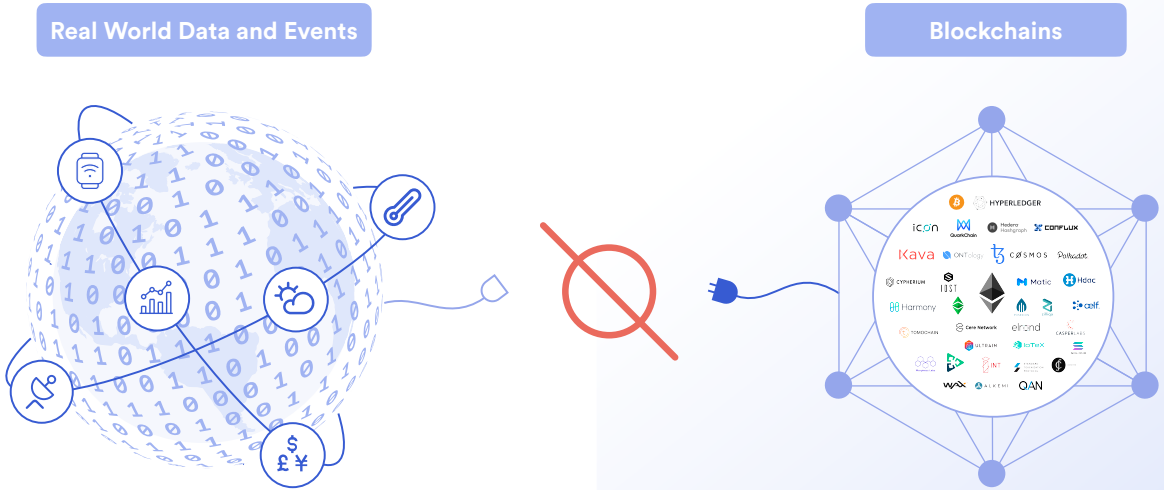
Chainlink

Externally Connected Smart Contracts

Consensus 2020

The “Oracle Problem” for Smart Contracts

Smart Contracts are unable to connect with external systems, data feeds, APIs, existing payment systems or any other off-chain resources on their own.



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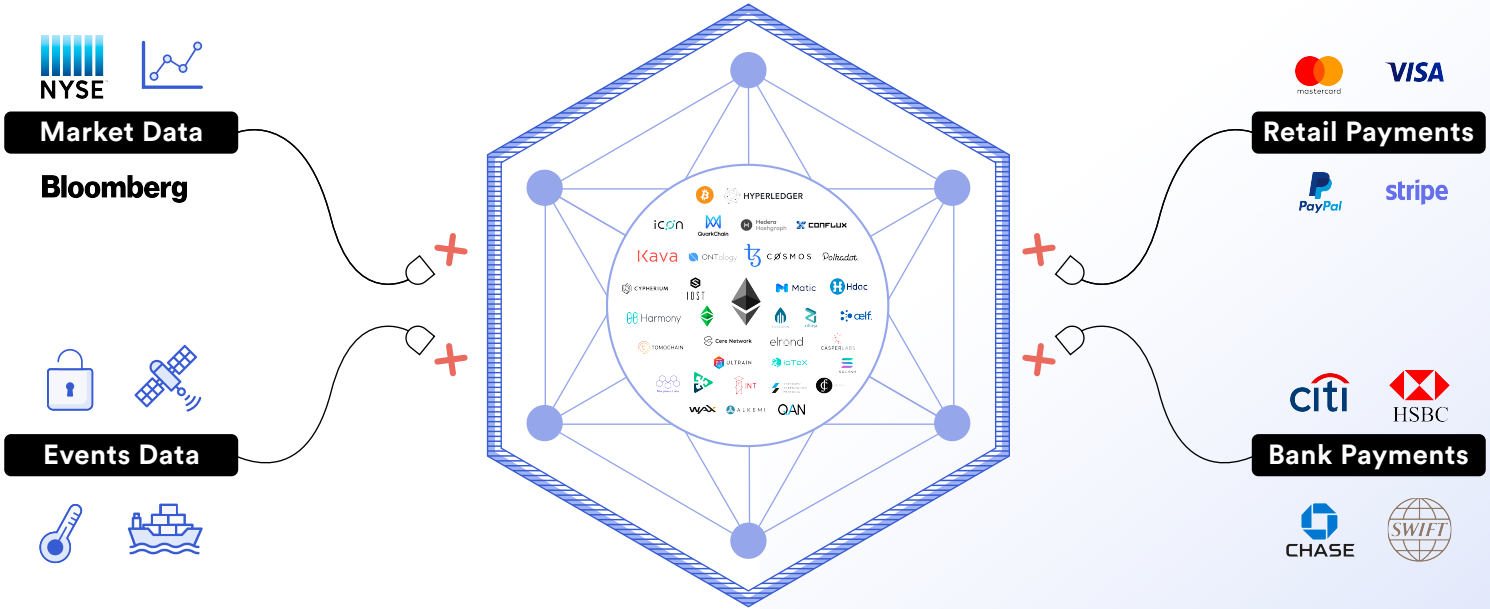
The “Oracle Problem” for Smart Contracts



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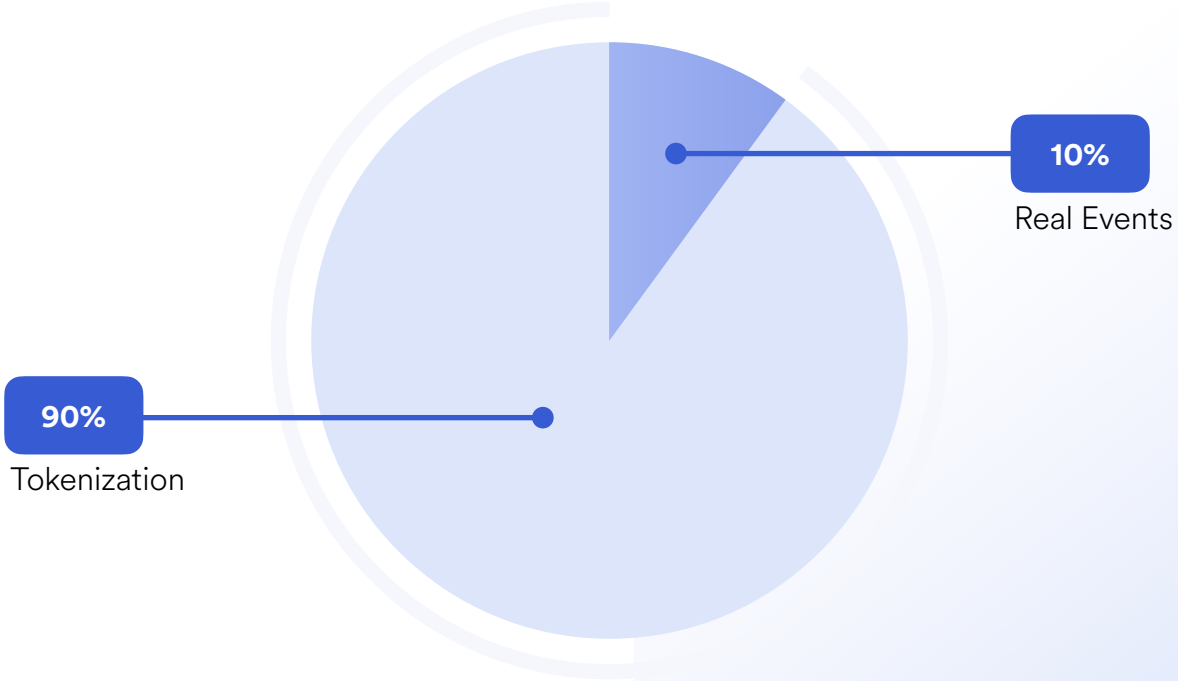
Smart Contracts are Currently Used for Tokenization



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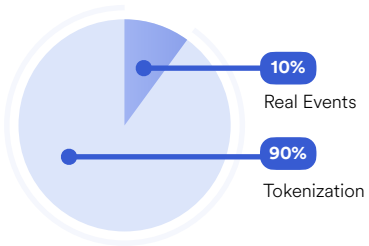
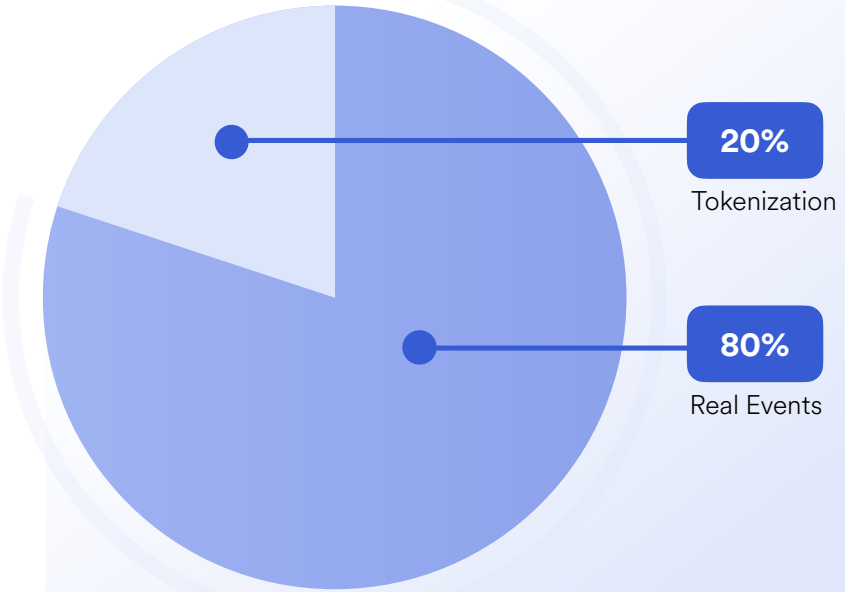
Redefining Smart Contracts With External Events

Current Distribution of Smart Contract Transaction Volume and Value Secured



Externally Connected Contracts

Future Distribution and 1000%+ Growth of Transaction Volume and Value Secured



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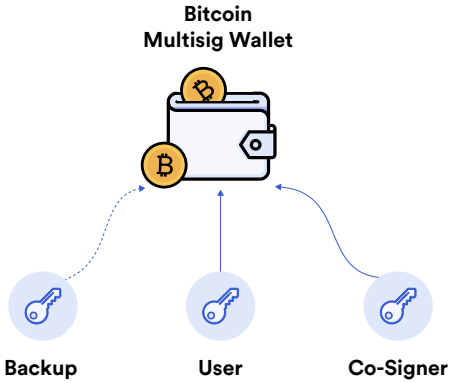
The Initial Leap Forward for Smart Contracts



Bitcoin Multi-signature as
“Programmable Money”

Protocol Smart Contracts =
Smart Contracts 1.0

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The Scriptable Leap Forward for Smart Contracts

Protocol Smart Contracts =
Smart Contracts 1.0

```
pragma solidity ^0.4.16;

contract MyToken {
    // This creates an array with all balances
    mapping (address => uint256) public balanceOf;

    // Initializes contract with initial supply tokens to t
    function MyToken (
        uint256 initialSupply
    ) payable {
        balanceOf[msg.sender] = initialSupply;
    }

    // Send coins
    function transfer(address _to, uint256 _value) payable
        require(balanceOf[msg.sender] >= _value);
        require(balanceOf[_to] + _value >= balanceOf[_to]);
        balanceOf[msg.sender] -= _value;
        balanceOf[_to] += _value;
    }
```

Scriptable Smart Contracts =
Tokenization/Smart Contracts 2.0

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The Connectivity Leap Forward for Smart Contracts

```solidity
pragma solidity ^0.4.16;

contract MyToken {
    // This creates an array with all balances
    mapping (address => uint256) public balanceOf;

    // Initializes contract with initial supply tokens to t
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        uint256 initialSupply
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        balanceOf[msg.sender] = initialSupply;
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    function transfer(address _to, uint256 _value) payable
        require(balanceOf[msg.sender] >= _value);
        require(balanceOf[_to] + _value >= balanceOf[_to]);
        balanceOf[msg.sender] -= _value;
        balanceOf[_to] += _value;
    }
```

Scriptable Smart Contracts =
Tokenization/Smart Contracts 2.0

Externally Connected Smart Contracts =
All Other Dapps/Smart Contracts 3.0

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DeFi is the Beginning of Redefining Smart Contracts

Total Value Locked (USD) in DeFi

DEFI PULSE

SYNTHETIX

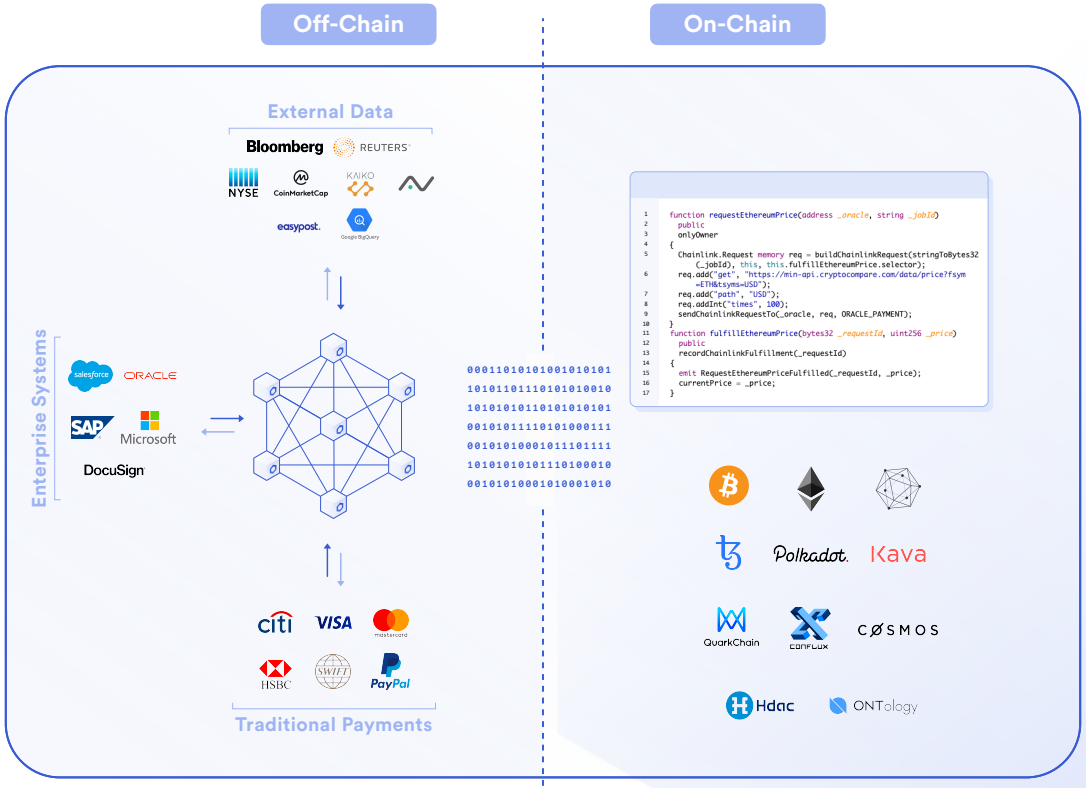
AAVE

bZx

Nexus Mutual

Chainlink

DeFi Smart Contracts Have Two Important Parts



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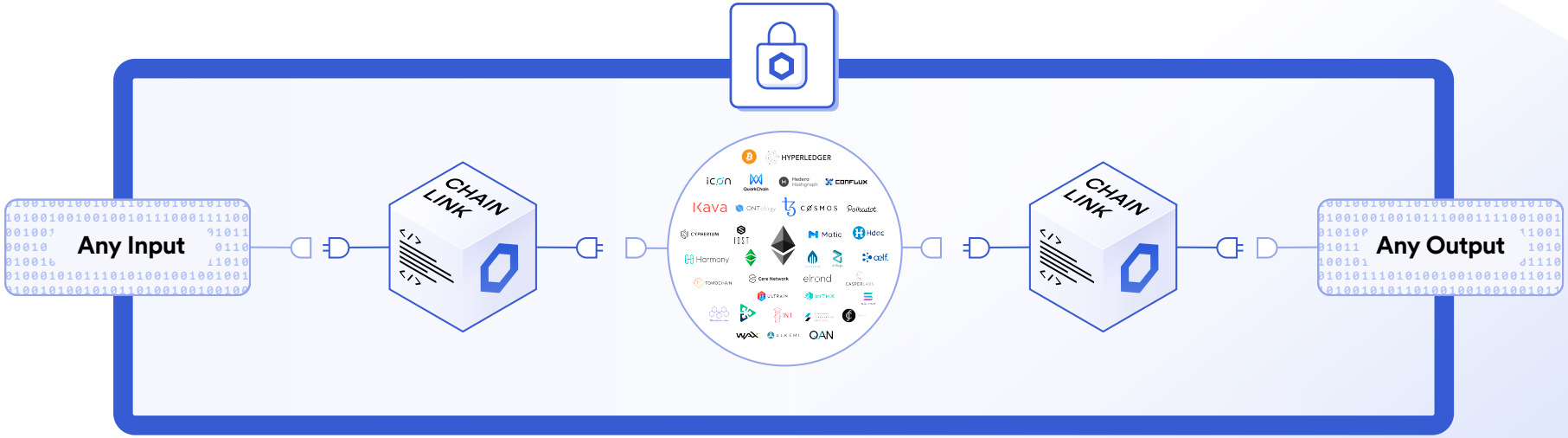
End-to-end Reliability Is The Promise of Smart Contracts



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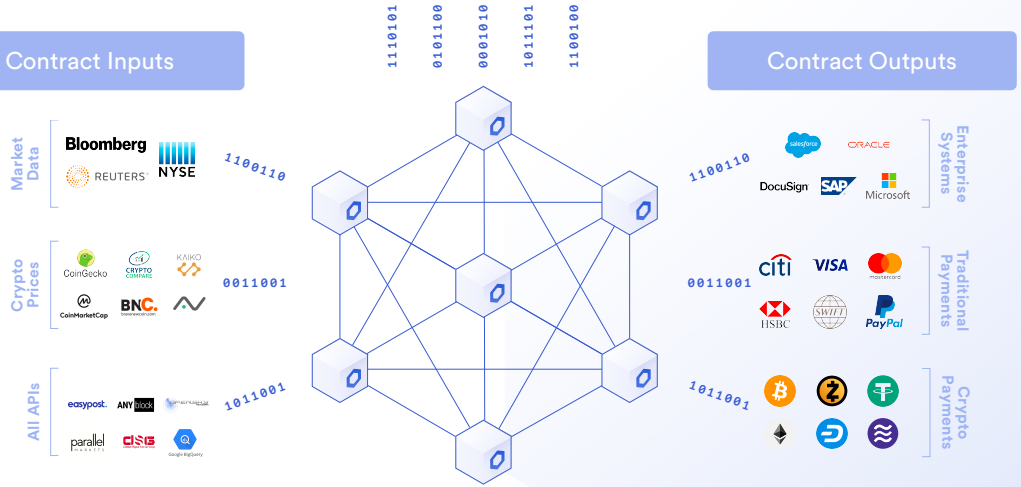
Connecting Smart Contracts to All Inputs and Outputs

Smart Contracts & Blockchains

Contract Inputs

Contract Outputs



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Our Approach to Reliable & Secure Oracles for Web3

Decentralization of many
Independent/Sybil Resistant
Nodes into Oracle Networks

Chainlink

Our Approach to Reliable & Secure Oracles for Web3

Decentralization of many Independent/Sybil Resistant Nodes into Oracle Networks

Provably Secure Nodes that provide cryptographic proof of their overall security

Chainlink

Our Approach to Reliable & Secure Oracles for Web3

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High Quality Data from multiple reliable sources and well validated by multiple nodes

Chainlink

Our Approach to Reliable & Secure Oracles for Web3

Decentralization of many Independent/Sybil Resistant Nodes into Oracle Networks

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Cryptoeconomic Security using binding service agreements to generate staking penalties

Chainlink

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Chainlink

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A Large Open Source Community of Node Operators, Developers, Researchers and Security Auditors

Connecting any blockchain environment to all inputs and outputs
Connected to the leading public and private blockchains. Accelerating what developers can build and the amount of places data can be sold on-chain.

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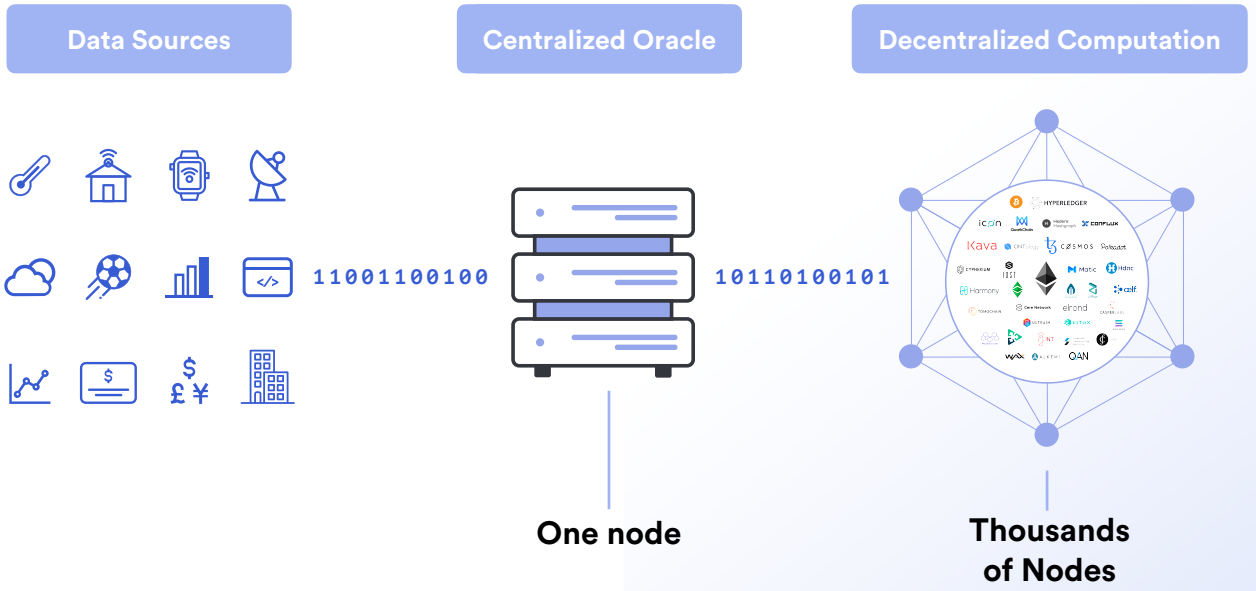
Centralized Oracles are a Point of Failure



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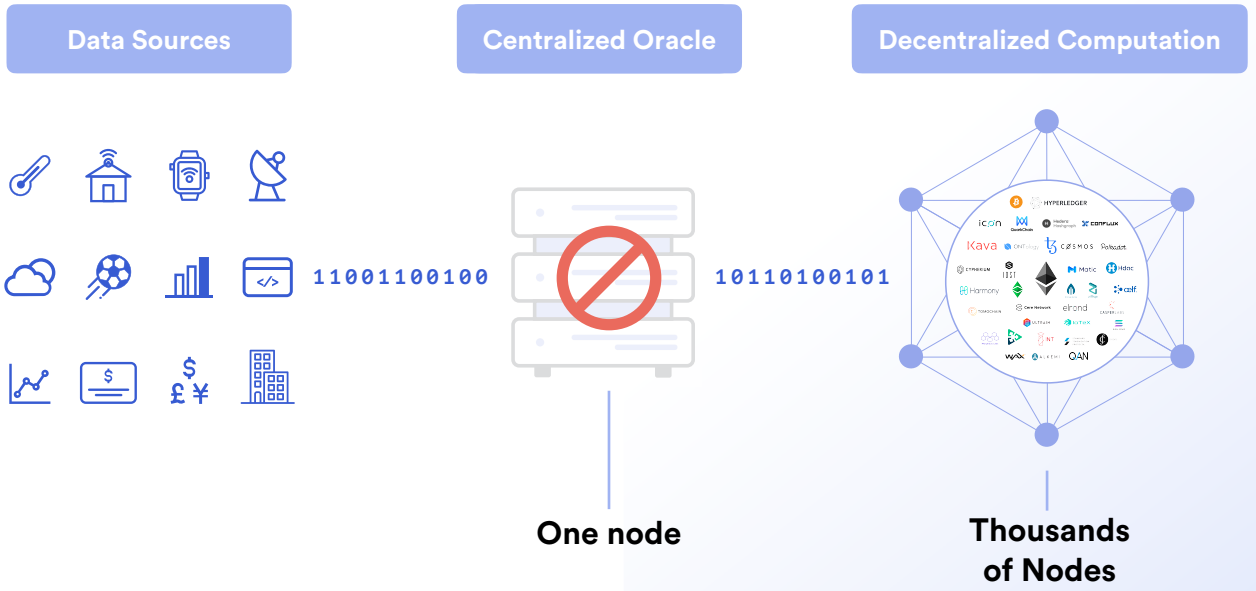
Centralized Oracles are a Point of Failure



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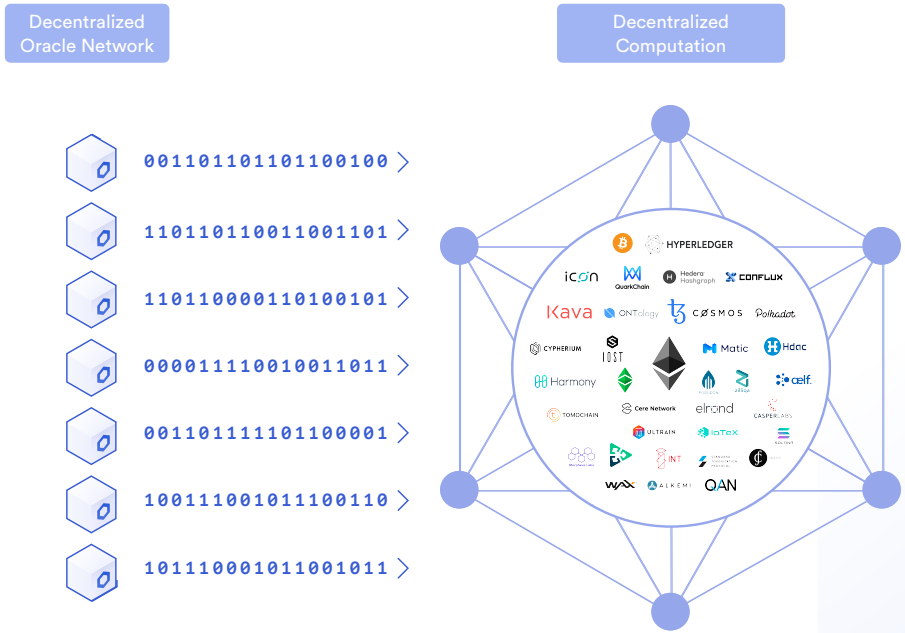
A Decentralized Oracle Network



Decentralization

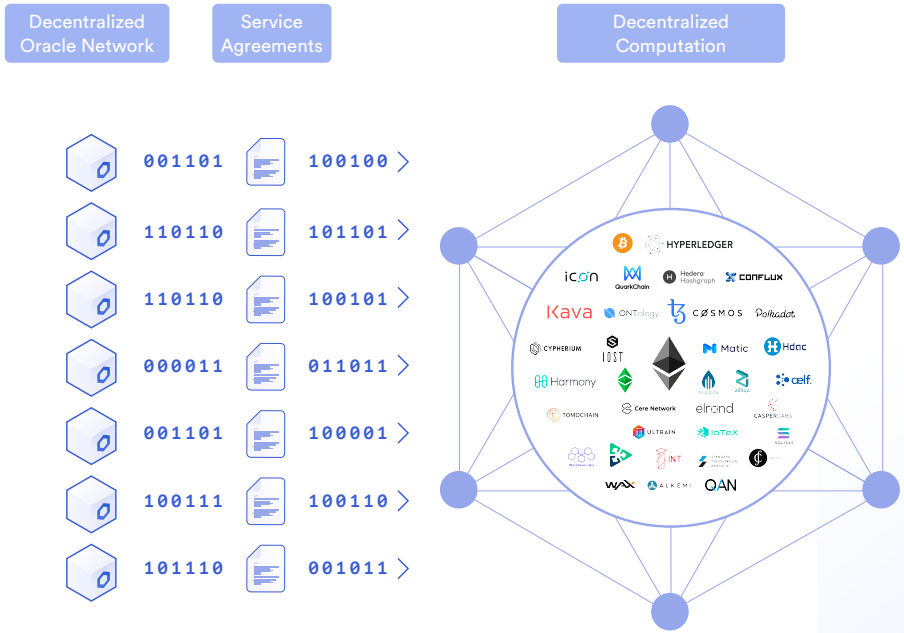
Full replicas being run by independent and sybil resistant node operators, coming to consensus about a computation.

Focused on data validation and consensus about individual off-chain values to make them reliable enough to trigger contracts.

Node Operators are security reviewed, can provide a proven performance history and are high quality and highly sybil resistant.

Chainlink

Binding Commitments by Oracles to Contracts



Binding Service Agreements

Technically enforced commitments to meeting high security and data quality standards are made on-chain by the oracle, committing them to high levels of quality.

Both the commitment and the final performance of the commitment are both on-chain and fully verifiable.

Creating a cryptographically provable performance history that can be relied on. Oracles that don't fulfill their commitments won't be selected for future quoroms, losing large future revenue.

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On-chain Service Agreements Provide Guarantees

Data Providers

Chainlink Node

- High Quality Data
- Highly Responsive
- Quality Guarantees

1010110111

1010110111

On- chain Service Agreement

1001010010100101001010

- Defined Data Delivery Parameters
- Defined Data Quality Parameters
- Quality Connected to Payment

Smart Contract with High Quality Data

Chainlink

On-chain Service Agreements Provide Guarantees

Data Providers

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- High Quality Data
- Highly Responsive
- Quality Guarantees

1010110111

Chainlink Node

1010110111

On- chain Service Agreement

10010100101001010010

- Defined Data Delivery Parameters
- Defined Data Quality Parameters
- Data Quality Connected to Payment

Smart Contract with High Quality Data

Unpaid/Free OpenAPI

- Low Quality Data
- Unreliable Responses
- No Quality Guarantees

1010111010101111011

A Node Without Credential Management

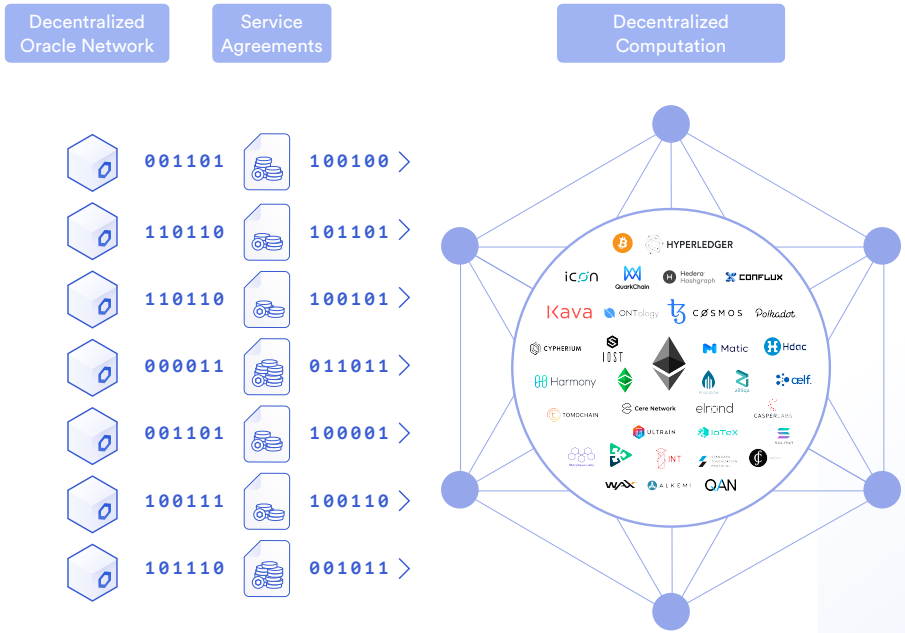
- Undefined Data Delivery Terms
- Undefined Data Quality Terms
- No Data Quality Guarantees

101011001 0 1 0 0

Smart Contract With No Data Delivered

Chainlink

Crypto-economic Security from Staking



Cryptoeconomic Security from Staking

Using the commitments from binding service agreements, we can define clear parameters for the penalties for misbehaving nodes, bad data providers and any other point in the data origination and/or data transfer process.

Staking ensures that there is a penalty for node misbehavior, data inaccuracy and any other key condition specified in an on-chain binding service agreement. Staking guarantees are not only very specific and expandable, to properly manage new risks as they appear, but the amount of stake can be increased as value secured by an oracle rises.

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Crypto-economic Security from Staking

Data Providers

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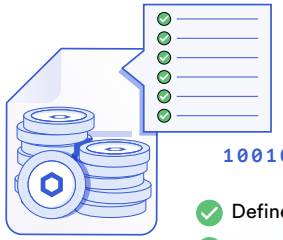
- High Quality Data
- Highly Responsive
- Quality Guarantees

1010110111

Chainlink Node

1010110111

Service Agreement



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- Defined Data Delivery Parameters
- Defined Data Quality Parameters
- Quality Connected to Payment

Smart Contract with High Quality Data

Unpaid/Free OpenAPI

- Low Quality Data
- Unreliable Responses
- No Quality Guarantees

1010111010101111011

A Node Without Credential Management

- Undefined Data Delivery Terms
- Undefined Data Quality Terms
- No Data Quality Guarantees

101011001 0 1 0 0

Smart Contract Broken by Bad Data

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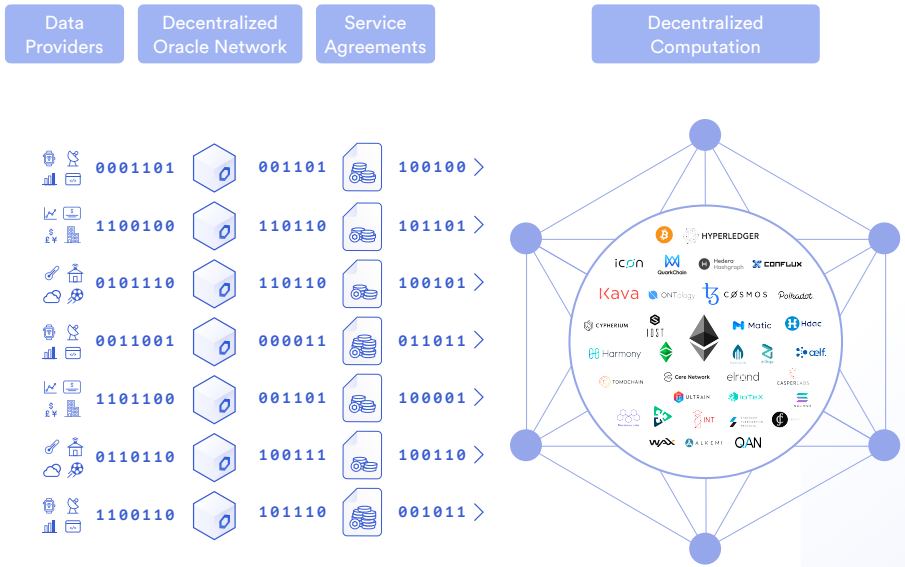
Decentralization at the Data Source Level

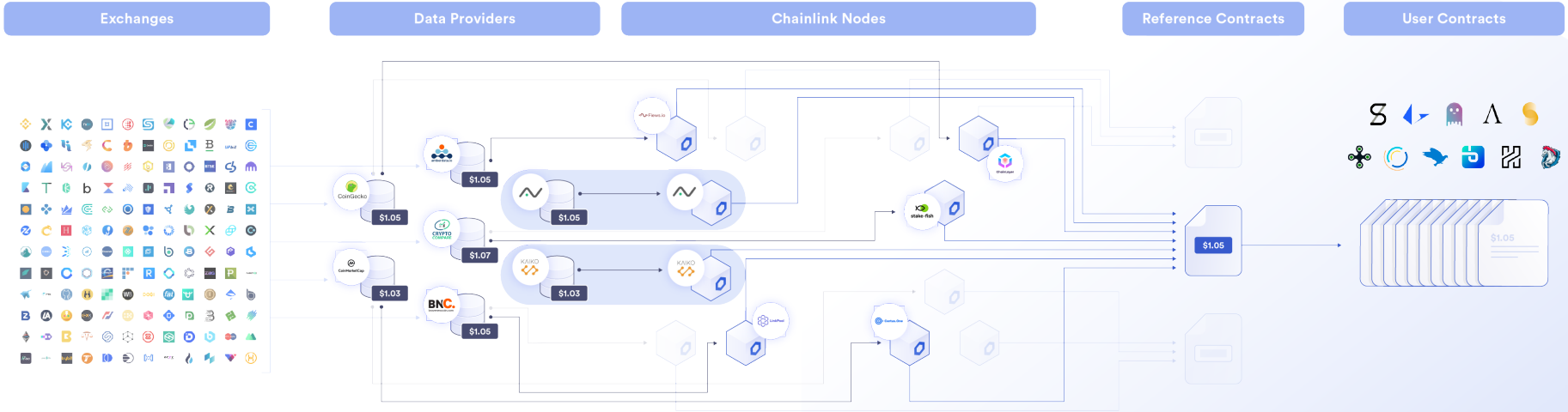


Highly Validated Data

Decentralization at the middleware layer enables the inclusion of multiple secured data sources

Pre-made Chainlinks make it easy to build multiple data sources into your smart contract, with data quality grantees and data delivery guarantees from node operators built in.

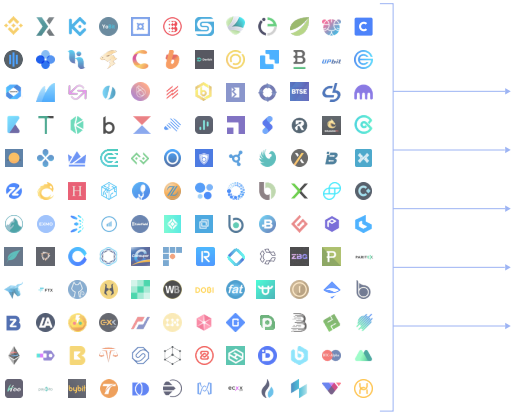
Truly Decentralized Finance via Decentralized Oracles



Chainlink

Truly Decentralized Finance via Decentralized Oracles

Cryptocurrency Exchanges



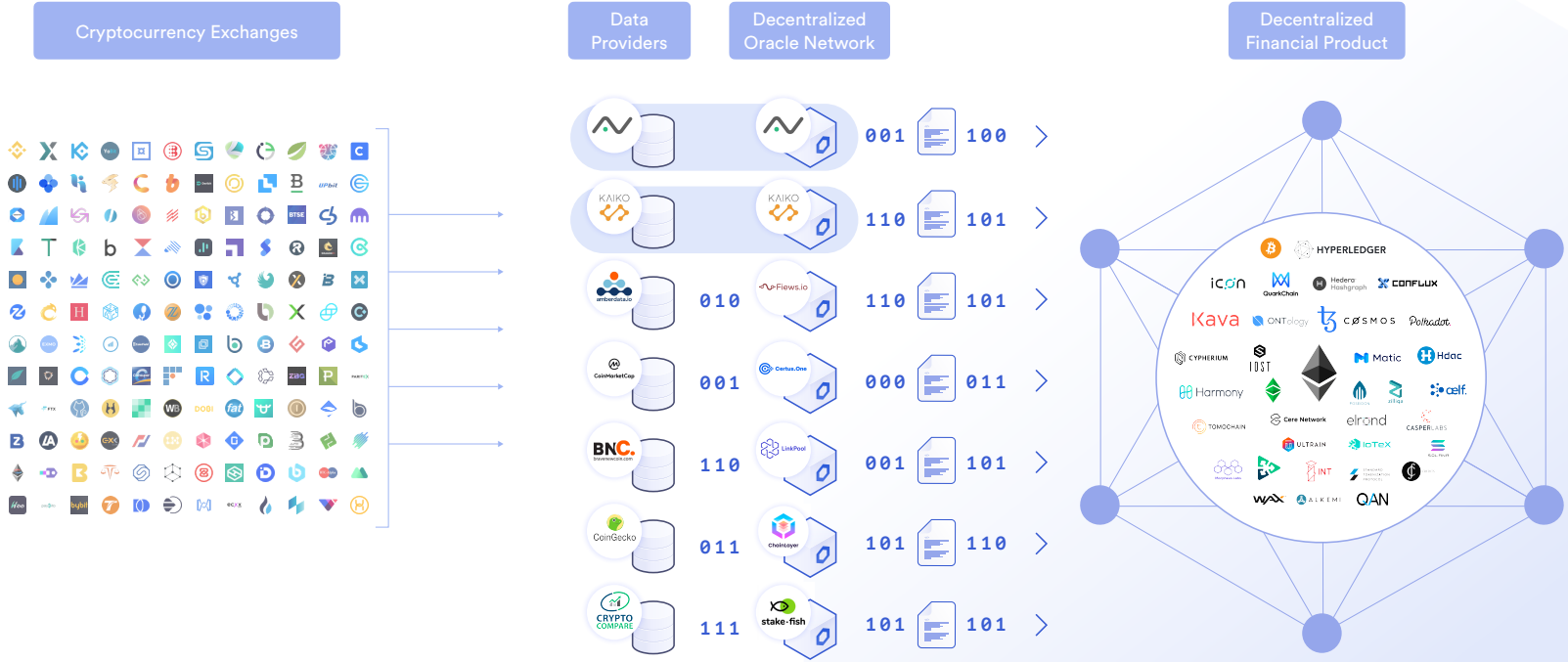
Data Providers

Decentralized Oracle Network

Decentralized Financial Product

Chainlink

Truly Decentralized Finance via Decentralized Oracles



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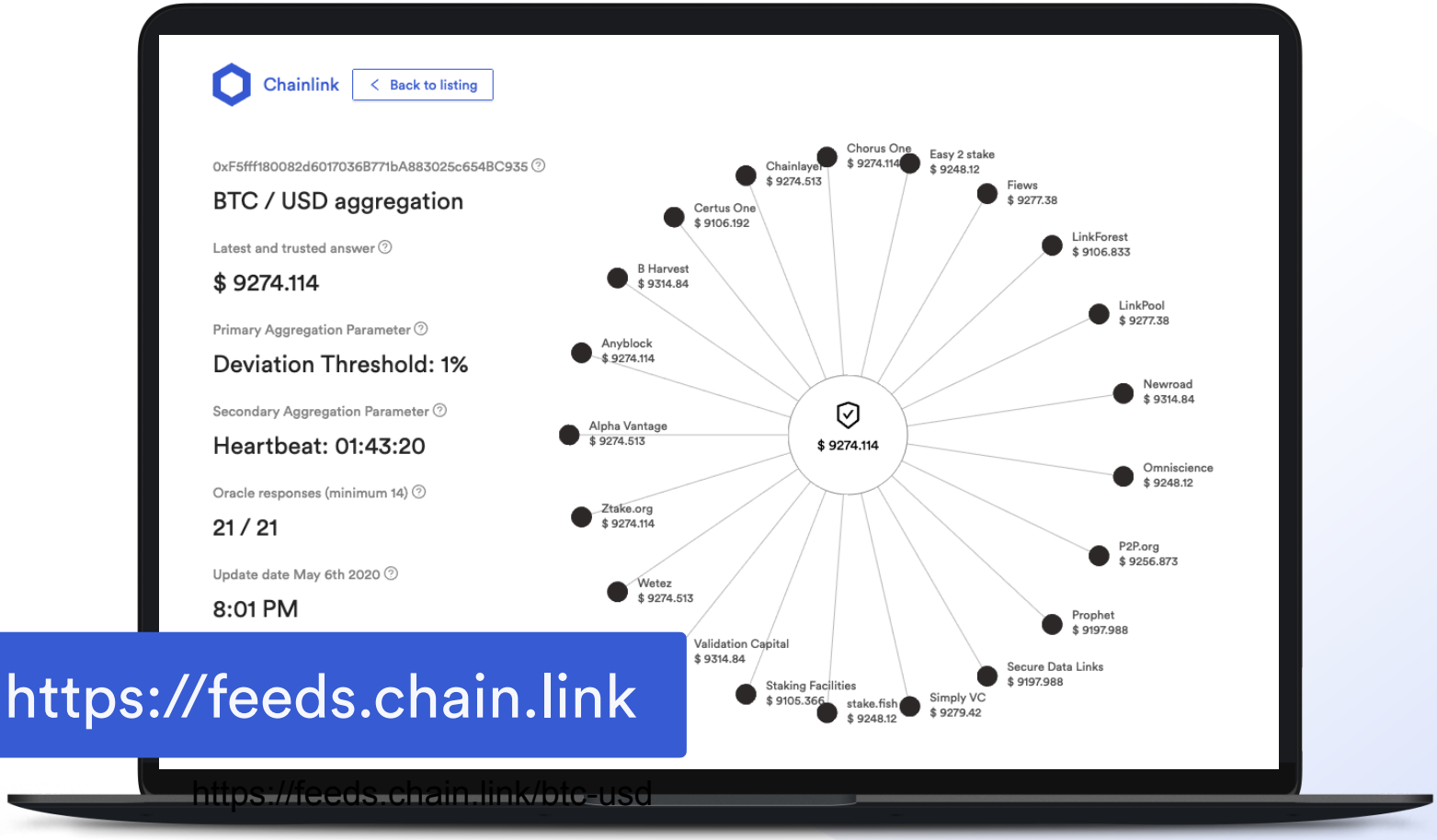


https://feeds.chain.link

https://feeds.chain.link/btc-usd

Chainlink

Introducing Chainlink VRF

0 5 8 2 5 8 9 7
5 6 7 4 1 2 3 0
7 4 7 0 3 4 7 4
4 8 0 4 5 0 4 4
5 6 2 3 5 4 8 7
5 9 8 7 4 6 1 2

On-chain Verifiable Randomness for Smart Contract Developers

Provably Fair

Provably Random

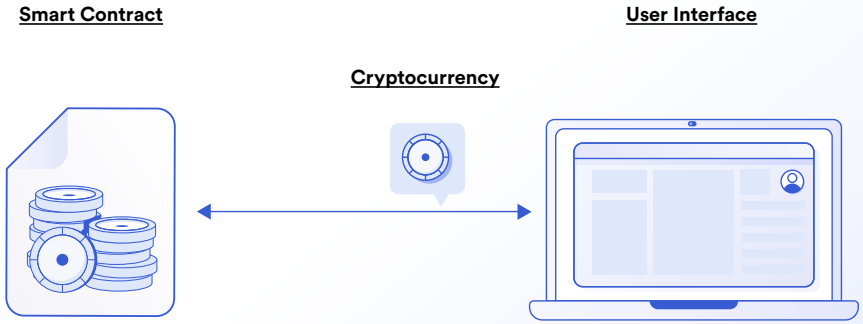
Cost Effective

Reliable and Secure

Easy to Integrate

Chainlink

Blockchain Gaming's Use of Randomness



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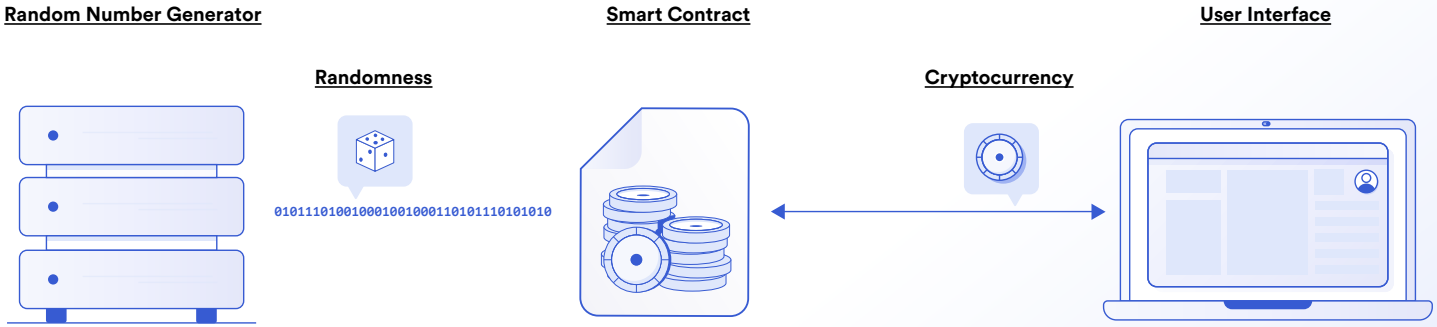
Blockchain Gaming's Use of Randomness



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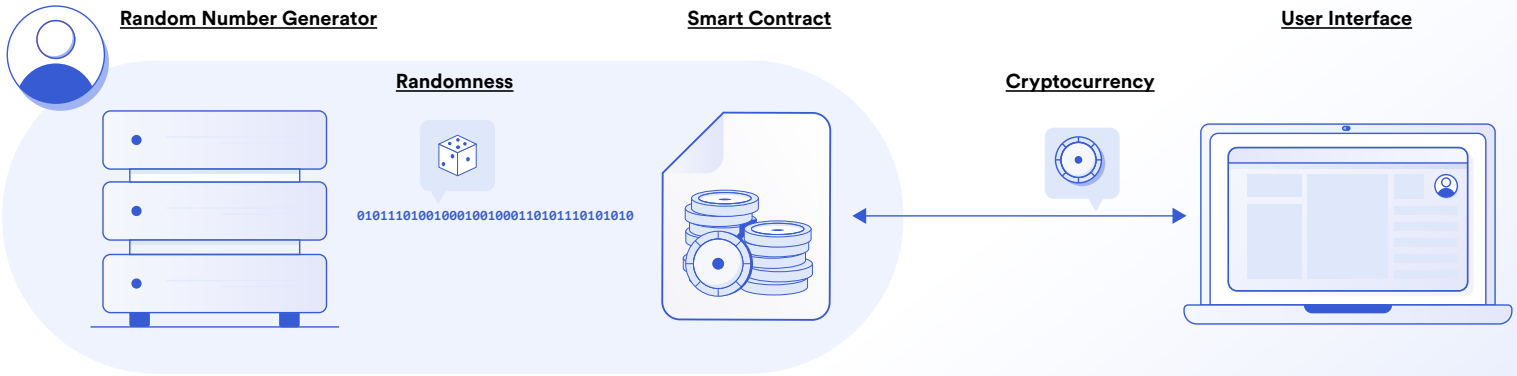

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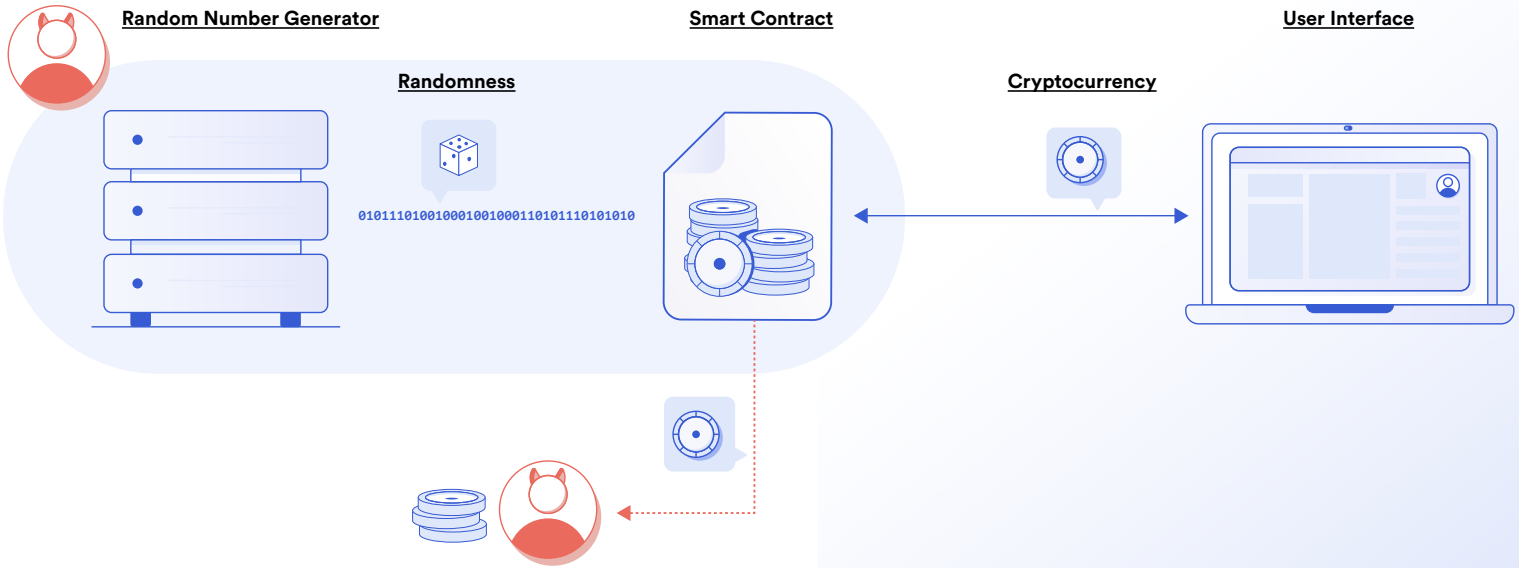
Malicious RNG Operators are a Risk



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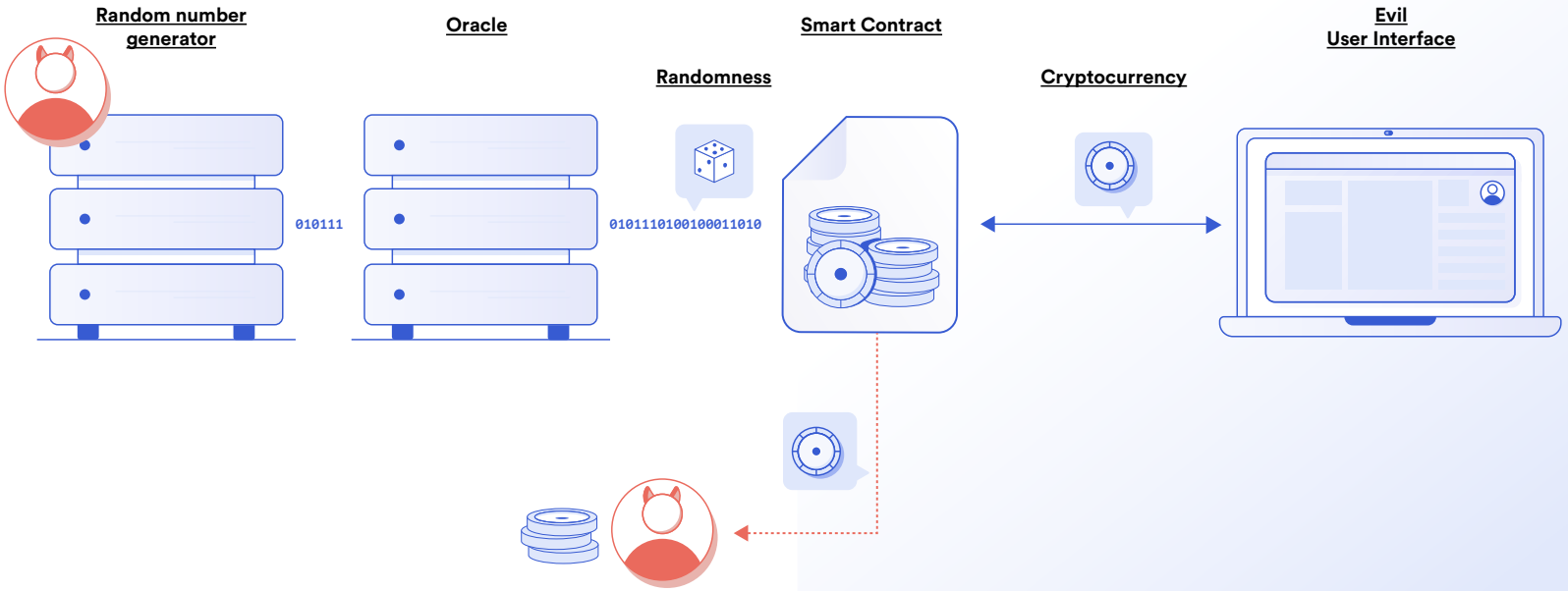
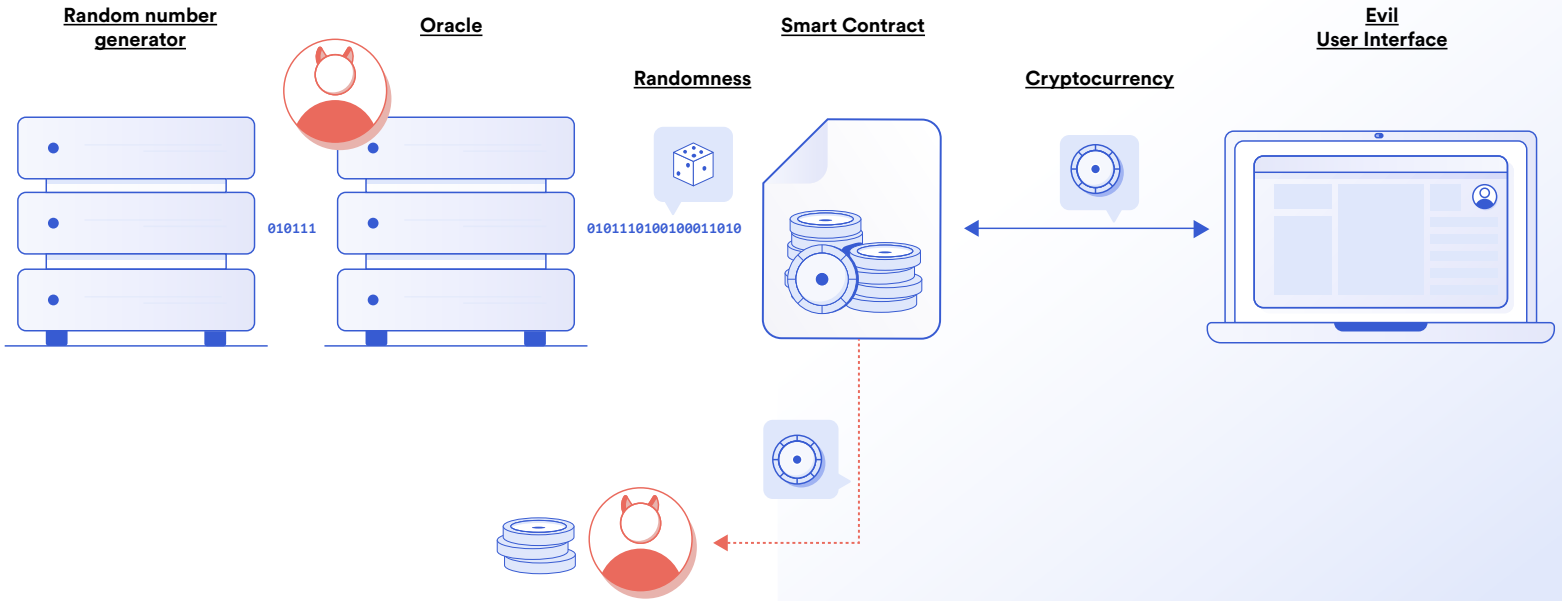


Chainlink

Single Malicious Oracle Operators are a Risk



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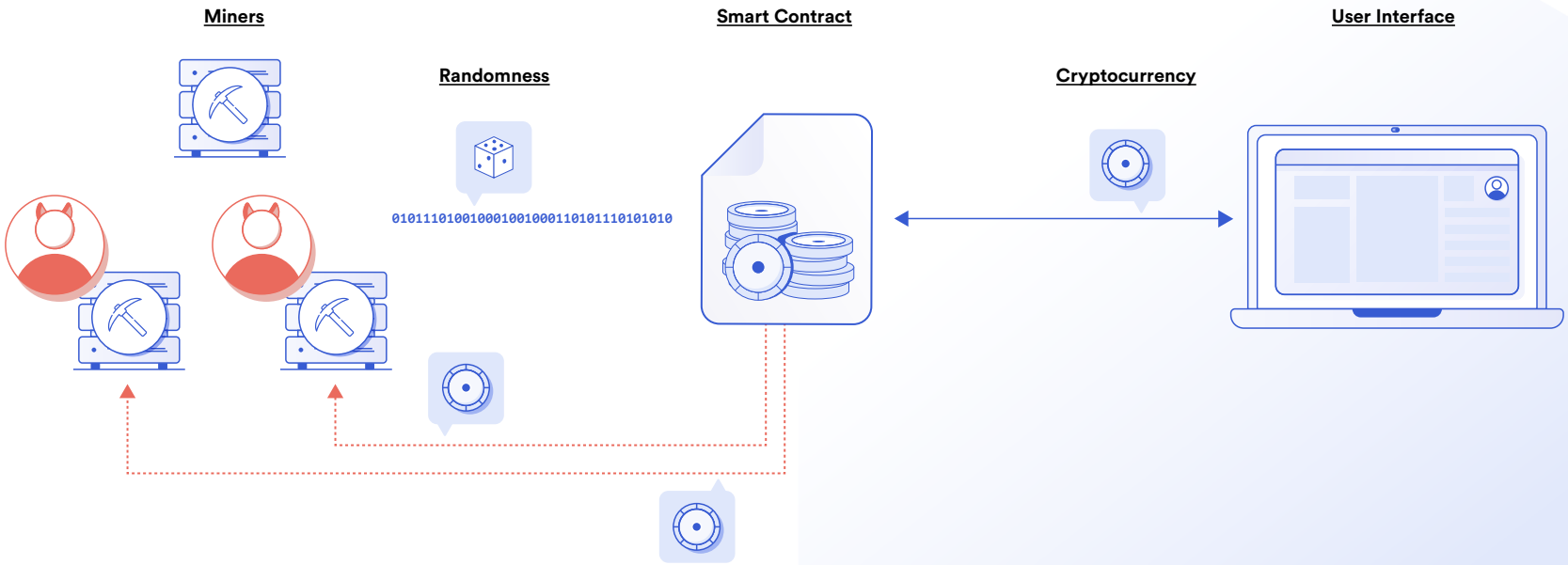
Malicious Miners are a Risk when using Blockhashes



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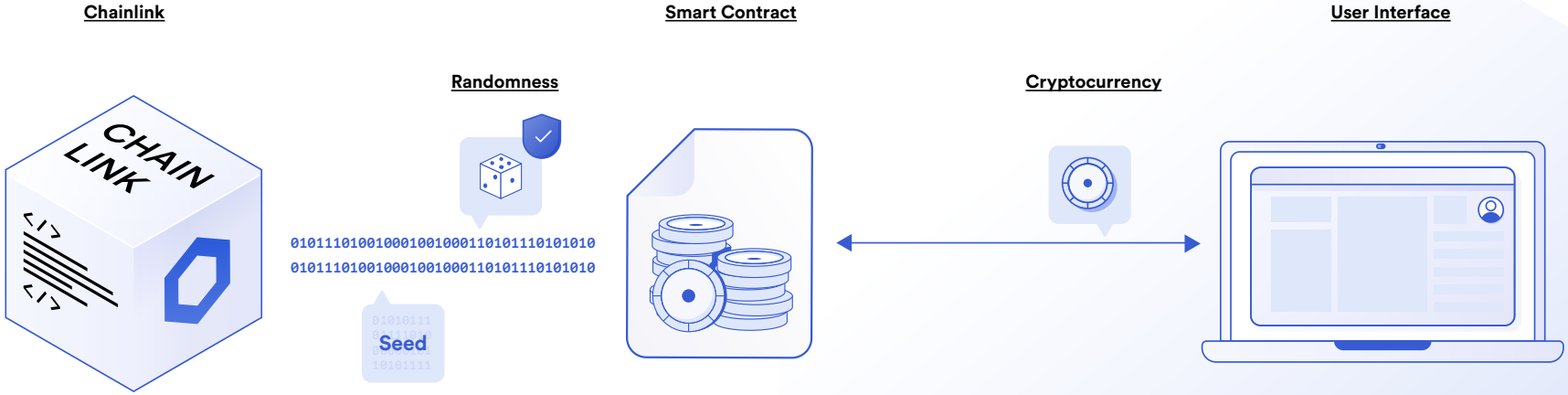
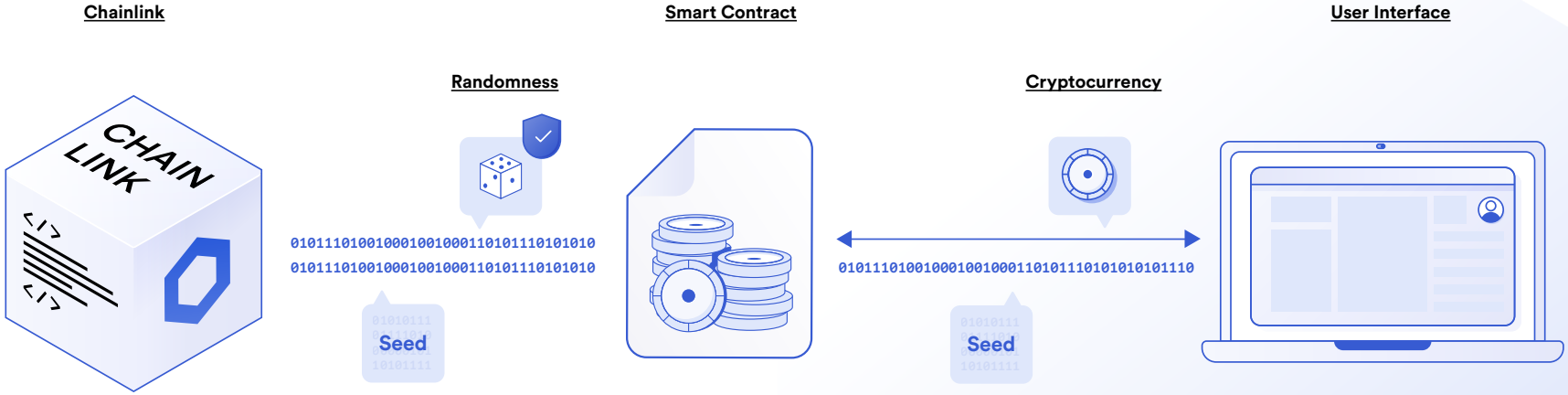
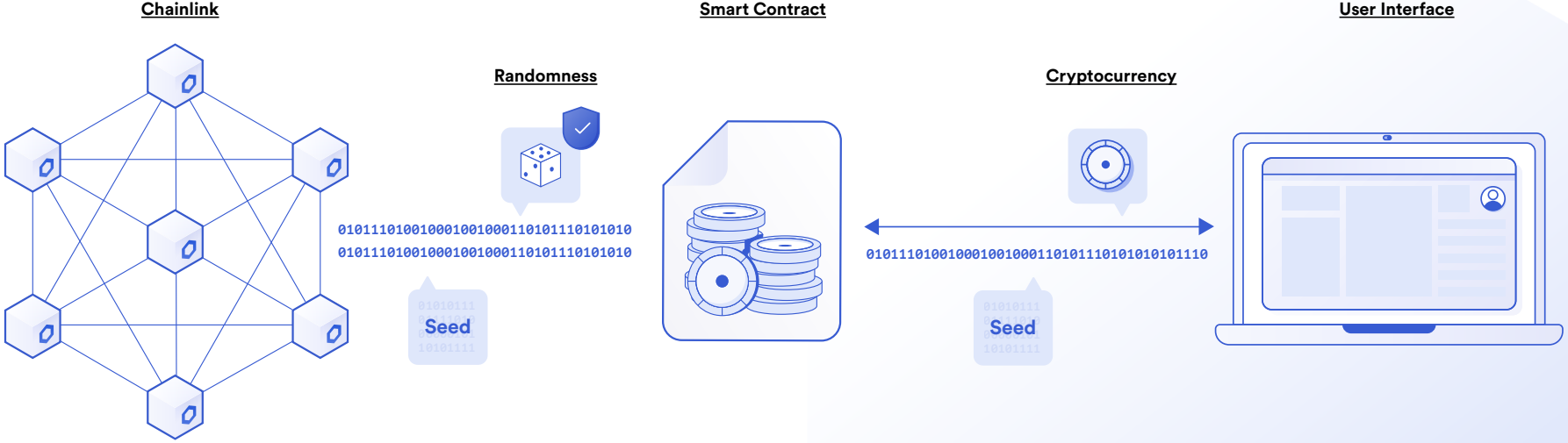
Chainlink VRF Provides Verifiable Randomness



Chainlink VRF Can Use Multiple Seeds



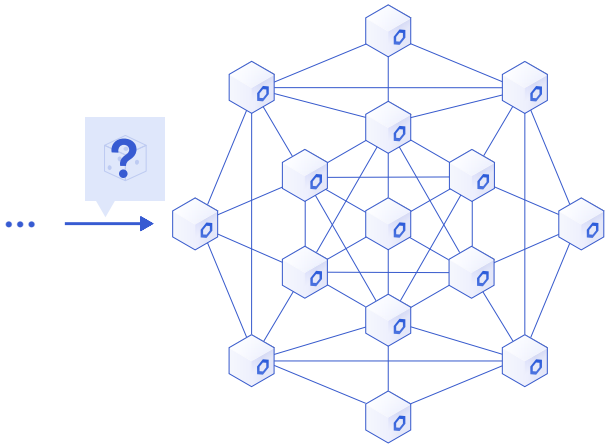
Chainlink VRF Gains Availability with More Nodes



Threshold VRF

Off-Chain

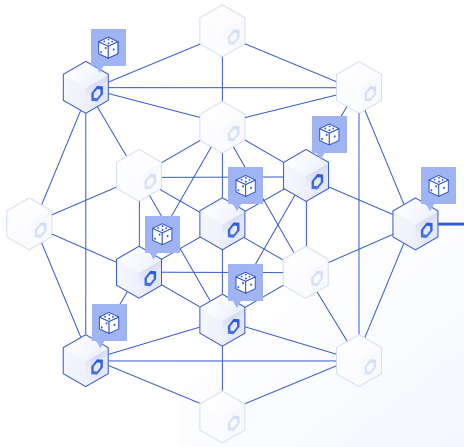
Chainlink Nodes



A new request for data is sent to the Chainlink network.

Off-Chain

Chainlink Nodes



Chainlink nodes respond and aggregate responses with a required number of participants (e.g. 7).

Once the threshold is met, the result is broadcasted in a single transaction.

On-Chain

Smart Contract

The result is verified, updated and made available for smart contract applications.

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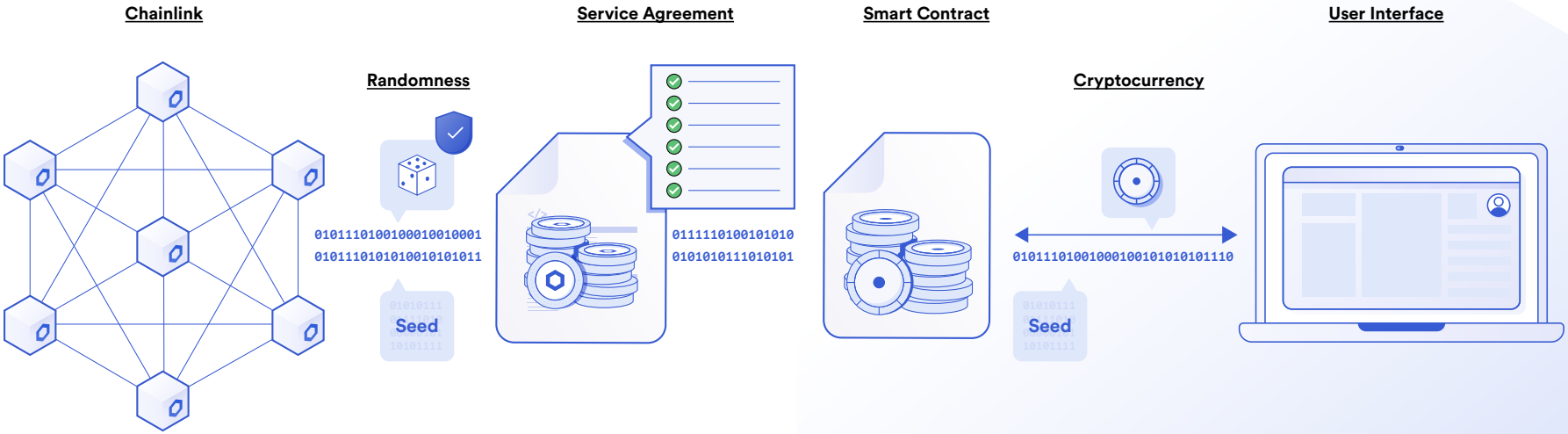
Chainlink VRF Can Utilize Cryptoeconomic Security



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Chainlink VRF: On-chain Verifiable Randomness

```
function requestRandomness(bytes32 _keyHash,
uint256 _fee, uint256 _seed) public returns
(bytes32 requestId);

function fulfillRandomness(bytes32 requestId,
uint256 randomness) external {
    // Do something with randomness
}
```

Available On Testnet Today

https://docs.chain.link/docs/chainlink-vrf

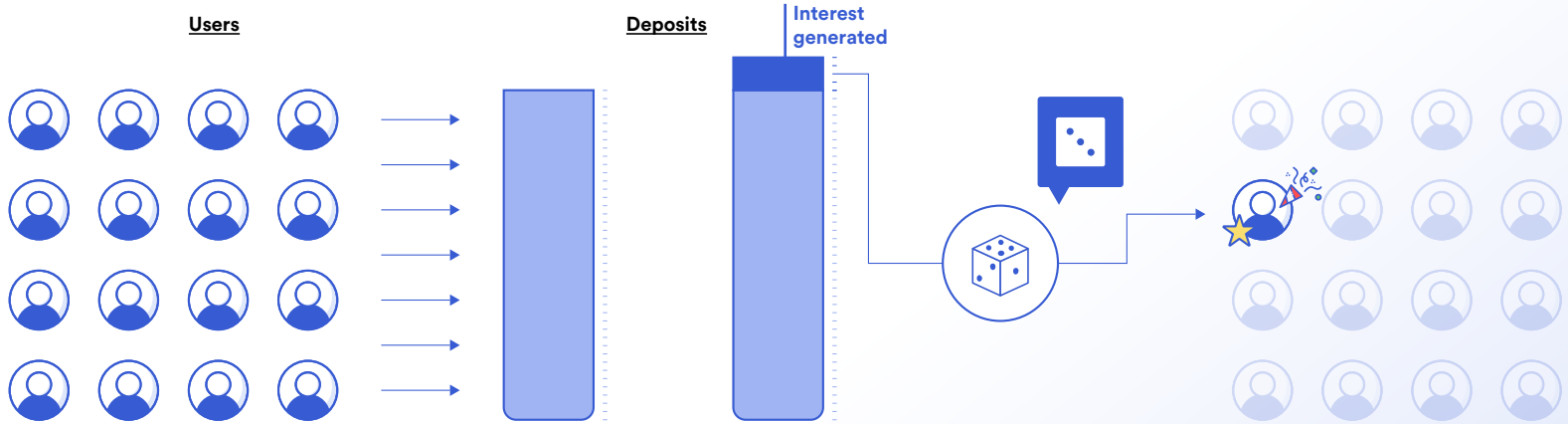
Chainlink


pool
together


Chainlink

Pool Together

The no-loss savings game

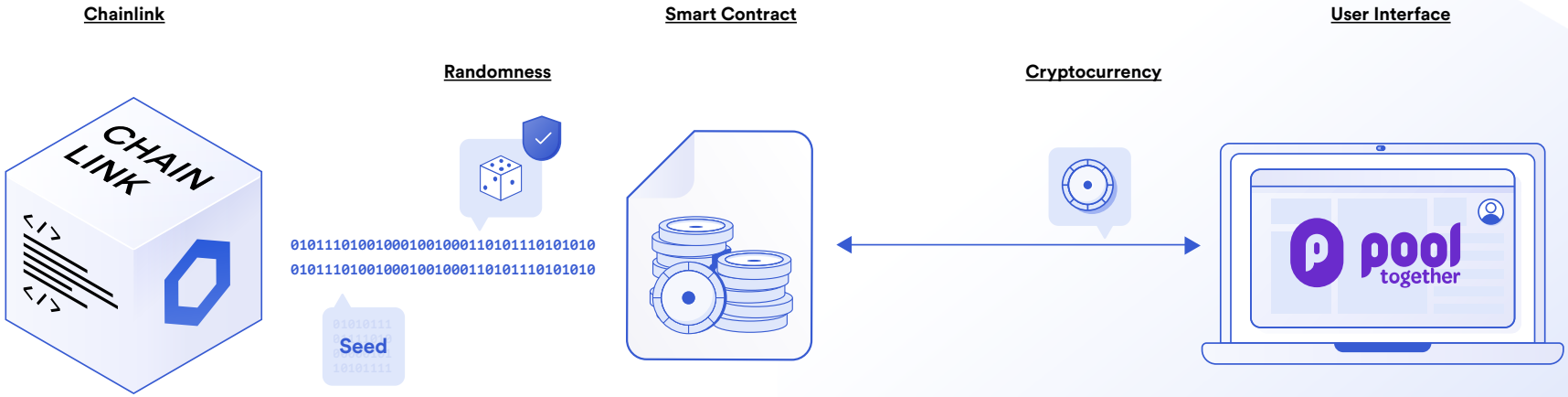


Users deposit into PoolTogether.

PoolTogether uses DeFi lending protocols to generate interest on deposits.

PoolTogether uses randomness to select a winner, who gets all interest accrued that week. Underlying deposits still belong to each user.

Chainlink VRF Providers Verifiable Randomness



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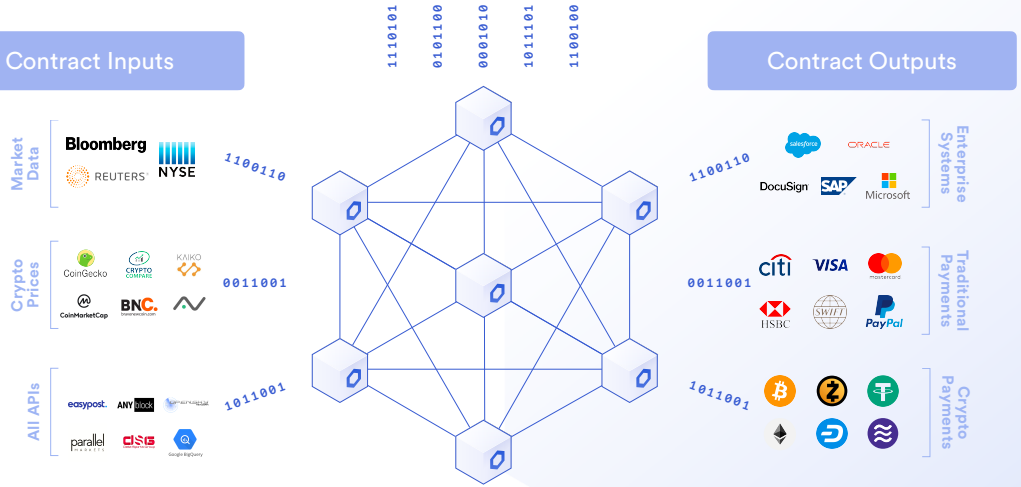
Connecting Smart Contracts to All Inputs and Outputs

Smart Contracts & Blockchains

Contract Inputs

Contract Outputs



Chainlink

Join Our Team

Build great open source software that enables the next generation of DeFi and many other smart contract types.

We're an idea meritocracy where the best ideas win.

We're a remote team working with great people all over the world.

careers.chain.link

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Thank You

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