and sustainable development of crypto.

## Building a world-leading crypto dataset

Building and maintaining an accurate and robust dataset of crypto activity is made possible through a range of processes deployed by Elliptic's crypto intelligence functions. These include:

- 1. Open source intelligence (OSINT):** Elliptic maintains broad analytical, investigative and linguistic capabilities to identify and assess crypto crime intelligence from public and private sources. Our OSINT operations involve both overt and covert data gathering to detect and understand the nature of illicit activity.
- 2. Dark web investigations:** our specialist researchers are dedicated to in-depth investigations and risk assessments in the dark web ecosystem. This ensures that Elliptic maintains accurate coverage of a range of illicit activities, including dark web markets, stolen data vendors, terrorist financing and forums dedicated to facilitating ransomware and malware attacks.
- 3. Data science:** our data scientists are well versed with the unique requirements of analyzing patterns in blockchain activity and complex transaction heuristics. Additionally, we are a leading innovator in key industry-specific needs that give investigators crucial advantages over crypto criminals, such as tracing through mixers and privacy wallets.
- 4. Pre-empting threats with Horizon Scanning:** we recognize that crime moves fast, and is often at risk of outpacing prevention efforts. Our research and data prioritization is based on identifying the likely trajectory of the wider crypto ecosystem, so that we can pre-empt coverage of emerging criminal threats before they become mainstream.
- 5. High capacity engineering:** the fast-moving pace of crypto means that we often handle tens of thousands of data points every minute. Our data engineering capabilities are scaled and innovated to meet the challenge, ensuring that data is entered, processed and verified quickly to provide timely insights.

6. **Industry partnerships:** Elliptic recognizes that the push for a safe and secure cryptoasset ecosystem is shared by other stakeholders and competitors. Whether it is to combat child sex abuse, ransomware or fraud, Elliptic partners and shares data with other reliable industry leaders under the common goal of combating crypto crime.
7. **Quality assurance:** Bringing down false positives is crucial for more efficient crypto compliance and wider trust in the blockchain ecosystem. Elliptic takes great care to ensure that its data is accurate, verifiable and robustly evidenced before incorporating it into our tools.

It is these processes that power Nexus – our next-generation blockchain analytics engine – and solidify it as an industry-leading platform for crypto compliance and investigations. Nexus allows virtual asset services and investigators to trace cryptoassets both within and across blockchains concurrently. At Elliptic, we leverage our world-class intelligence through Nexus to make detailed analytical queries, enhanced due diligence reports and bespoke solutions for our clients – allowing us as an industry to remain ahead of even the most complex risks and criminal threats.

## A positive impact for the wider industry

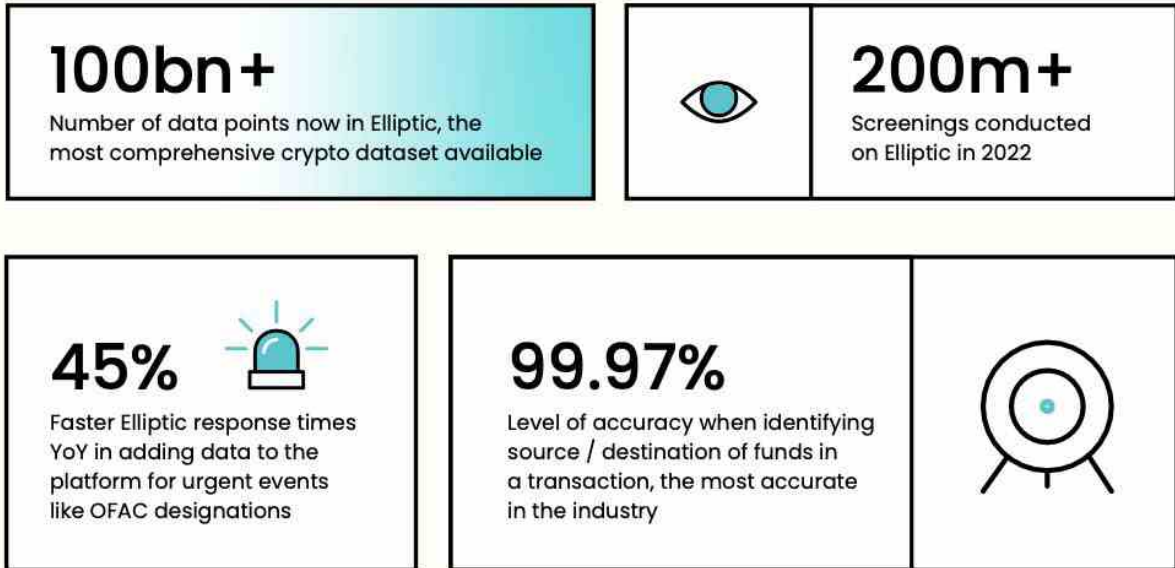
Our crypto intelligence capabilities do not only serve to underpin our leading compliance and investigative solutions. Elliptic is also proud to have facilitated crucial industry-specific and data-driven research in the form of blogs, research reports and briefing notes. Topics have included cross-chain crime, an investigation into the Conti ransomware group and the financial crime risks of non-fungible tokens (NFTs) and the metaverse.

Elliptic also leverages its crypto intelligence capabilities to conduct in-depth investigations and advise industry partners on key risks and crypto crime trends. Our data and expertise has helped inform sanctions agencies, law enforcement, financial intelligence units, policymakers and regulators across many jurisdictions. As crypto expands and matures, Elliptic is committed to maintaining, expanding and informing the wider industry through its world-leading data collection and analytical capabilities.

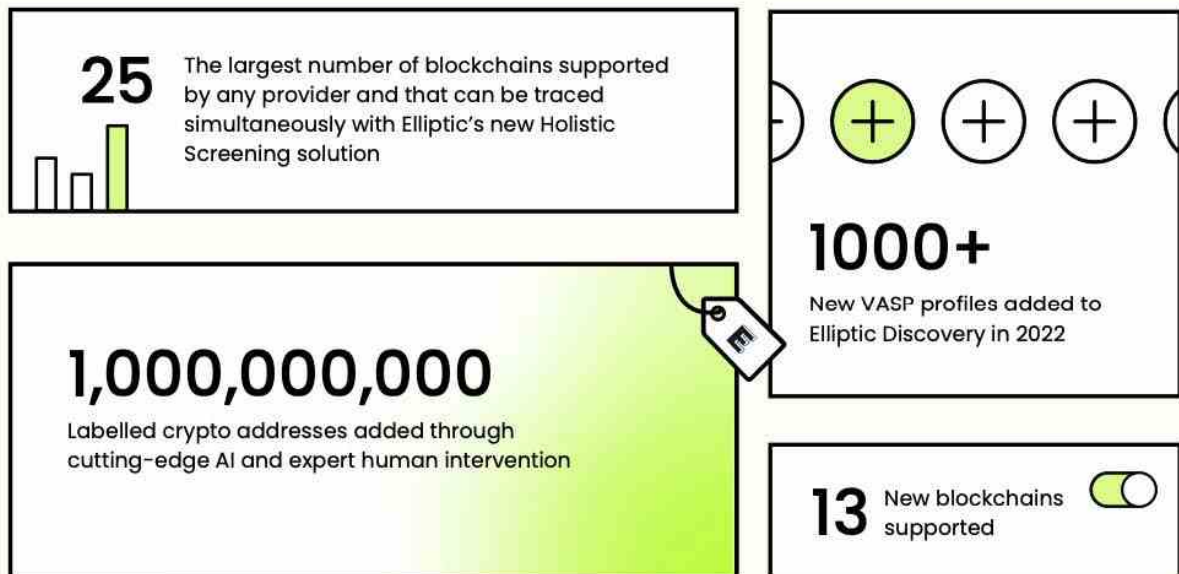
Read our crypto intelligence insights on the Elliptic Blog: [www.elliptic.co/blog](https://www.elliptic.co/blog).



## Industry leading data quality



## Expanded coverage



# → Glossary

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**Address:** a cryptoasset address is a unique identifier that serves as a virtual location where a cryptoasset can be sent. The address can be freely shared with others to facilitate transactions.

**Automated market maker (AMM):** see “DEX”.

**Blockchain:** a blockchain is the transaction database shared by all nodes participating in a specific cryptoasset network. A full copy of a network’s blockchain contains every transaction ever executed in the asset. It was first introduced in the Bitcoin whitepaper published in October 2008 as the underlying protocol to allow truly peer-to-peer transactions.

**Carding:** is the process of stealing identity or credit card information through hacking consumer databases or “skimming” payment cards through point-of-sale (PoS) terminals infected with malware.

**Centralized exchange:** a centrally-managed virtual asset service that allows users to hold, trade and exchange cryptoassets. Also known simply as a “crypto exchange”.

**Chain hopping:** a money laundering technique where a criminal exchanges cryptoassets on one blockchain to another – possibly multiple times – to obfuscate their transaction trails.

**Coin swap service:** a usually non-transparent online service that allows users to swap their cryptoassets without verifying their identity or opening an account. Many of these services are typically based in Russia or Iran.

**Cross-asset:** the process of exchanging cryptoassets on one blockchain to cryptoassets on another, usually through the use of a centralized exchange, a coin swap service or a decentralized exchange (DEX).

**Cross-chain:** the process of exchanging cryptoassets on one blockchain to cryptoassets on another, usually through the use of a centralized exchange, a coin swap service or a cross-chain bridge.

**Cross-chain bridge:** a usually-decentralized protocol that allows users to exchange cryptoassets across blockchains.

**Cross-chain problem:** describes the issue that the legacy blockchain solutions which many compliant virtual asset services have in place for AML/sanctions compliance are unable to trace through cross-chain or cross-asset blockchain transactions – a key weakness exploited by criminals.

**Cryptoasset:** a cryptoasset is a digital asset that is secured with cryptography and where transactions are distributed and validated by a decentralized set of participants, and recorded on a public ledger known as a blockchain.

**Cryptocurrency:** the term “cryptocurrency” can be used as an umbrella term for virtual forms of money, but is generally used when talking about assets which are supported by a blockchain like Bitcoin’s. Cryptocurrencies are not issued or controlled by any government or other central authority. They exist on peer-to-peer networks of computers running free, open-source software. Generally, anyone who wants to participate by owning, sending or spending can do so. The term “crypto” is often used when speaking and writing.

**DAI:** a stablecoin pegged to the US dollar that is not freezable by a centralized entity.

**Dark market:** dark markets are marketplaces available on the dark web which allow users to sell a range of goods and services. However due to the largely anonymous nature of the dark web, many of the items for sale are illicit.

**Decentralized:** where no central counterparty has unilateral control of a system and consensus across participants is required to effect changes.

**Decentralized exchange (DEX):** a service, typically running on smart contracts, that allows users to swap between cryptoassets on the same blockchain. Examples include Uniswap and SushiSwap.

**Decentralized exchange (DEX) aggregator:** a service that searches through many decentralized exchanges to identify the best conversion rate for a specific cryptoasset swap pair. Examples include 1inch and CoW Protocol.

**Decentralized finance (DeFi):** decentralized finance (DeFi) is a peer-to-peer, decentralized, censorship-resistant financial system. Common DeFi applications include crypto wallets, lending, borrowing, spot trading, margin trading, interest-earning, market-making, derivatives and options.

**Ethereum:** the Ethereum blockchain is a network with the ambition of being a decentralized world computer. As such, it offers a more function-rich protocol than the Bitcoin blockchain and allows users to transfer the native asset Ether (ETH) as well as creating smart contracts and tokens, or creating more complex decentralized applications (DApps). Ethereum was launched in 2015 and its co-creator Vitalik Buterin is a well known individual in the blockchain world – often speaking at conferences and being active in the space.

**ERC20:** ERC-20 is a technical standard for the implementation of tokens on the Ethereum blockchain, although it has also been adopted by other compatible blockchains. The rules within the standard include how tokens are transferred between addresses and how data within each token is accessed. Tether (USDT) is a well-known example of an ERC-20 token and many more can be tracked online.

**Flash loan:** a flash loan is a means of borrowing funds – typically used for arbitrage – that must be repaid within the same block. However, there have been examples where flash loans have been used nefariously to steal funds and exploit smart contracts.

**Holistic blockchain analytics:** the ability to screen and trace blockchain activity across all cryptoassets.

**Know your customer:** know-your-customer (KYC) standards help protect the financial services industry against fraud, money laundering, corruption and terrorist financing. They involve the checking and verifying of a client's identity both at the onboarding stage and as part of continuing obligations.

**Lazarus Group:** a North Korean state-affiliated cybercriminal group responsible for a large number of crypto and traditional financial heists, as well as the notorious Sony Entertainment hack in 2014. The group is sanctioned by the United States and is also known as "Appleworm", "APT-C-26", "GROUP 77", "Guardians of Peace", "Hidden Cobra", "Office 91", "Red Dot", "Temp.Hermit", "The New Romantic Cyber Army Team", "Whois Hacking Team" or "Zinc".

**Malware:** malicious software which bad actors will look to deploy onto a target's computer with the aim of stealing sensitive information.

**Multi-asset screening:** the ability to check incoming and outgoing cryptoasset flows of a certain wallet for all cryptoassets it has ever held at once, without the need to screen the wallet for each asset separately.

**Non-fungible tokens (ERC721/ERC1155):** a non-fungible token (NFT) is a kind of cryptoasset that records ownership of a digital item and unlike cryptoassets such as Ether (ETH) and Bitcoin (BTC), is not mutually interchangeable. Each NFT is a unique asset in the digital world and can be bought and sold like any other item.

**NFT collection:** a set of NFTs minted using the same smart contracts. Over time, the smart contract of reference of an NFT collection may change due to improvements or changes in the protocol.

**NFT marketplace:** a marketplace where users can buy, sell and browse non-fungible tokens.

**Office of Foreign Assets Control (OFAC):** the Office of Foreign Assets Control (OFAC) of the US Department of the Treasury administers and enforces economic and trade sanctions based on US foreign policy and national security goals against targeted foreign countries and regimes, terrorists, international narcotics traffickers, those engaged in activities related to the proliferation of weapons of mass destruction, and other threats to the national security, foreign policy or economy of the United States.

**Phishing:** where illicit actors will send emails pretending to be from recognized companies or senders in the hope of tracking the recipient to share personal or sensitive information.

**Ponzi scheme:** a type of financial scam where victims are encouraged to invest in a non-existent product or service and recruit others to do the same, after which initial investors will be compensated with the investments of later victims. The scheme collapses when new investments dry up and the scheme is no longer able to pay earlier investors.

**Ransomware:** malicious software that encrypts a victim's files and demands a ransom – usually in cryptoassets – in return for the decryption key.

**RenBridge:** a cross-chain bridge that has been used to launder over \$540 million of illicit cryptoassets.

**Smart contract:** a smart contract is a computer program or a transaction protocol which is intended to automatically execute, control or document legally relevant events and actions according to the terms of a contract or an agreement. It was initially conceived by Nick Szabo in 1998 and later implemented on blockchains such as Ethereum.

**Stablecoin:** a cryptoasset that is pegged at a fixed exchange rate to another asset or currency, such as the US dollar.

**Tether (USDT):** a stablecoin pegged to the US dollar, operated by Tether Limited Inc.

**Token:** the term token refers to a programmable unit of value which is recorded and transferred on a blockchain. However, it is distinct from the native asset which is the cryptocurrency created by the protocol and used to pay fees, created as a block subsidy or used in the consensus protocol. Tether (USDT) is an example of a token.

**Tornado Cash:** a decentralized mixer operating on numerous blockchains before being sanctioned by the United States in August 2022. Tornado Cash mixed over \$7.1 billion of cryptoassets, of which \$1.54 billion was confirmed to have originated from illicit sources.

**Uniswap:** the largest decentralized exchange (DEX) on the Ethereum blockchain.

**USD Coin (USDC):** a stablecoin pegged to the US dollar, operated by Circle.

**Virtual Asset Service Provider (VASP):** a business that deals with virtual assets. Examples include centralized exchanges and payment service providers.

**Wallet:** a wallet is a collection of cryptoasset addresses and the corresponding private keys. They allow cryptoassets to be stored, keeping them safe and accessible. They also allow you to send, receive, and spend cryptoassets. Wallets can be self-hosted (where you retain control of the private keys) or hosted (where a custodian stores the private keys on your behalf).

**Wrapped ETH / Wrapped BTC:** a cryptoasset similar to a stablecoin that is pegged to another cryptoasset (for instance, Wrapped ETH would be pegged to ETH). Wrapped tokens are often used to invest in DeFi protocols and allow representations of cryptoassets on different blockchains to be used as investments.

# → Notes & Citations

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1. Eray Arda Akartuna & Thibaud Madelin, "The State of Cross-chain Crime". Elliptic. Report. Published: October 4th 2022. Accessible at: [www.elliptic.co/resources/state-of-cross-chain-crime-report](http://www.elliptic.co/resources/state-of-cross-chain-crime-report).
2. See: [www.elliptic.co/holistic](http://www.elliptic.co/holistic).
3. "Following the Money in a Cross-chain World: A Law Enforcement Supplement". Elliptic. Report. Published: November 30th 2022. Accessible at: [www.elliptic.co/resources/following-the-money-in-a-cross-chain-world](http://www.elliptic.co/resources/following-the-money-in-a-cross-chain-world).
4. Tom Robinson & Chris DePow. "DeFi: Risks, Regulation and the Rise of DeCrime". Elliptic. Report. Published: November 18th 2021. Accessible at: [www.elliptic.co/resources/defi-risk-regulation-and-the-rise-of-decrime](http://www.elliptic.co/resources/defi-risk-regulation-and-the-rise-of-decrime).
5. Shane D. Johnson, Rob T. Guerette & Kate Bowers. "Crime displacement: what we know, what we don't know, and what it means for crime reduction". Journal of Experimental Criminology. Journal article. Published: July 6th 2014. Accessible at: [doi.org/10.1007/s11292-014-9209-4](https://doi.org/10.1007/s11292-014-9209-4).
6. "Tornado Cash Mixer Sanctioned After Laundering Over \$1.5 Billion". Elliptic Connect. Blog post. Published: August 8th 2022. Accessible at: [www.hub.elliptic.co/analysis/tornado-cash-mixer-sanctioned-after-laundering-over-1-5-billion/](http://www.hub.elliptic.co/analysis/tornado-cash-mixer-sanctioned-after-laundering-over-1-5-billion/).
7. Jamie Redman. "Alameda-Funded Ren Tells Users to 'Bridge Back to Native Chains' as It Sunsets 1.0 Platform". Bitcoin.com. News article. Published: December 8th 2022. Accessible at: [www.news.bitcoin.com/alameda-funded-ren-tells-users-to-bridge-back-to-native-chains-as-it-sunsets-1-0-platform/](http://www.news.bitcoin.com/alameda-funded-ren-tells-users-to-bridge-back-to-native-chains-as-it-sunsets-1-0-platform/).
8. "One of the darkweb's largest cryptocurrency laundromats washed out". Europol. Press release. Published: March 15th 2023. Accessible at: [www.europol.europa.eu/media-press/newsroom/news/one-of-darkwebs-largest-cryptocurrency-laundromats-washed-out](http://www.europol.europa.eu/media-press/newsroom/news/one-of-darkwebs-largest-cryptocurrency-laundromats-washed-out).
9. "Stolen Funds From the Wormhole Hack on the Move, After Laying Dormant For Almost a Year". Elliptic Connect. Blog post. Published: February 1st 2023. Available at: [www.hub.elliptic.co/analysis/stolen-funds-from-the-wormhole-hack-on-the-move-after-laying-dormant-for-almost-a-year](http://www.hub.elliptic.co/analysis/stolen-funds-from-the-wormhole-hack-on-the-move-after-laying-dormant-for-almost-a-year).
10. "Terrorist Financing through Cryptoassets". Elliptic. Report. Published: 10 August 2023. Available at: [www.elliptic.co/resources/terrorist-financing-and-cryptoassets-in-2023](http://www.elliptic.co/resources/terrorist-financing-and-cryptoassets-in-2023).
11. "Cross-chain Crime: More Than Half a Billion Dollars has Been Laundered Through a Cross-chain Bridge". Elliptic. Blog post. Published: August 10th 2022. Accessible at: [www.hub.elliptic.co/analysis/cross-chain-crime-more-than-half-a-billion-dollars-has-been-laundered-through-a-cross-chain-bridge/](http://www.hub.elliptic.co/analysis/cross-chain-crime-more-than-half-a-billion-dollars-has-been-laundered-through-a-cross-chain-bridge/).

12. Ezra Reguerra. "Ren Protocol transfers all assets to FTX debtors' wallet in case of shutdown". CoinTelegraph. News article. Published: April 12th 2023. Available at: [www.cointelegraph.com/news/ren-protocol-transfers-all-assets-to-ftx-debtors-wallet-in-case-of-shutdown](https://www.cointelegraph.com/news/ren-protocol-transfers-all-assets-to-ftx-debtors-wallet-in-case-of-shutdown).
13. "The Harmony Horizon Bridge Hack: Part 1". Elliptic. Briefing note. Published: January 31st 2023. Available at: [www.elliptic.co/resources/harmony-horizon-bridge-hack](https://www.elliptic.co/resources/harmony-horizon-bridge-hack).
14. "Elliptic Collaborates With Binance and Huobi to Freeze Lazarus Group Hack Proceeds." Elliptic. Blog post. Published: February 14th 2023. Available at: [www.hub.elliptic.co/analysis/elliptic-collaborates-with-binance-and-huobi-to-freeze-lazarus-group-hack-proceeds/](https://www.hub.elliptic.co/analysis/elliptic-collaborates-with-binance-and-huobi-to-freeze-lazarus-group-hack-proceeds/).
15. "How Romance Scams Work in Crypto". Elliptic. Blog post. Published: May 9th 2022. Available at: [www.elliptic.co/blog/analysis/how-romance-scams-work-in-crypto#:~:text=How%20Does%20Pig%20Butchering%20Work,there%20are%20romantic%20feelings%20involved](https://www.elliptic.co/blog/analysis/how-romance-scams-work-in-crypto#:~:text=How%20Does%20Pig%20Butchering%20Work,there%20are%20romantic%20feelings%20involved).
16. David Carlisle. "Pig Butchering: Using Blockchain Analytics to Detect and Disrupt Fraudsters". Published: April 3rd 2023. Available at: [www.hub.elliptic.co/analysis/pig-butchering-using-blockchain-analytics-to-detect-and-disrupt-fraudsters/](https://www.hub.elliptic.co/analysis/pig-butchering-using-blockchain-analytics-to-detect-and-disrupt-fraudsters/).
17. David Carlisle. "Preventing Financial Crime in Cryptoassets: Typologies Report 2023". Elliptic. Report. Published: June 14th 2023. Available at: [www.elliptic.co/resources/elliptic-typologies-report-2023](https://www.elliptic.co/resources/elliptic-typologies-report-2023).
18. "SEC Charges Avraham Eisenberg with Manipulating Mango Markets' "Governance Token" to Steal \$116 Million of Crypto Assets". US Securities Exchange Commission. Press release. Published: January 20th 2023. Available at: [www.sec.gov/news/press-release/2023-13](https://www.sec.gov/news/press-release/2023-13).
19. Arda Akartuna. "Mango Market Exploit: DeFi Loses Nearly \$900 Million to Hackers in Costliest 30 Days on Record". Elliptic. Blog post. Published: October 12th 2022. Available at: [www.hub.elliptic.co/analysis/mango-market-exploit-defi-loses-nearly-900-million-to-hackers-in-costliest-30-days-on-record](https://www.hub.elliptic.co/analysis/mango-market-exploit-defi-loses-nearly-900-million-to-hackers-in-costliest-30-days-on-record)
20. "US Sanctions Garantex Exchange and Hydra Dark Web Marketplace After German Seizure". Elliptic. Blog post. Published: April 5th 2022. Available at: [www.hub.elliptic.co/analysis/us-sanctions-garantex-exchange-and-hydra-dark-web-marketplace-after-german-seizure/](https://www.hub.elliptic.co/analysis/us-sanctions-garantex-exchange-and-hydra-dark-web-marketplace-after-german-seizure/).
21. Tom Robinson. "Cybercriminals Have Built Their Own Blockchain Analytics Tool". Elliptic. Blog post. Published: August 13th 2021. Available at: [www.elliptic.co/blog/cybercriminals-have-built-their-own-blockchain-analytics-tool](https://www.elliptic.co/blog/cybercriminals-have-built-their-own-blockchain-analytics-tool).
22. "Cryptocurrency in Conflict". Elliptic. Report. Published: February 24th 2023. Available at: [www.elliptic.co/resources/crypto-in-conflict](https://www.elliptic.co/resources/crypto-in-conflict).
23. "Russian State-Sponsored and Criminal Cyber Threats to Critical Infrastructure". Published: May 9th 2022. U.S. Cybersecurity & Infrastructure Security Agency. Cybersecurity advisory. Available at: [www.cisa.gov/news-events/cybersecurity-advisories/aa22-110a](https://www.cisa.gov/news-events/cybersecurity-advisories/aa22-110a).
24. David Carlisle. "Sanctions Compliance in Cryptocurrencies 2023". Elliptic. Report. Published: April 18th 2023. Available at: [www.elliptic.co/resources/elliptic-guide-to-sanctions-compliance-in-crypto-2023](https://www.elliptic.co/resources/elliptic-guide-to-sanctions-compliance-in-crypto-2023).

25. "The SBU seized more than 800 kg of silver from a criminal group that "laundered" UAH 65 million". Office of the Prosecutor General of Ukraine. Press release. Published: April 28th 2021. Available at: [www.ssu.gov.ua/novyny/sbu-vyluchyla-ponad-800-kh-sribla-u-zlochynnoi-hrupy-yaka-vidmyla-65-mln-hrn-video](http://www.ssu.gov.ua/novyny/sbu-vyluchyla-ponad-800-kh-sribla-u-zlochynnoi-hrupy-yaka-vidmyla-65-mln-hrn-video).
26. "FBI Disrupts Virtual Currency Exchanges Used to Facilitate Criminal Activity". U.S. Attorney's Office, Eastern District of Michigan. Press Statement. Published: May 1st 2023. Available at: [www.justice.gov/usao-edmi/pr/fbi-disrupts-virtual-currency-exchanges-used-facilitate-criminal-activity](http://www.justice.gov/usao-edmi/pr/fbi-disrupts-virtual-currency-exchanges-used-facilitate-criminal-activity).
27. Note: since coin swap services are centralized and do not operate through smart contracts like most DEXs and cross-chain bridges, only some can be traced through using blockchain analytics.
28. "Coin Swap Services: Cashing Out Dirty Crypto in the Cybercriminal Underworld". Elliptic. Report. Published: December 5th 2022. Available at: [www.elliptic.co/resources/coin-swap-services-briefing-note](http://www.elliptic.co/resources/coin-swap-services-briefing-note).

All URLs provided here were securely accessible on August 7th 2023.



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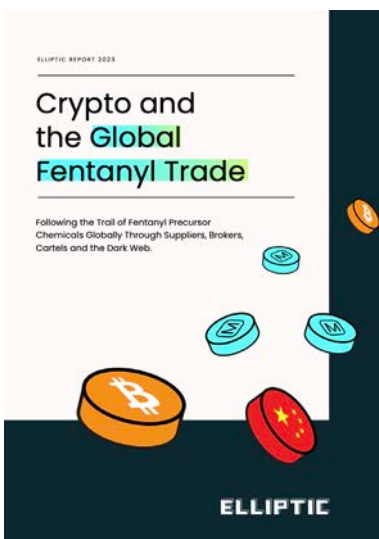
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## Terrorist Financing Through Cryptoassets

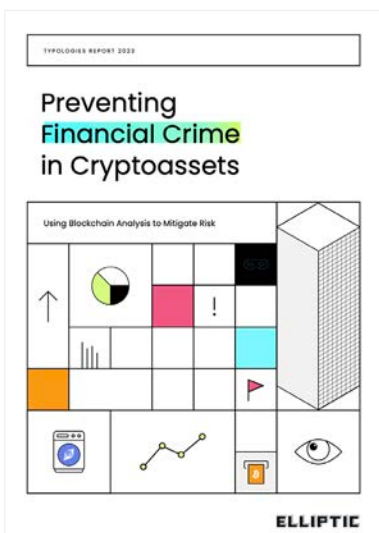
Terrorist financing through crypto is a well documented but constantly evolving phenomenon. In this report, we explore the theoretical nexus between cryptoassets and terrorist finance, along with a timeline of key relevant events since the first online crypto-based terrorist financing campaign was identified over a decade ago.

Please email [government@elliptic.co](mailto:government@elliptic.co) using your law enforcement or government email address to access this report.



## Crypto and the Global Fentanyl Trade

In this report, we explore the use of crypto across the fentanyl supply chain, from the raw chemical manufacturers, through to the dark web vendors selling a range of synthetic opioids, some of which are even more lethal than fentanyl. We also examine how cryptoassets can be prevented from being exploited for this deadly trade.

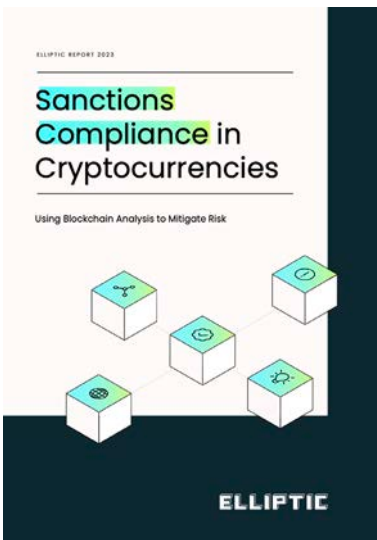


## Typologies Report 2023

With actionable advice, insights, and case studies, this report is designed to equip financial crime analysts and investigators with the knowledge and insights needed to:

- Proactively and practically identify specific risks.
- Investigate cases of crypto crime.
- Develop AML/CFT responses.
- Evolve their responses to manage risk to businesses, consumers and society.





## Sanctions Compliance in Cryptocurrencies

Amid this rapidly changing sanctions landscape, it is critical that cryptoasset businesses and financial institutions consider the impact on their compliance operations and prepare for an ever-tightening sanctions compliance environment.

In this report, we take a look at five key steps to navigate the emerging challenge of cryptocurrency sanctions compliance with success.



## Tactics, Techniques & Procedures

The essential reference guide for every law enforcement officer investigating crypto-related crimes.

This practical guide to money laundering and terrorist financing details the latest crypto crime typologies, red flags, warning signals and case studies.



## Crypto in Conflict

Using its internal proprietary data, Elliptic has conducted an in-depth analysis into the use of cryptoassets on both sides of the Russia-Ukraine war – ranging from humanitarian causes to sanctioned groups suspected of war crimes.

This report provides case studies, best practices and sanctions compliance guidance on how to navigate the implications.



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