



CoinShares

ASSET HIGHLIGHT



CHAINLINK

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CHAINLINK



PURPOSE

Link blockchains to external, real-world data and systems

THE SYSTEM

An Oracle
Aggregates and computes data in the real world to send to smart contracts on chain

Source: CoinShares

THE ASSET

Transaction Fees
Staking (not enabled yet)

Source: CoinShares

PRICE ACTION

2019*	-2.24%
2020	529.86%
2021	81.97%
2022 (YTD)	-62%

**Since September 2019
Source: LINK/USD, Compass Financial Technologies. The figures shown relate to past performance. Past performance is not a reliable indicator of future results and should not be the sole factor of consideration when selecting a product. Transaction costs, fees and expenses not included. Figures do not include any staking rewards.*

GENERAL INFO

Creators	Sergey Nazarov, Steve Ellis, Ari Juels
Launch	4th September 2019
Consensus	Proof of Stake
Asset	LINK, an ERC677 token that inherits functionality from ERC20
Total Supply (native tokens)	1bn
Smallest Unit	Juel, 1e18
Core Products	Data Feeds, VRF, Automation, Proof of Reserves, Cross Chain Communication
Language	Go, TypeScript, Solidity

Source: GitHub, Chainlink Docs, Chainlink Whitepaper, CoinShares

QUICK STATS

Market Cap	\$3.49b
Circulating Supply (LINK)	491m
Total Value Secured	\$11.3bn
Number of Node Operators	325

Source: Chainlink, Messari, DeFi Llama, Link, CoinShares as of 14th October 2022

EXECUTIVE SUMMARY

This report simplifies and clarifies what LINK is, the problem LINK has tried to solve, and its development since its launch. Strengths and weaknesses, opportunities and threats, core components and network architecture are also covered.

As a leader in the Oracle sector, Chainlink is around twice as big as its nearest competitor, Maker. Chainlink is a trusted middleware delivering secure, decentralised, tamperproof and aggregated data from external systems to any smart contract on any blockchain. Adding flexibility and functionality whilst preserving the exact design trade-offs distributed ledger technology was made to solve, Chainlink opens up the rest of the world to Decentralised Finance (DeFi). It enhances the importance and utility of DeFi.

Having revamped its tokenomics and development roadmap for the future, Chainlink has greatly emphasised Decentralised Oracle Networks (DONs). DONs are a group of nodes that connect smart contracts to real-world, off-chain resources in an efficient yet decentralised way. The introduction of Super-Linear Staking aimed to boost network security; however, like all Proof of Stake networks, high token volatility is a causal factor to reduced resistance against attacks as Stakers leave.

PURPOSE, MOTIVATION AND SOLUTION

Chainlink aims to take external, off-chain information in the real world and put it on-chain. Base layer blockchains can now talk to an API, compute and generate privacy-preserving and/or random functions and much more in a secure, decentralised and tamperproof manner without giving up their value propositions of security, decentralisation and speed. Chainlink's important service removes a central point of failure prone to manipulation, poor quality data and allows for a valuable and flexible system (blockchains) that still benefits from inflexibility.

CORE TEAMS

Chainlink Labs, created in 2017, is the leading provider of secure and reliable open-source blockchain oracle solutions. It enhances smart contracts by connecting them to a wide range of off-chain, real-world data sources. With a suite of five products and data providers such as Google Cloud, AccuWeather and Binance, Chainlink has serviced >\$6.18 trillion of transaction value utilising a Chainlink oracle in 2022. Cumulatively >4.2bn data points were delivered on-chain with >1500 projects across 15 different chains in the ecosystem.

With the release of Chainlink's Economics 2.0, Chainlink Foundation now has two main roles. Scheduling a release of Chainlink's (LINK) tokens from their Economics 2.0 development to support growth initiatives for Stakers and holders. As well as operate Chainlink's Grant Program to fund the improvement of Chainlink network, oracles and network dependencies. Other roles include furthering technical specifications and maintenance standards for open-source developers and node operators to uphold.

CORE PEOPLE

Sergey Nazarov, CEO of Chainlink Labs, has had an extensive background in peer-to-peer technologies since 2009. His first venture, ExistLocal, aimed to capture the peer-to-peer marketplace for authentic local experiences. In 2011, Nazarov helped lead a venture firm called QED Capital to turn its attention to crypto only two years after bitcoin's creation. 2014 was a big year for Nazarov, as he set up three companies, two of which were with his Co-Founder in multiple ventures, Steve Ellis. Cryptamail was a decentralised email server; Secure Asset Exchange was a web application that enabled the trading of blockchain bonds, equities and contracts; and SmartContract was the initial prototype providing software for smart contracts to connect to external data. As a successor to Smart Contract in 2017, Chainlink has been his focus ever since. Nazarov graduated with his bachelor's in Philosophy and Management from New York University, later working as a Teaching Fellow.

Steve Ellis, Co-Founder of Chainlink, also has a similar background to Nazarov's. Steve achieved his bachelor's in Computer Science, also from New York University, and became a Teacher's Assistant. The pair split paths as Ellis played an important role as a Software Engineer at Pivotal Labs until they both set up Secure Asset Exchange, then Smart Contract and Chainlink.



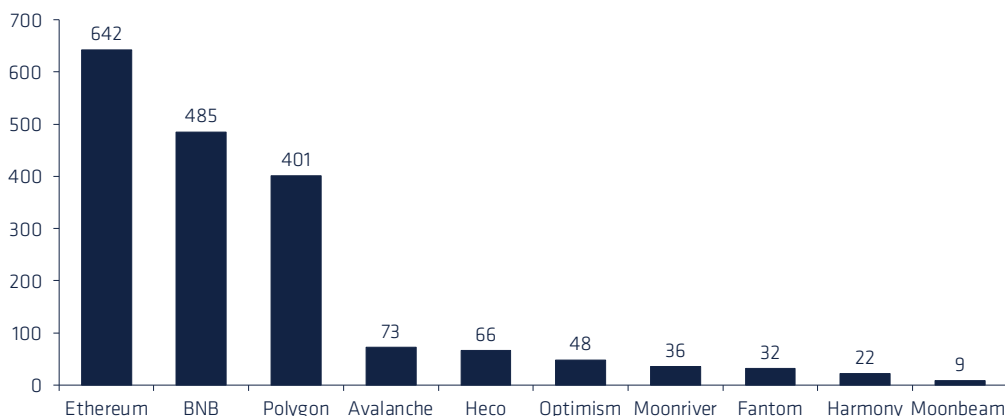
Ari Juels, Chief Scientist at Chainlink Labs, worked at Dell as an Engineer and held the role of Chief Scientist at RSA before he became a professor at Cornell Tech in 2014. Juels achieved his PhD in Computer Science from the University of California, Berkeley.

Eric Schmidt, a strategic advisor for Chainlink Labs, was the driving force of the internet we know today in the early 2000s and central to the battle against Apple and Microsoft. Eric previously held roles as the CEO and Chairman of Google and Chairman and Technical Advisor of Alphabet (Google's parent company).

PRODUCTS AND USE CASES

Chainlink has four main overarching products. Data Feeds fetch information from the real world to deliver on-chain. This product contains six sub-products: Bitcoin Interest Rate Curve, NFT Floor Pricing, Token Pairs, Real-World data such as weather or sports, FX /Commodities Data and definitive Collateralization Proof of Reserves Service. These sub-products provide an open gateway of credit, NFTs, trading, market data, and corporate balance sheets onto the blockchain. Some of the largest decentralised exchanges, such as Aave, Synthetic and Compound, with billions of dollars in total value locked, use Chainlink for price feeds.

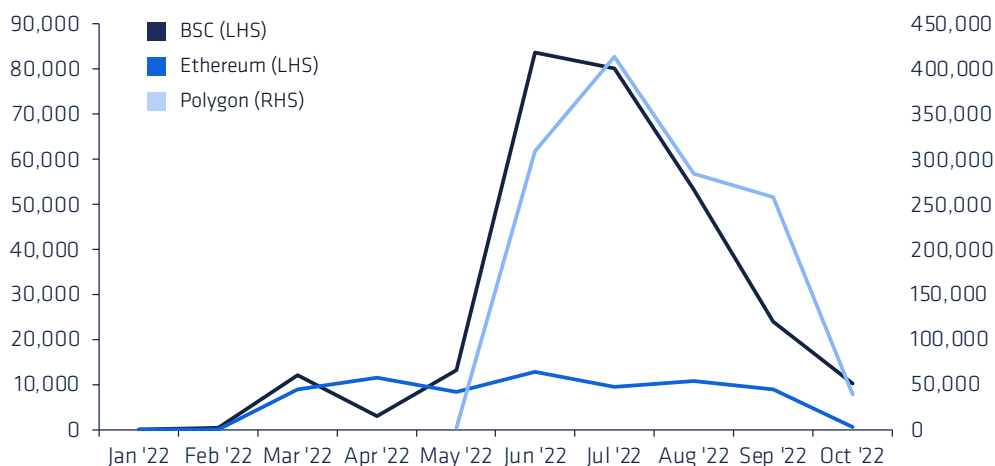
Number of Chainlink Data Feeds by Network



Source: LinkPool, CoinShares, data available as of close 06 October 2022

Secondly, Chainlink's Verifiable Random Function (VRF) service generates cryptographically-truthful, tamperproof and fair random numbers - essential for virtual economies such as gaming and NFTs. Without randomness, a logical and predictive output would drive zero interest and value, especially in corruptible, unfair and biased circumstances and events. One example is a small business called Ether Cards, which provides advanced tools for creating any NFT. Revenues reached \$24M in total sales, having taken two days to integrate Chainlink VRF.

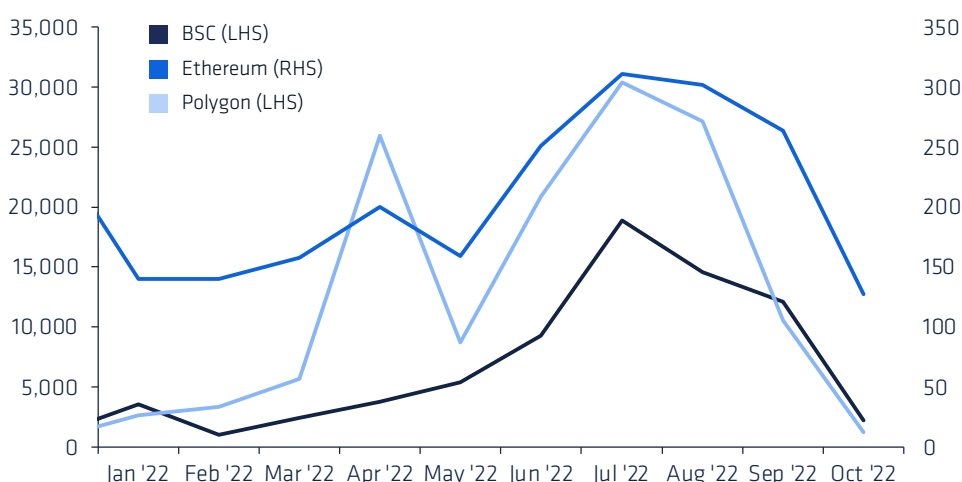
Number of Verifiable Random Function Requests Completed By Chainlink Nodes on Different Chains



Source: Dune, CoinShares, data available as of close 06 October 2022

Chainlink Automation provides an automation framework to eliminate the set-up costs, ongoing maintenance, and risks associated with building automated systems that link the blockchain and the real world. COTI created the Crypto Volatility Index (CVI), an index designed to predict the cryptocurrency market's expected future volatility for the upcoming 30 days, along with volatility tokens pegged to the index. Rebasings these tokens is vital to maintain their peg by adjusting their supply. Automating this exercise is far better, as relying on centralised scripts or manual input would subject the volatility token basing function to potential downtime, leading to incorrect token pricing and cascading failures in other DeFi applications integrating the tokens.

Number of Automation Requests by Chainlink Nodes on Different Chains to Automate Smart Contracts



Source: Dune, CoinShares, data available as of close 06 October 2022

Chainlinks Cross-chain bridging infrastructure comprises Cross Chain Interoperability Protocol (CCIP) that allows smart contracts to communicate across chains; with a programmable token bridge built on top of it. A partnership between SWIFT (messaging service in every major bank) and Chainlink (on most significant blockchains) came to fruition in 2016. Six years on, the most important and recent announcement of a proof-of-concept allows banks (through SWIFT) to instruct token transfers across nearly every important blockchain environment.

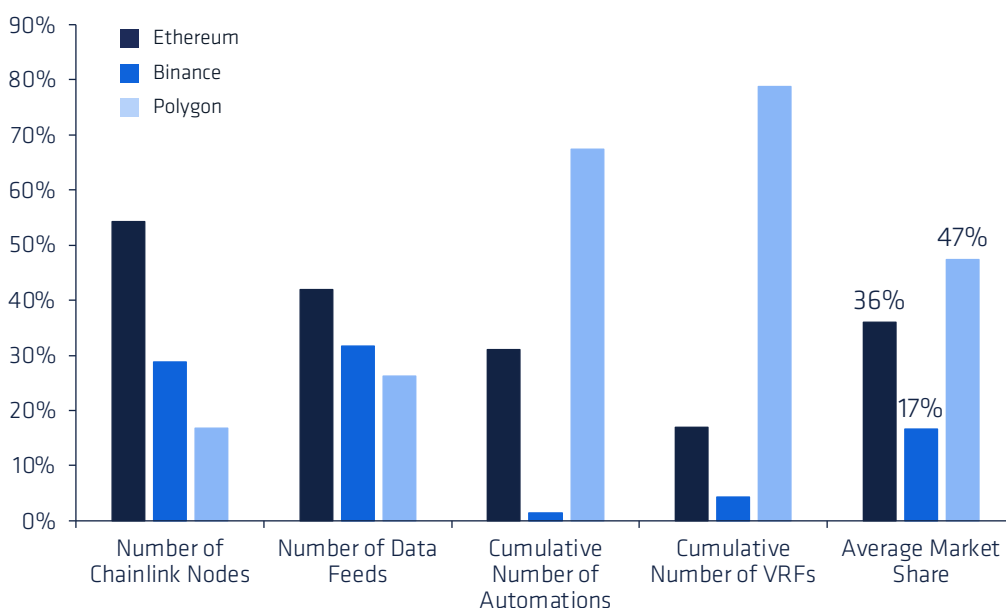
DEVELOPMENT

Chainlink Ecosystem

	Number of Chainlink Nodes	Number of Data Feeds	Cumulative Number of Automations	Cumulative Number of VRFs	Average Market Share
Ethereum	100	642	45,508	279,752	36%
Binance	53	485	2079	71,741	17%
Polygon	31	401	98,736	1,304,002	47%

Source: Chainlink Market, Dune, CoinShares as of 10th October 2022
NB: # of VRF requests and Keepers summed since January 2022

Chainlink Ecosystem



Source: LinkPool, Dune, CoinShares, data available as of close 26 October 2022

Chainlink has expanded the most on Ethereum, Binance and Polygon. Yet, Polygon has the largest average market share across the number of Chainlink Nodes, Data Feeds, Automations and VRF requests at 47% compared to Ethereum's 36% and BNB's 17%. Ethereum had the largest market share of Chainlink Nodes and Data Feeds (54% and 42%, respectively), but Polygon had the largest number of Keepers and VRFs (67% and 79%, respectively). Data Feeds are primarily used for DeFi, where Ethereum garners 57% of TVL, and 51% of that are Decentralised Exchanges which require price feeds and token pairs. A likely reason for Polygon dominating market share of Keepers and VRFs is because Polygon is a dominant Layer 2 with faster and cheaper transactions that derive its security from Ethereum. Therefore, developers are incentivised to build automated smart contracts and dApps on Polygon.

Staking and 'Super-Linear Staking' kicked off Chainlink Economics 2.0, focusing on revamping staking, technical innovations, network development, and robustness. The theory goes that decreased operational costs for nodes from more staking lead to improved security, decentralisation and data aggregation. Better quality data leads to increased smart contract use and, therefore, higher node revenue as nodes get paid for every data delivery to a smart contract. Therefore, more nodes should join due to increased profitability, further increasing the security, decentralisation, aggregation and tamperproof nature of the data delivered—a perpetual flywheel.

v1 introduces additional functionality such as slashing and incorporating user fees as rewards for nodes, and v2 expands utility with more external services and loss protection of honest nodes against dishonest nodes.

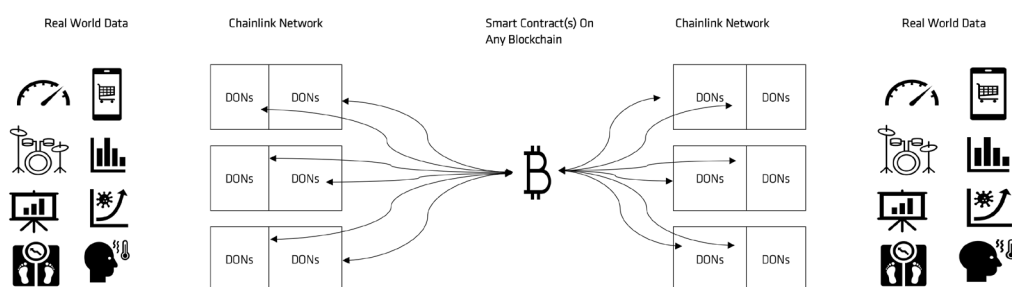
SCALE (Sustainable Chainlink Access for Layer 1 and 2 Enablement) is a Chainlink Labs initiative where blockchain projects commit to offset operating costs of oracle networks to accelerate their ecosystem's growth and support the long-term sustainability of Chainlink oracle services. Blockchains and layer-2 networks in the initial launch include Avalanche, Metis, Moonbeam, and Moonriver.

The Chainlink BUILD Program aims to accelerate the growth of early-stage and established projects within the Chainlink ecosystem by providing enhanced access to Chainlink services and technical support in exchange for fees and other incentives for Chainlink service providers, such as Stakers.

Technical innovations include Off-Chain Reporting (OCR), which aggregates data from data providers who pull from both centralised and decentralised exchanges. Alongside VRF, Chainlink is evolving toward a general-purpose framework and infrastructure for providing the computational resources that smart contracts require for advanced functionality.

ARCHITECTURE

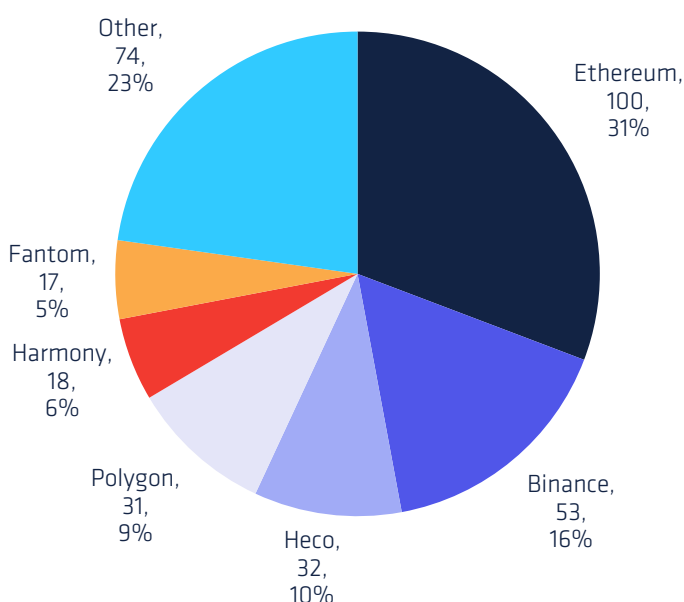
For simplicity, Chainlink's Decentralised Oracle Networks (DONs, otherwise called oracle nodes) receive data from real-world events via data providers and backend systems to inject secure, decentralised and aggregated data into smart contracts that have requested such information.



Source: Chainlink, CoinShares

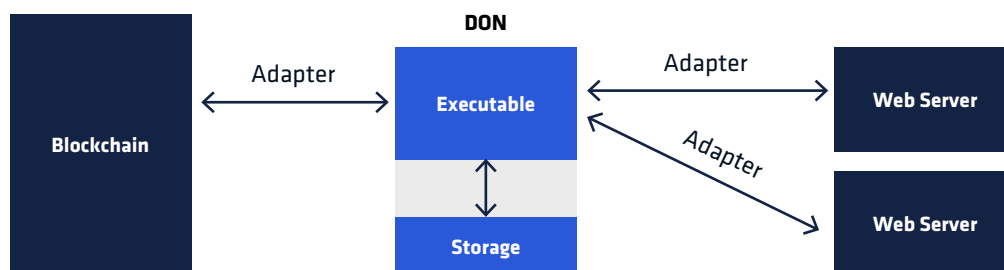
Decentralized Oracle Network

Number & Percentage of Active Chainlink Nodes by Network



Source: LinkPool, CoinShares, data available as of close 06 October 2022

As the foundation for v2, DONs are vital for Chainlink in the future. DONs enable the creation of hybrid smart contracts. On-chain code and off-chain infrastructure support advanced decentralised applications (dApps) that react to real-world events and interoperate with traditional systems.



Source: Chainlink, CoinShares

Above is a conceptual figure showing an example of how it could work, i.e., relay off-chain data to a contract. An executable uses adapters (or adaptors?) to fetch off-chain data, which it computes, sending output over another adapter to a target blockchain. The executable can also read and write to local DON storage to keep the state and/or communicate with other executables. Flexible networking, computation, and storage in DONs enable novel applications.

Architecture Overview

	Decentralized Oracle Network (DON)	Executable	Adaptor
Role	Allow access between on-chain code (smart contracts) and off-chain services	Programs that run on the DON and interact with external resources	Links Executable to external resources with an interface and may be called by the initiator or code in Executable
Process	DONs are formed by oracle nodes coming together to fulfill a one-off or persistent 'data delivery' job to clients	Can read and write to local DON storage and keep state and communicate with other executables	Existing adapters typically only fetch data from data sources
Other	DONs are the foundation for Chainlink 2.0 to develop seven key areas: hybrid smart contracts, abstracting away complexity, scaling, confidentiality, order-fairness for transactions, trust minimization, and incentive-based (cryptoeconomic) security	Do not directly store main-chain assets	In the future they may operator in two ways: leverage joint computation by DON nodes to achieve additional features

Source: Chainlink, CoinShares

TOKEN

Architecture Purpose

	LINK, THE TOKEN / ERC677 Medium of Exchange	Staking
Functionality	Pay node operators for retrieving data for smart contracts Deposits places by node operators as required by contract creators Inherits functionality as a derivative of the Ethereum token standard, ERC20 Extra functionality due to ingrained transfer and call functions. This enables sender to call a function and pay the node operator in LINK, all in one transaction	Stake LINK as collateral to ensure data delivery process, and, therefore, user assurances and security guarantees Staking LINK, in turn, enhances the ability for nodes to receive data delivery jobs and earn corresponding fees from users
Other	Price for which user needs to pay node operator to provide them with cryptographically-truthful, decentralised, tamper-proof data is set by the node operator	Super linear staking impact results in lower operational costs as oracle security grows which attracts more users and boosts fees perpetuating into a positive feedback loop

Source: Chainlink Labs, CoinShares

STRENGTHS

Chainlink is blockchain agnostic that can connect to all public and private blockchain environments, providing a universal layer for cross-network connectivity in conjunction with events in the outside world. Unlike Maker, Chainlink has focused on combining scalable and efficient off-chain compute (oracle) to provide secure, decentralised, tamperproof and aggregated data. Alongside the benefits of on-chain infrastructure, more useful smart contracts have resulted in positive business development and architectural improvements. As a result of a growing ecosystem and network effects - the number of requests, nodes and different blockchains from an increasing set of products - Chainlink commands 45% of all total value secured in the Oracle sector, three times more than Maker (15% market share), the second largest.

OPPORTUNITIES

Solving the problem that smart contracts cannot connect to the outside world opens up colossal value creation for Chainlink as smart contracts DeFi may require knowledge of real-world data and events happening off-chain. Industries can benefit from combining oracles and smart contracts in a secure, decentralised, tamperproof and aggregated way, including price feeds for finance, weather information for insurance, randomness for gaming, and private but verifiable identification for government and users—the most notable opportunity being the Chainlink-SWIFT partnership.

THREATS

Some products and narratives seem differentiated but are not. Chainlink is trying to compete in competitive and well-researched fields such as privacy (for example, zero-knowledge proofs), randomness (including Proof of Work or Verifiable Delay Function), cross-chain bridging (combined TVL of \$10bn, third-largest DeFi sector) and readily-available frameworks (software development kits offered by major base layer protocols). Further, albeit with little but recognisable competition from Maker, one of the main threats to Chainlink is token volatility (currently annualised at 138%) which could affect the economics of staking and security of the network as people and institutions withdraw and sell.

COMPARISON

	Chainlink	Maker	Pyth	WINKlink
Purpose	Oracle	Protocol	Oracle	Oracle
Total Value Secured	\$11.9bn	\$7.77bn	\$400m	\$4.3bn
Number of protocols secured	15	2	27	2
Number of Authors Counts	9.4	6.4	6.2	0
Number of Pull Requests	7.6	4.5	4.9	0

*"Source: DeFi Llama, GitHub, CoinShares, as of 25 October 2022
NB: Figures are 30 Day Moving Average"*

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