



Chainlink Oracle

Chainlink CCIP



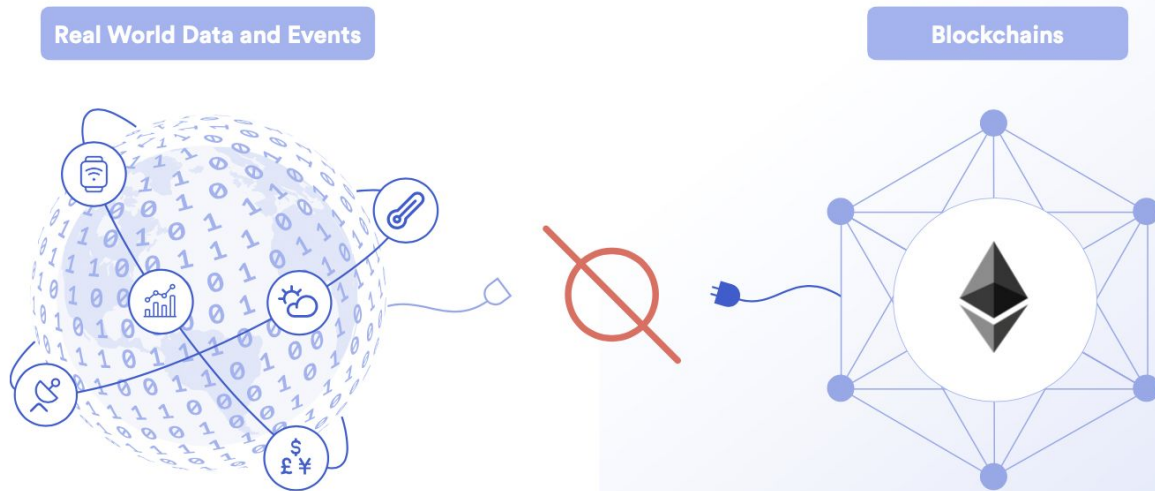
Frank
Developer Advocate
Chainlink Labs

Content

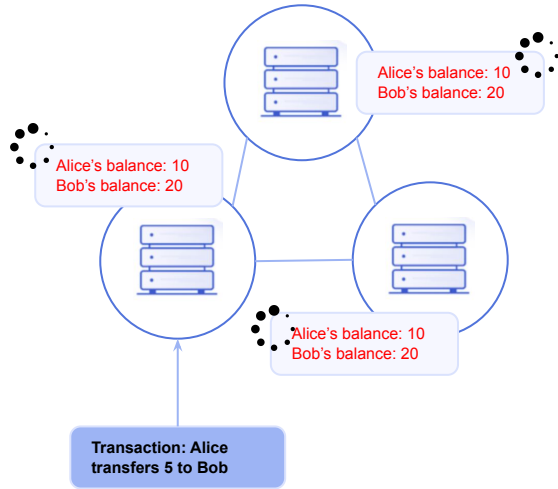
- 1. Oracle problem**
- 2. DON introduction**
 - a. Data feed
 - b. Functions
- 3. Chainlink CCIP**
- 4. Chainlink Community**

Oracle problem

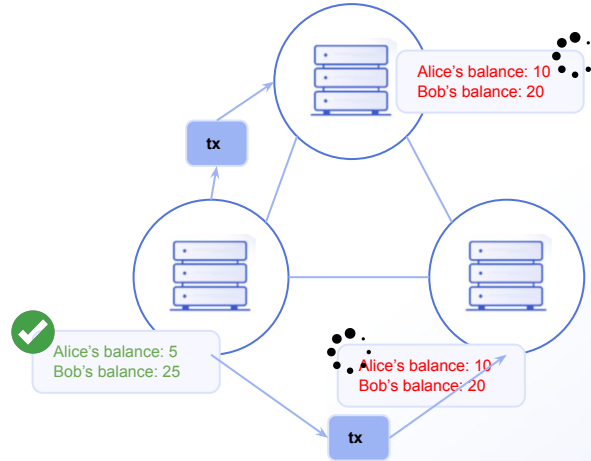
Smart contracts are unable to connect external system, data feed, APIs, existing payment systems or any other off-chain resources on their own.



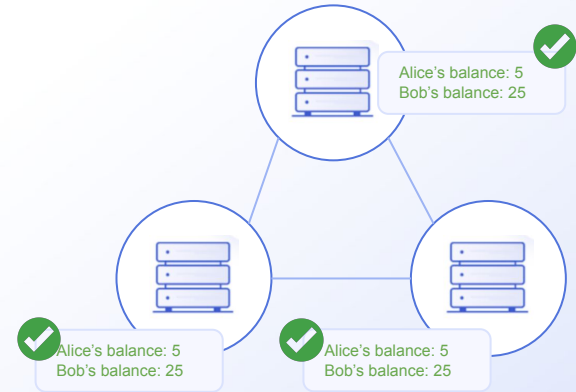
Consensus



Submit Transaction



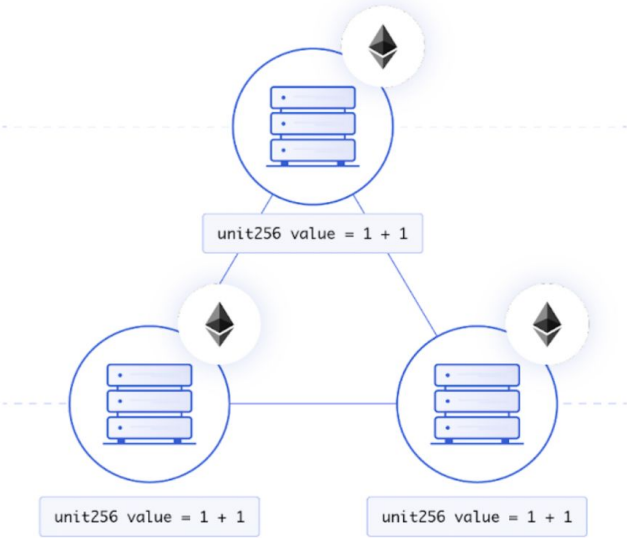
Broadcast Transaction



Reach consensus

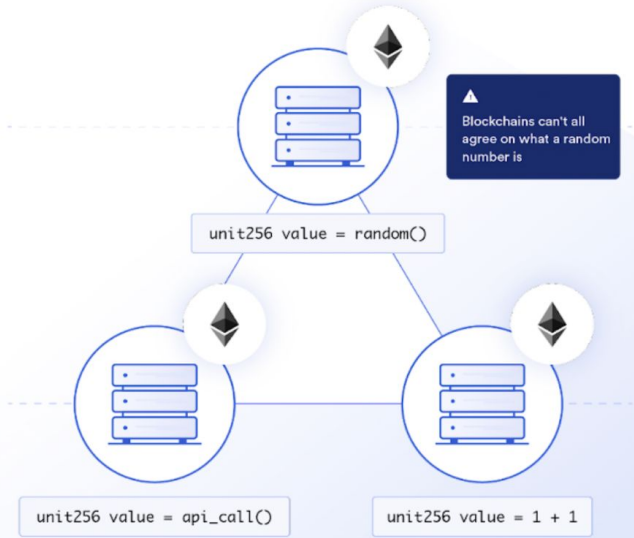
Blockchain is a Deterministic System

Deterministic Transaction




Consensus reached

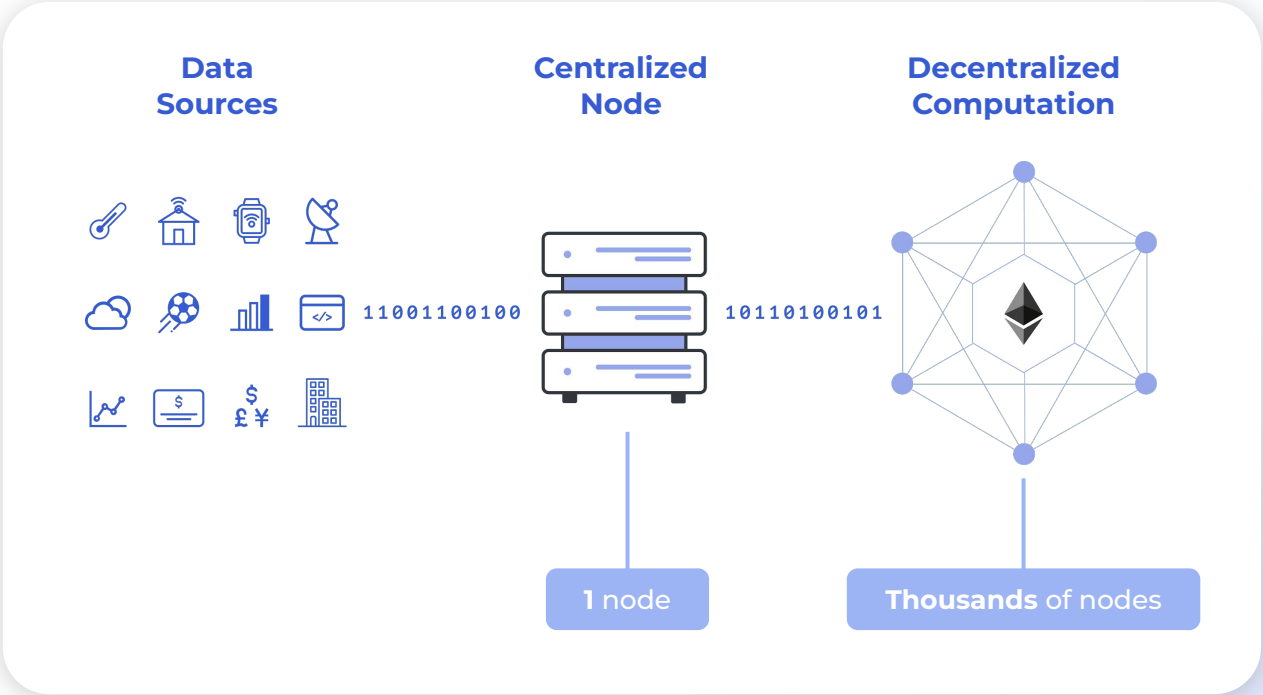
Indeterministic transaction



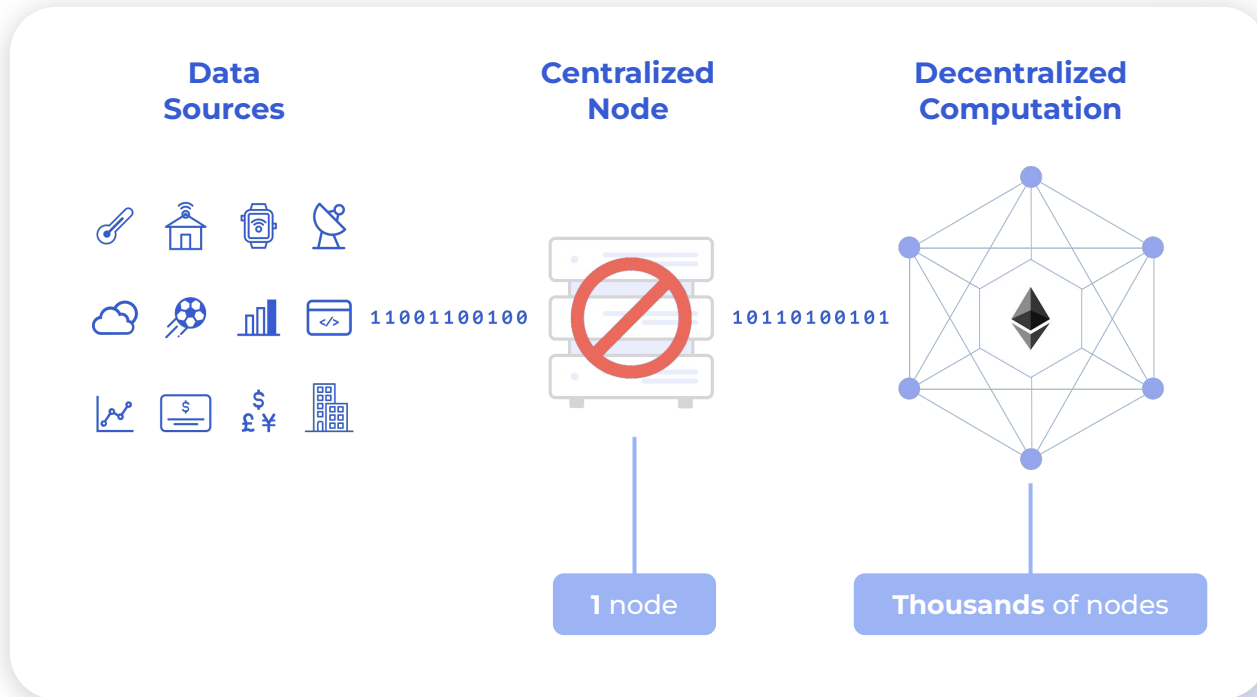

Blockchains can't all agree on API calls


Consensus not reached

Centralized Oracles

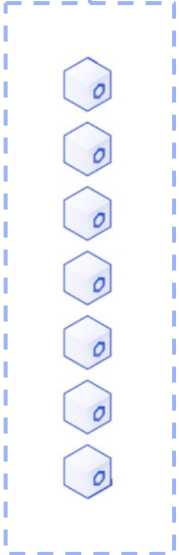


Single-Point Failure



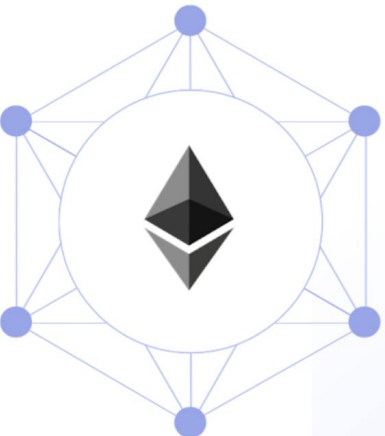
Decentralized Oracle Network (DON)

DON



001101101101100100 >
110110110011001101 >
110110000110100101 >
000011110010011011 >
001101111101100001 >
100111001011100110 >
101110001011001011 >

Decentralized network



Decentralized oracle network(DON)

Full replicas being run by independent and sybil-resistant node operators.

Data delivery layer mimic the trust-minimized that blockchain has.

Developers of a modern Web3 Apps

Composed of multi-chains, contracts, assets and web2 services.



Chainlink Web3 services

Data

Feed | Functions | Data Stream

Compute

VRF | Automation

Cross-chain

CCIP

Decentralized Oracle Network

Blockchain (L1/L2)

Contracts & Assets, etc.

Web 2

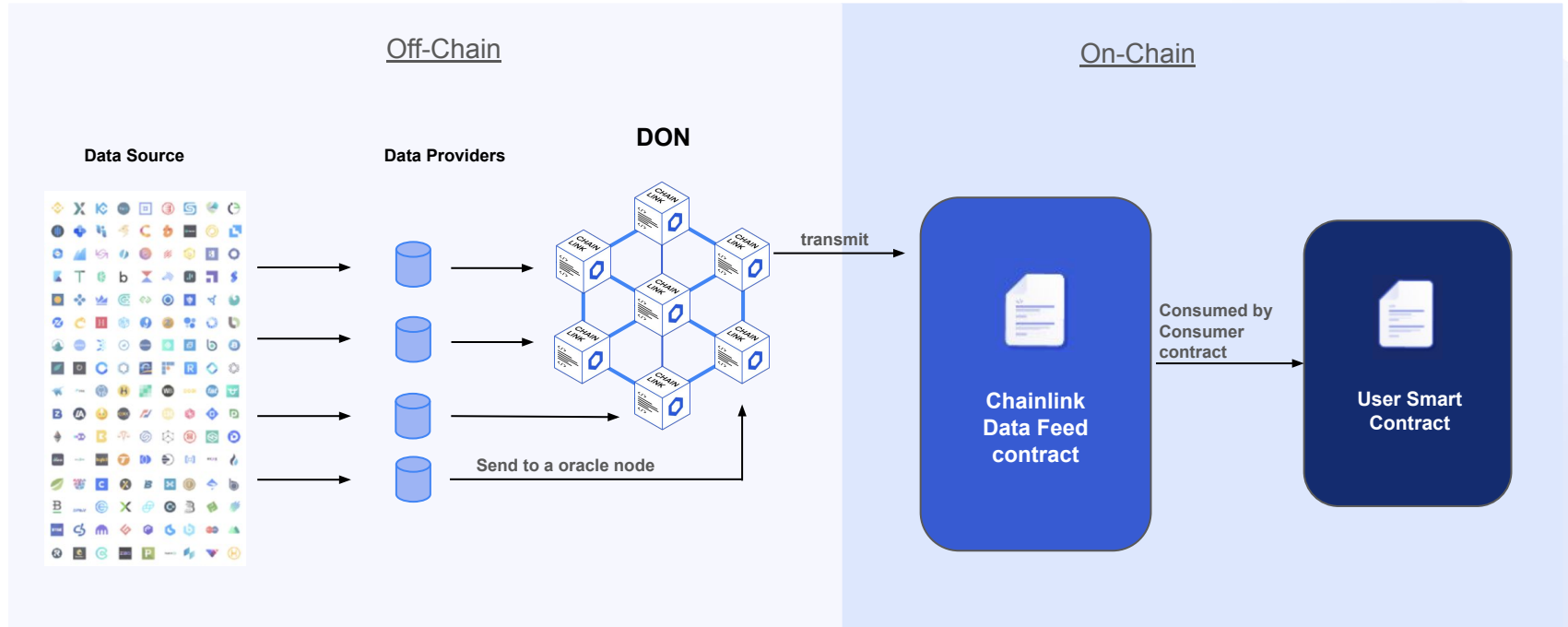
Data, App & Enterprise Legacy System



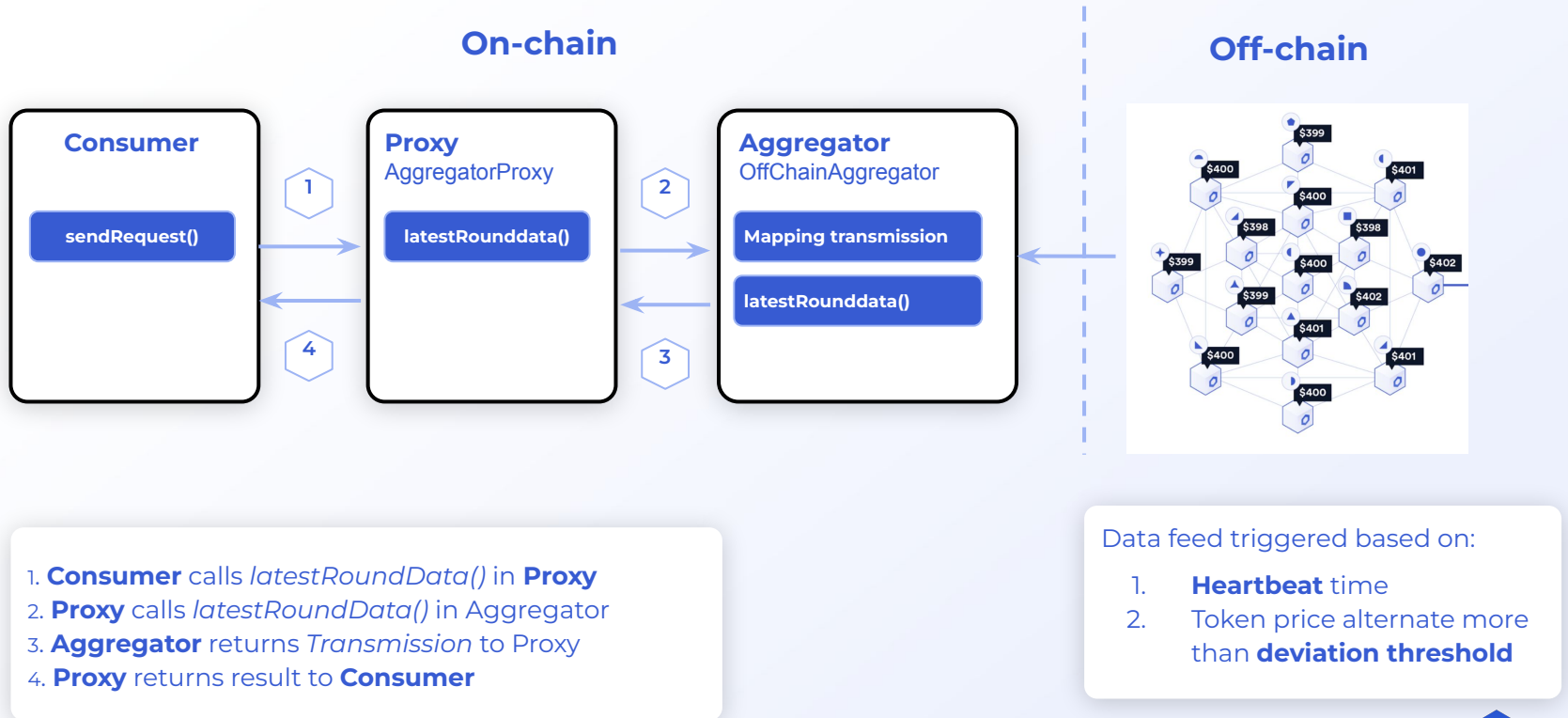
Chainlink oracle data services

Chainlink DON & services

Data Feed Workflow



Data Feed Architecture



Data Feed Use Cases



Lending & borrowing

Issue and settle loans, liquidate undercollateralized positions, trigger collateral swaps, and help protect against insolvency



Stable Coin

Use financial market data to determine the collateralization of stable coins, automate mint/burn operations, and trigger rebasing functions



Mirror Asset

Generate mirrored versions of real-world and on-chain assets using on-chain collateral and Price Feeds as the reference point for minting and redemption.



Asset management

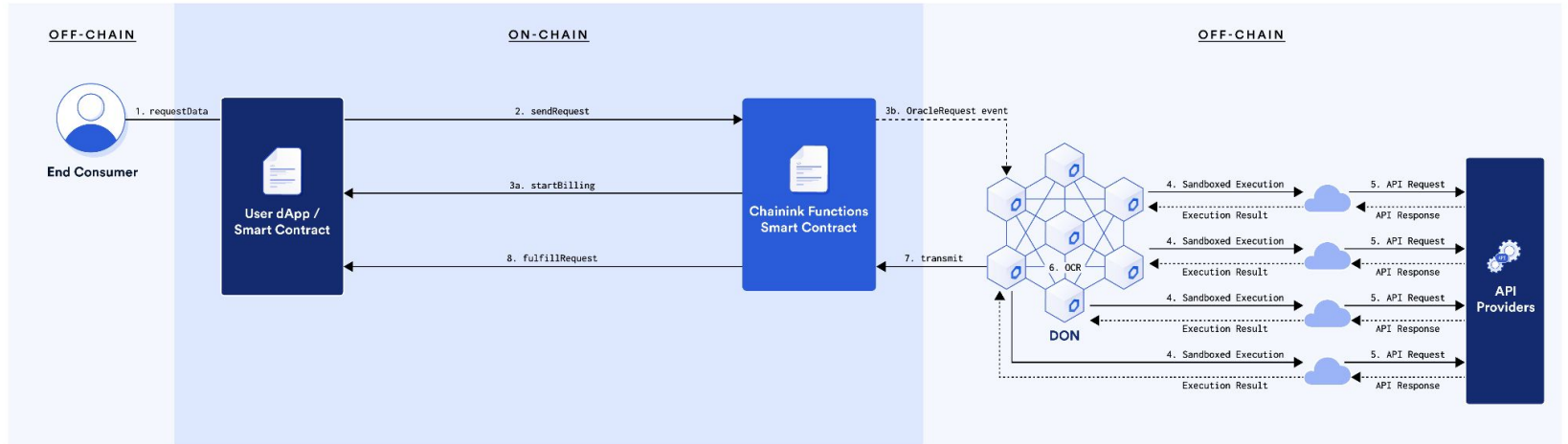
Enable the automated management of capital pools and the making of funds to market by referring to Price Feeds for rebalance.



Chainlink oracle data services

Chainlink Functions

Chainlink Functions Workflow



1

An end user initiates the Chainlink Function embedded within the dApp.

2

The dApp makes a request to the Chainlink Functions smart contract. This request consists of the API endpoint, any transformations to the data, and encrypted credentials (if any).

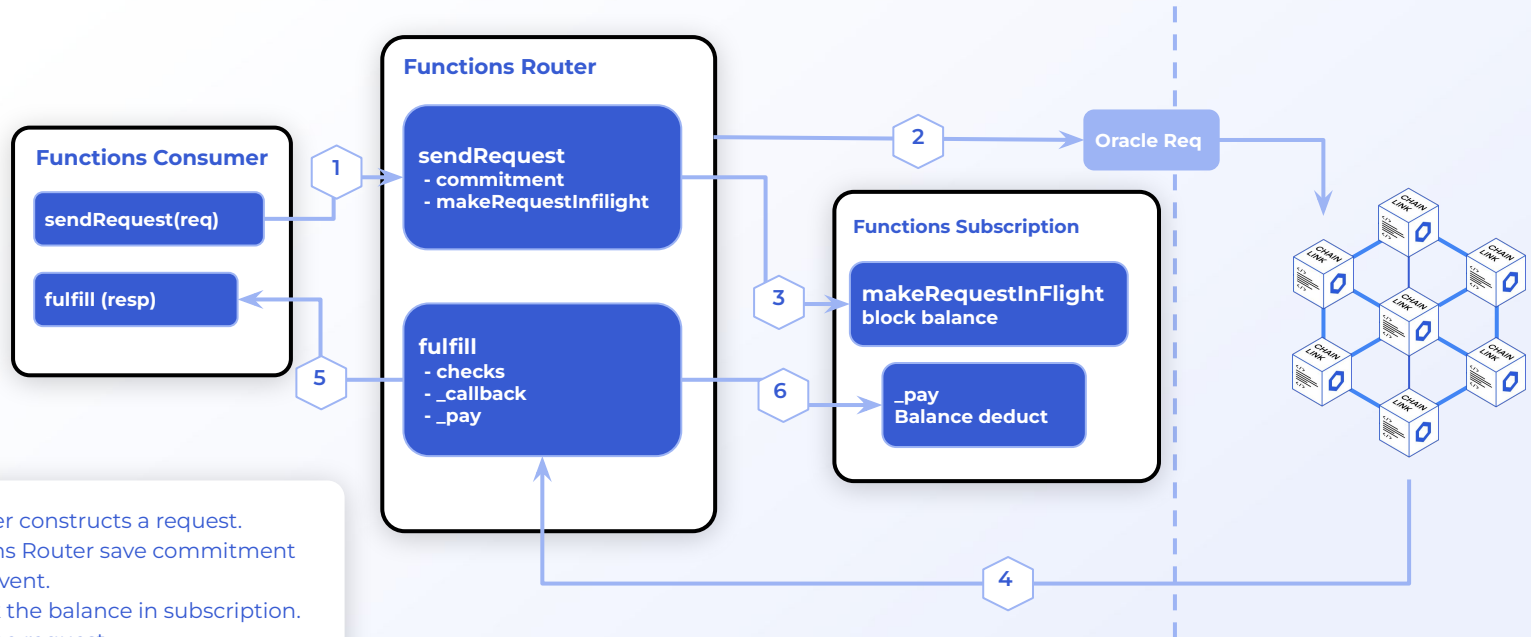
3

A decentralized oracle network (DON) continuously listens to the Chainlink Functions smart contract. When it picks up the request, each node independently triggers their runtime environment to fetch external data, performs any computations on it, and returns the result.

4

The nodes reach a consensus on the final answer using OCR 2.0. One node is then picked to transmit the result back on-chain. In the unlikely event that the node fails to publish the data, another node is chosen to transmit it on-chain. The end result is high reliability and trust-minimized security.

Chainlink Functions Architecture



1. The consumer constructs a request.
2. The Functions Router save commitment and emit the event.
3. Router block the balance in subscription.
4. DON fulfill the request
5. Router write the result back to consumer.
6. Fee deducted from balance

Chainlink Functions Use Cases

Access to custom external data



Weather & Flight Delay data: to provide necessary data for insurance applications



Greenhouse Gas Emission Data: Provide the data to carbon asset market



Election and sports data: Prediction markets and dynamic NFT



Assets and macroeconomic data: increase the liquidity of assets

Chainlink Functions Examples



- **AWS** connector for **data exchange**
- **Twilio** user notifications
- **Google** cloud connectivity
- **Meta** small business **NFT giveaway**

useChainlinkFunctions()

Collection of community submitted examples for [Chainlink Functions](#)



Chainlink oracle data services

CCIP (Cross-chain interoperability protocol)

Think Cross-chain

Number of Chains is increasing

The screenshot displays the ChainList website interface. On the left, there is a sidebar with the ChainList logo and the text "Helping users connect to EVM powered networks". Below this, there is a paragraph explaining that Chainlist is a list of EVM networks and provides information on how to connect wallets and Web3 middleware providers. There are three buttons in the sidebar: "Add Your Network +", "Add Your RPC +", and "View Code". At the bottom of the sidebar, there is a "Toggle Theme" option.

The main content area shows a grid of EVM networks. At the top, there is a checkbox for "Include Testnets" and a user address "0x4479...A057". The grid contains the following networks:

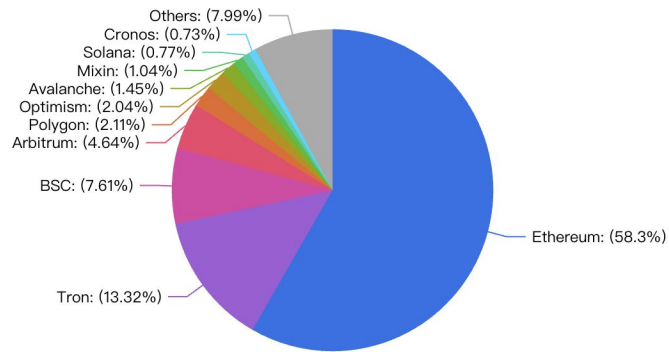
| ChainID | Currency |
|----------------|----------|
| 42161 (0xa4b1) | ETH |
| 137 (0x89) | MATIC |
| 10 (0xa) | ETH |
| 43114 (0xa86a) | AVAX |
| 25 (0x19) | CRO |
| 2222 (0x8ae) | KAVA |
| 8217 (0x2019) | KLAY |
| 369 (0x171) | PLS |
| 32659 (0x7f93) | FSN |

Each network card includes an "Add to Metamask" button and a dropdown arrow.

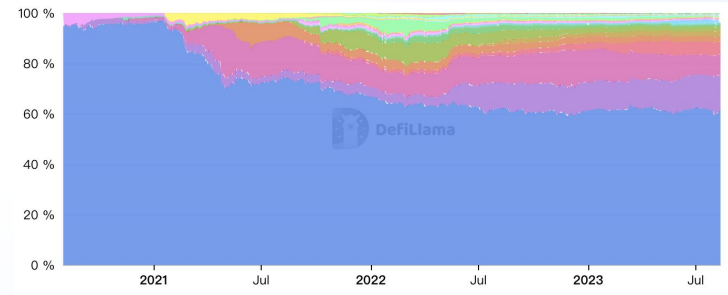
There are **more than 500** EVM chains in [Chainlist](#)

Liquidity

Liquidity fragmentation is increasing



Token value locked in EVM chains 2023



Token value locked Trend (Defi Llama data)

Total value bridged:
\$168 Billion

Past 12 months:
68% | \$115 Billion

Sources: Estimate performed based on Nansen & Dune Analytics data

Cross-chain abstraction

Token Transfers

Transfer tokens to a receiving smart contract or directly to an end-user on a different blockchain.

Programmable Token Transfers

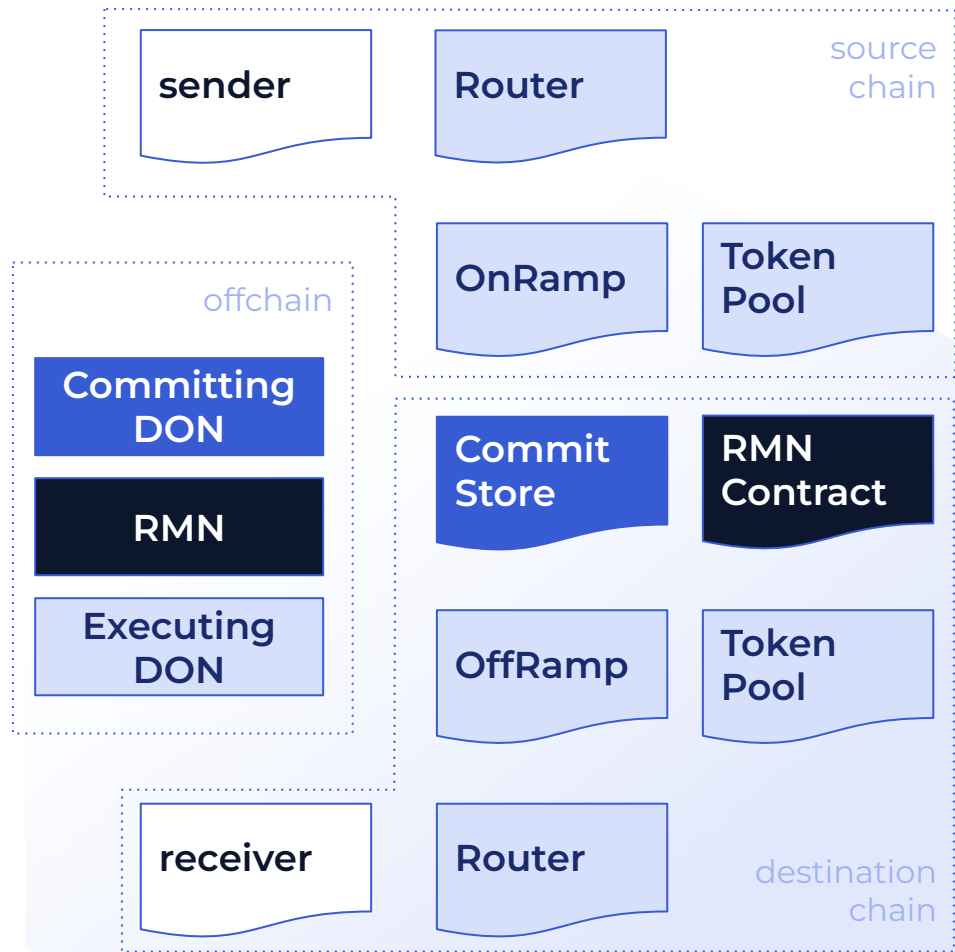
Transfer tokens along with instructions what to do with them, to a receiving smart contract on a different blockchain.

Arbitrary Messaging

Send arbitrary messages (i.e. bytes) to a receiving smart contract on a different blockchain

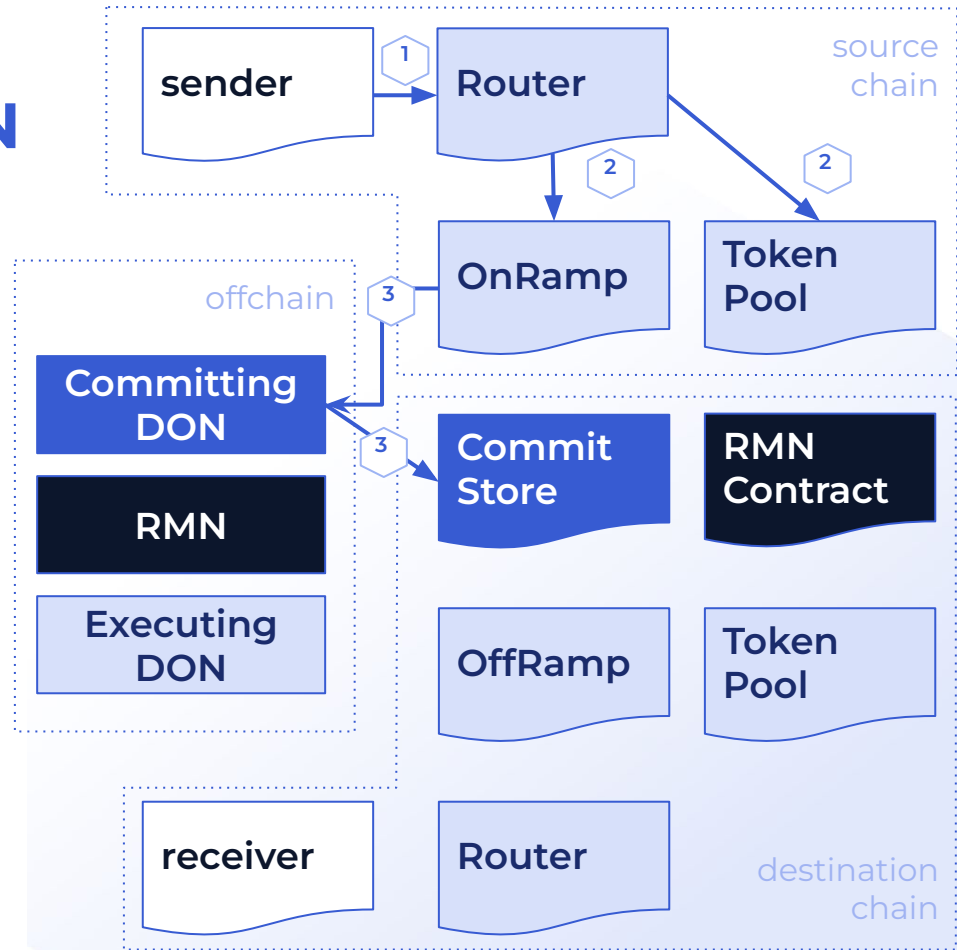
Major Components

- Three domains:
 - Source chain
 - Destination chain
 - Offchain
- Sender and receiver contracts are written by external developer
- Other components are developed by Chainlink Labs



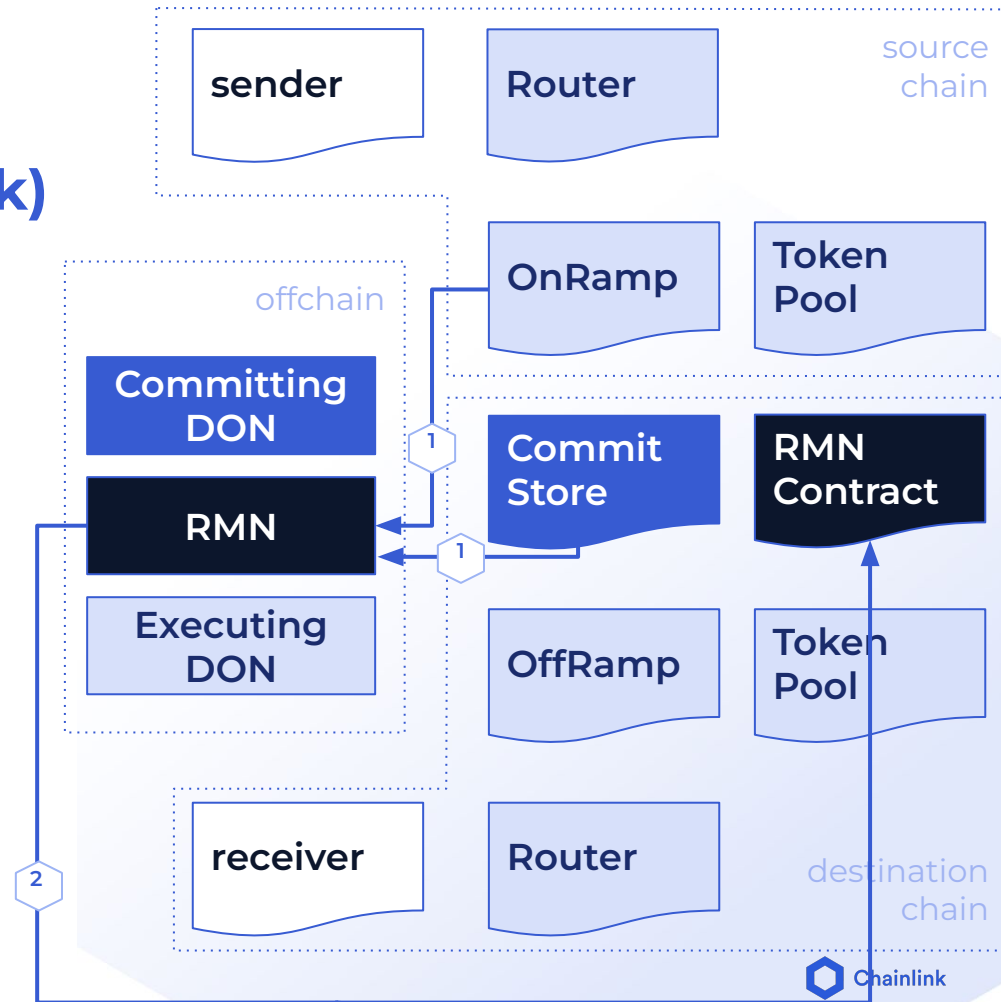
Commit: committing DON

- Send a message
- Routing a message
- Committing a message
- Router routes message based on destination chain and tokens



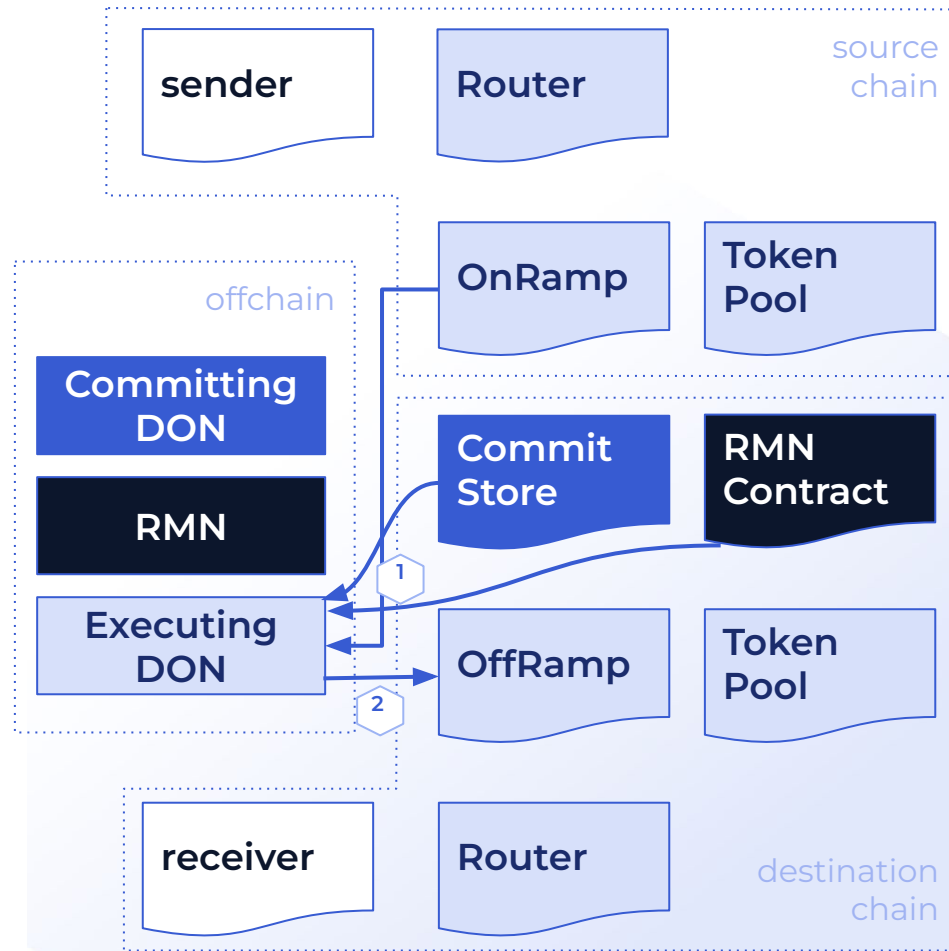
Bless: RMN (Risk Management Network)

- RMN waits for commitment and independently reconstructs it from events emitted by OnRamp
- commitment matches, RMN sends transaction to RMN Contract blessing commitment



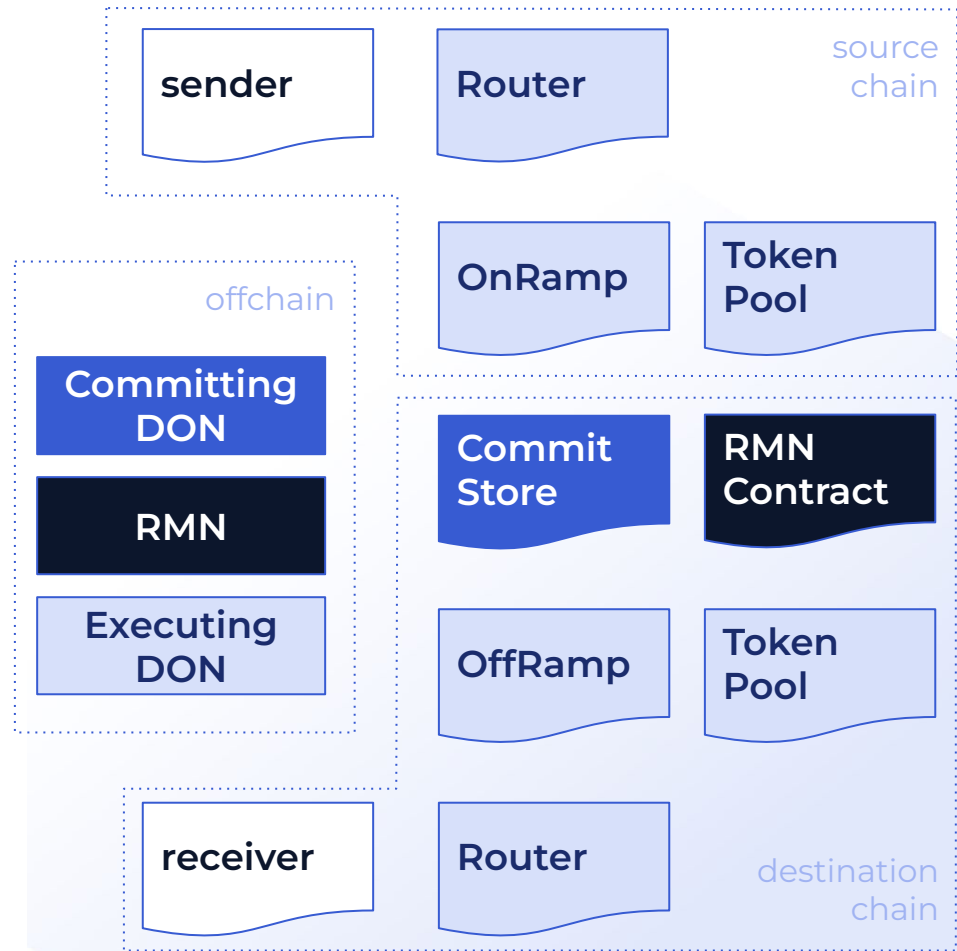
Execute: Executing DON

- Executing DON comprises many oracles running OCR2
- Waits for Message to be committed in CommitStore and blessed in RMN Contract
- Sends execution transaction to OffRamp with cryptographic proof that Message is included in commitment

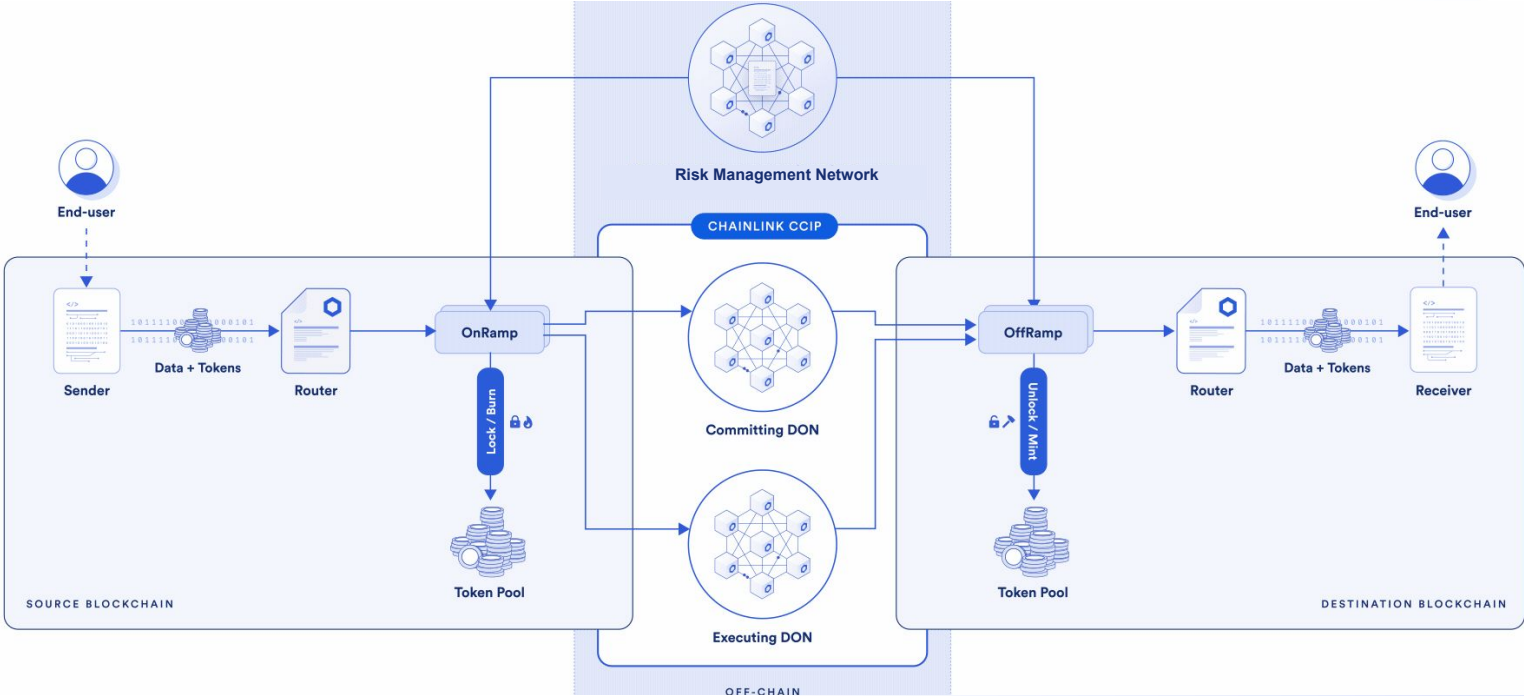


Separate Commit & Execution

- Efficiency through batching:
 - Large Committing DON
 - Committing DON commits many messages at once
 - AFN blesses many messages at once
- Forward-looking design:
 - Future message types with different execution models can share critical infrastructure



Recap



Chainlink CCIP Use Cases



Collateral

Use funds deposited on one chain as collateral to borrow against on another chain.



Governance

Automatically disseminate governance decisions across many chains.



Trading

Trade assets across many chains.



New Kinds of dApps

Take advantage of network effects on Ethereum mainnet while harnessing compute and storage on other chains.



Enterprise Workflow

Decentralized validation technology to reduce risk in cross-chain, multiparty middleware communications.



Chainlink CCIP

GETTING STARTED

Chainlink CCIP

How to use Chainlink CCIP

CCIP MASTERCLASS

Exercise #1: Transfer Tokens

Exercise #2: Transfer Tokens & Data

Exercise #3: CCIP Tic Tac Toe

CCIP Architecture in Depth

GOING BEYOND MASTERCLASS

Example Cross-chain dApps and Tools

Chainlink CCIP GitBook

<https://andrej-rakic.gitbook.io/chainlink-ccip/ccip-masterclass/exercise-1-transfer-tokens>

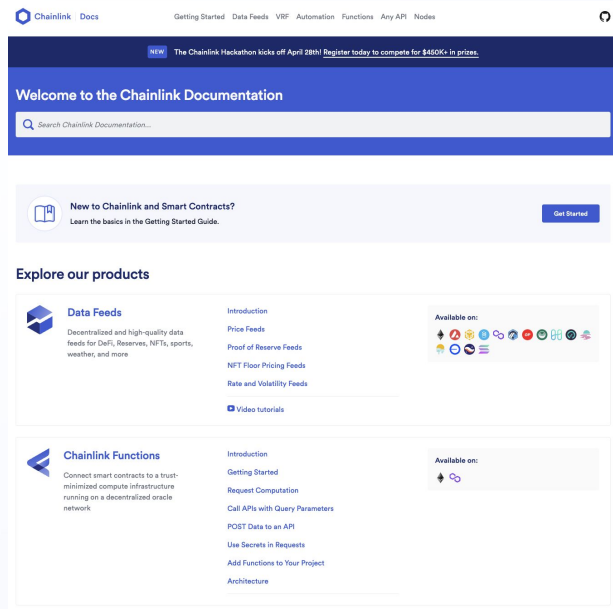


Chainlink Oracle

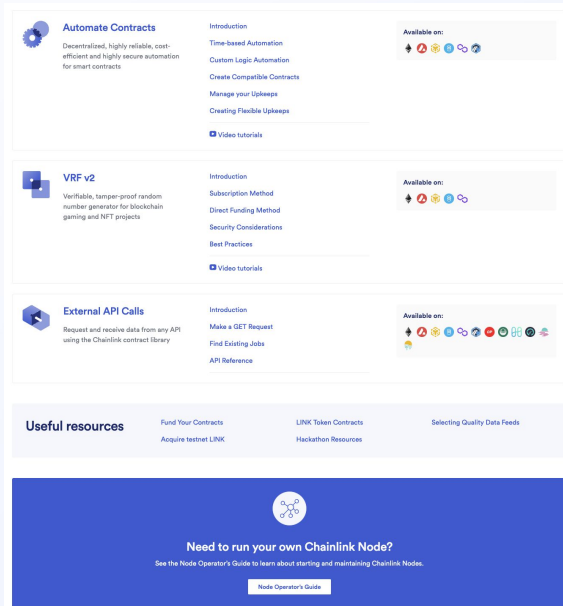
Developer Community

Documentation

Check more details of Chainlink services at docs.chain.link



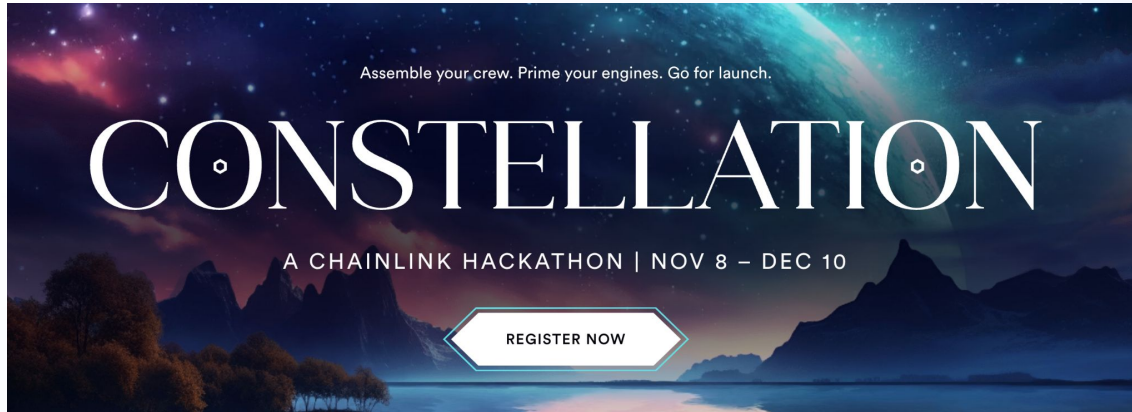
The screenshot shows the Chainlink Docs homepage. At the top, there is a navigation bar with 'Chainlink Docs' and a breadcrumb trail: 'Getting Started > Data Feeds > VRF > Automation > Functions > Any API > Nodes'. A blue banner below the navigation contains a 'NEW' tag and the text: 'The Chainlink Hackathon kicks off April 28th! Register today to compete for \$450K+ in prizes.' Below the banner is a search bar with the placeholder text 'Search Chainlink Documentation...'. The main content area is divided into three sections: 'New to Chainlink and Smart Contracts?' with a 'Get Started' button, 'Explore our products' which lists 'Data Feeds' and 'Chainlink Functions' with their respective sub-topics and 'Available on:' icons, and a 'Useful resources' section at the bottom.



This image shows a detailed view of three documentation cards from the Chainlink Docs site. Each card has a title, a brief description, a list of sub-topics, and an 'Available on:' section with icons for various platforms. The first card is 'Automate Contracts', the second is 'VRF v2', and the third is 'External API Calls'. Below these cards is a 'Useful resources' section with three links: 'Fund Your Contracts', 'LINK Token Contracts', and 'Selecting Quality Data Feeds'. At the bottom is a blue banner with the text 'Need to run your own Chainlink Node?' and a link to the 'Node Operator's Guide'.

Hackathon

[2023 Fall Hackathon \(Nov 8th - Dec 10th\)](#)



Chainlink Developer Experts



Access to exclusive chats with other Developer Experts on technical forums



Participation in feedback sessions with Chainlink Product and Engineering teams



Speaking opportunities at global Chainlink events and community meetups



Acknowledgment with exclusive badges and ranks on Chainlink developer forums



<https://chain.link/developers/experts>

Chainlink Jobs?

**Join us to help build a world
powered by truth**

<https://chainlinklabs.com/jobs>

What to get help?

- Post a question tagged with Chainlink at <https://ethereum.stackexchange.com/>
- Join our discord at <https://discord.gg/chainlink>

StackExchange Search on Ethereum...

ethereum

Home

PUBLIC

Questions

Tags

Users

Companies

Unanswered

TEAMS

Stack Overflow for Teams - Start

Cannot get Chainlink Conversion ETH/USD Correct other than 0

Asked 25 days ago Modified 24 days ago Viewed 28 times

I have followed both answers in the following similar question. I somehow cannot seem to get a non-zero result. I tried several different ways to modify the below conversion function. Using MockV3Aggregator in hardhat network, test running correctly pre-conversion. Can anyone see my problem? Thank you.

Similar question: [price conversion using chainlink ETHUSD price](#)

My code:

```
pragma solidity ^0.8.0;
```

contract-development chainlink solidity-0.8.x

Chainlink Official resources Check this channel first for all the resources available to developers just getting started building...

Public

This server requires members with moderation powers to have Two-Factor Authentication. You cannot take any moderation actions until you enable it.

Resolve

sessions

opportunities

[... Technical ...]

resources

developers

external-adapters

functions

nodes

automation

operator-requests

vrf

proof-of-reserve

- What are smart contracts <https://www.youtube.com/watch?v=VvYXTJDCgg>
- How Chainlink Works <https://docs.chain.link/docs/architecture-overview>
- Chainlink FAQ <https://docs.chain.link/docs/faq>
- Engineering
 - End-to-end beginner walkthrough <https://docs.chain.link/docs/example-walkthrough>
 - Make an API Call <https://docs.chain.link/docs/request-and-receive-data>
 - Use Price Feeds <https://docs.chain.link/docs/using-chainlink-reference-contracts>
 - Chainlink VRF <https://docs.chain.link/docs/chainlink-vrf>
 - Automate Contracts with Chainlink Automation <https://docs.chain.link/docs/chainlink-automation/introduction/>
 - External Adapters <https://blog.chain.link/build-and-use-external-adapters/>
 - Running a node <https://docs.chain.link/docs/running-a-chainlink-node>
 - What is a Chainlink Node: <https://blog.chain.link/what-is-a-chainlink-node-operator/>
 - Chainlink Engineering Tutorials (Videos) https://www.youtube.com/playlist?list=PLVP9aGDn-XOQwJVbQvKr-zrh2_DV5M6J
 - Importance of Data Quality for Smart Contracts <https://blog.chain.link/the-importance-of-data-quality-for-delf/#the-major-risks-of-improperly-leveraging-oracle-flexibility-when-sourcing-data> (edited)

2 25 7 5

What to get help?

Find Frank here:



Frank

Developer Advocate, Chainlink Labs



@AlongHudson



<https://www.linkedin.com/in/qingyang-kong-0a927785/>



Thanks