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Chainlink Oracle

# Chainlink CCIP

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Chainlink Labs

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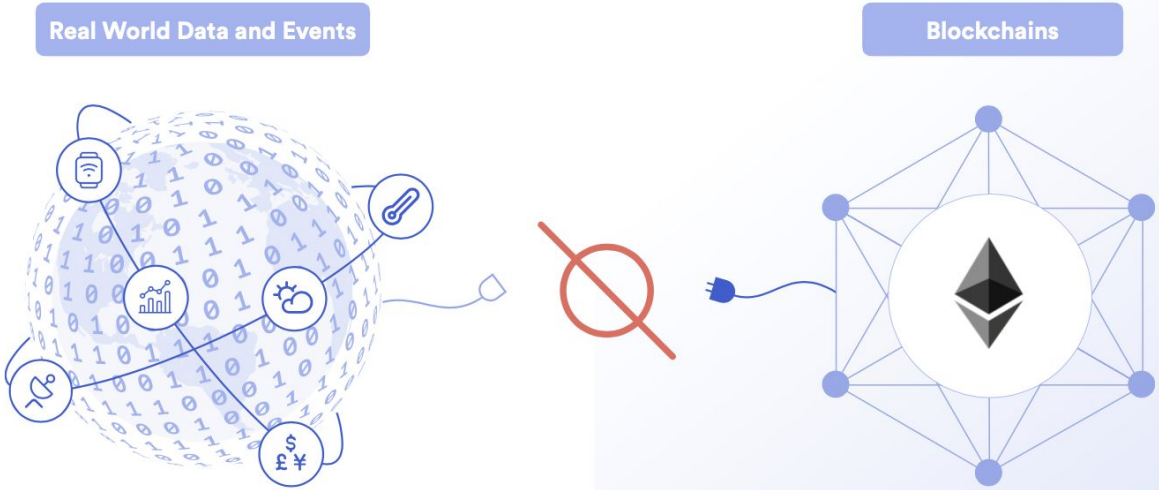
   a. Data feed
   b. Functions
3. **Chainlink CCIP**
4. **Chainlink Community**

# 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.

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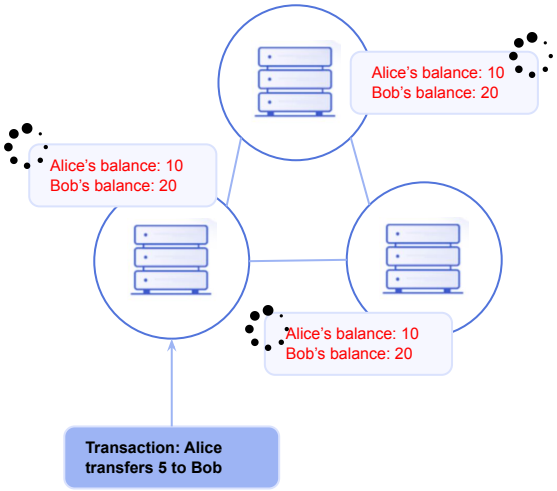
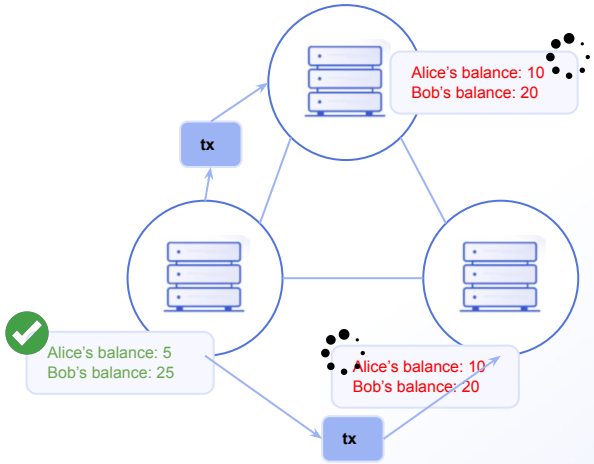
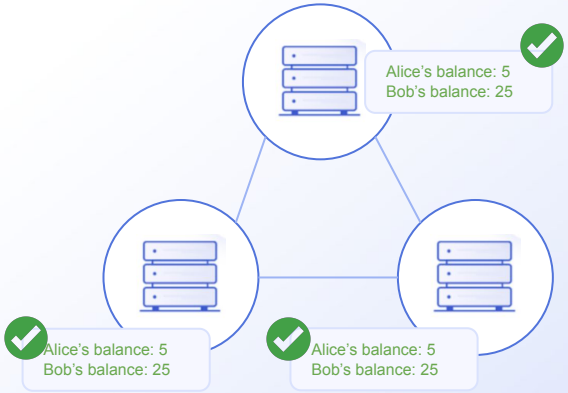
# Consensus




Submit Transaction




Broadcast Transaction




Reach consensus

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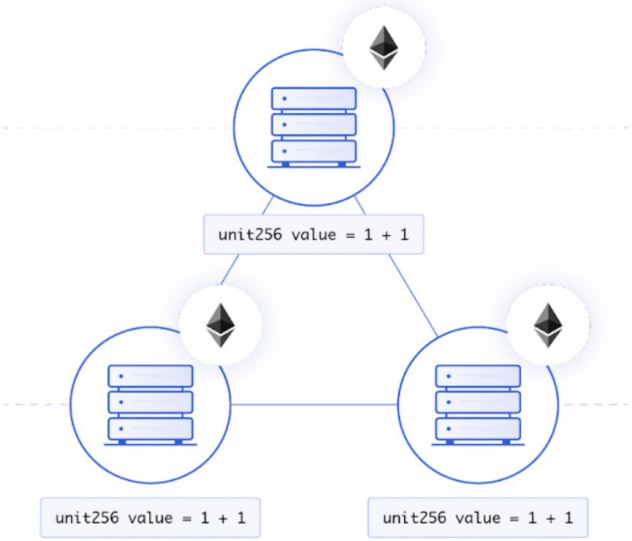
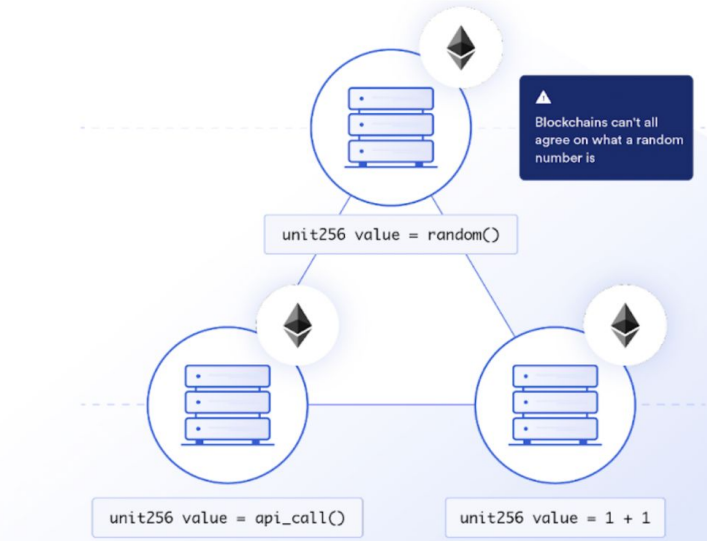
# Blockchain is a Deterministic System

## Deterministic Transaction



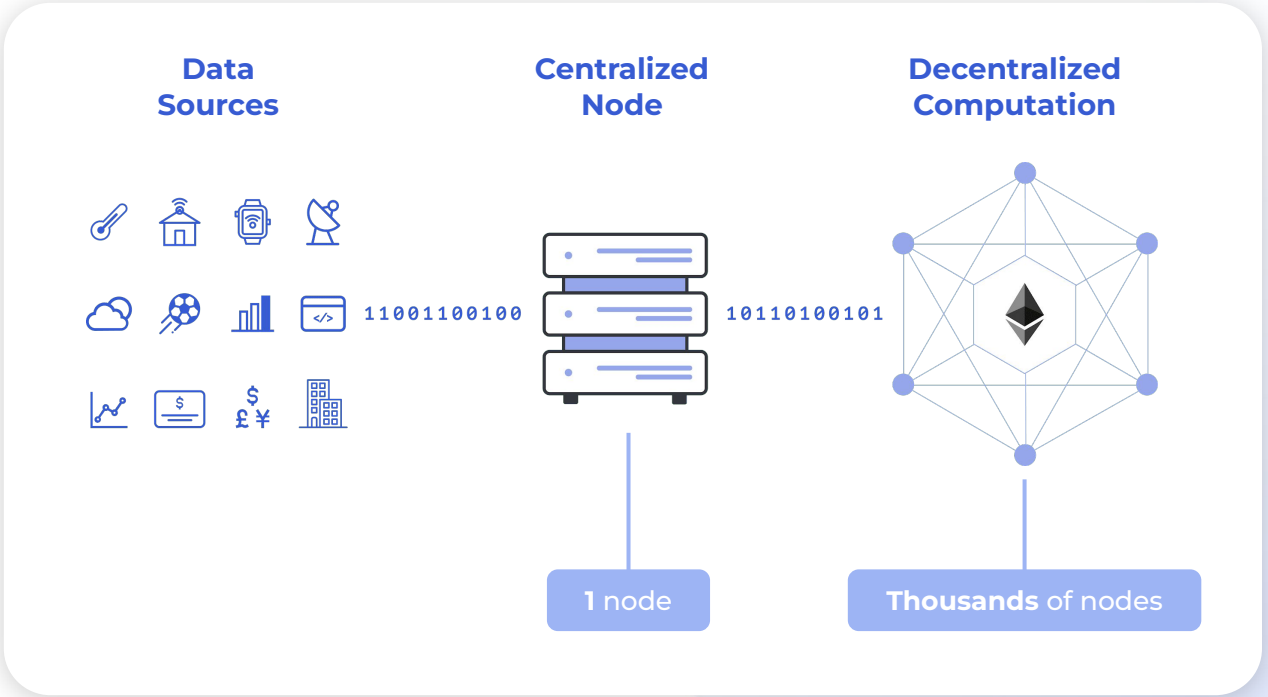

Consensus reached

## Indeterministic transaction




Consensus not reached

# Centralized Oracles

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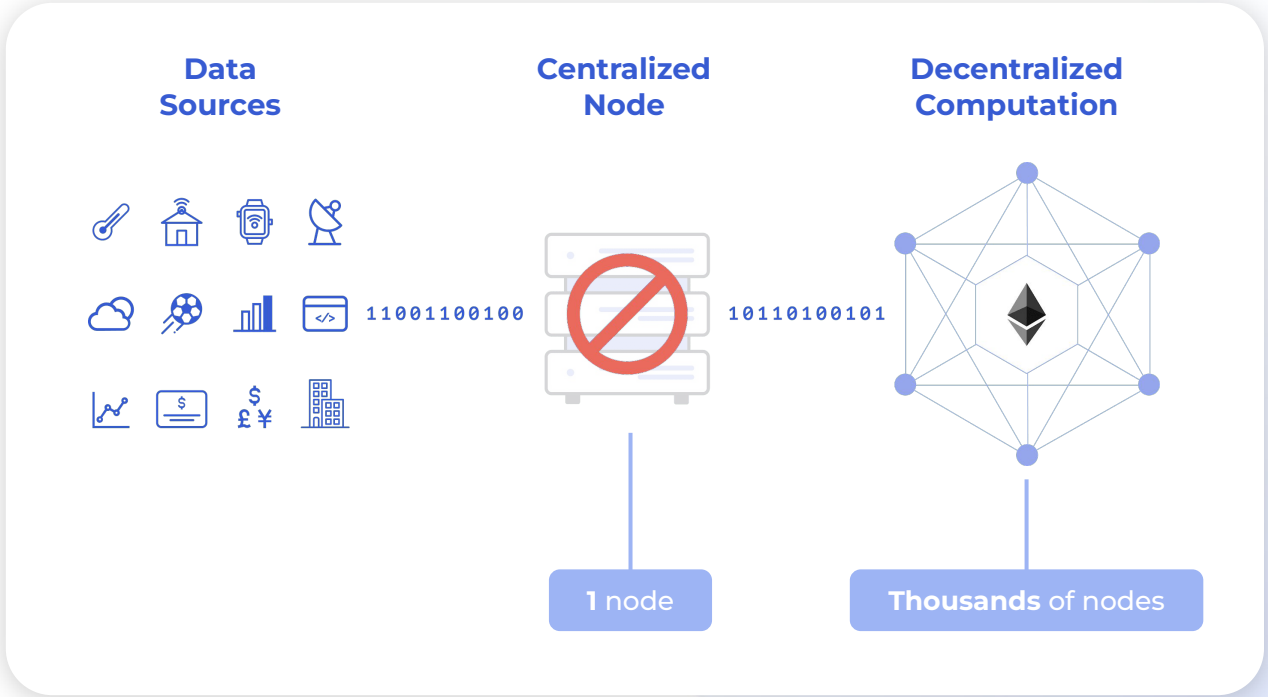
# Single-Point Failure

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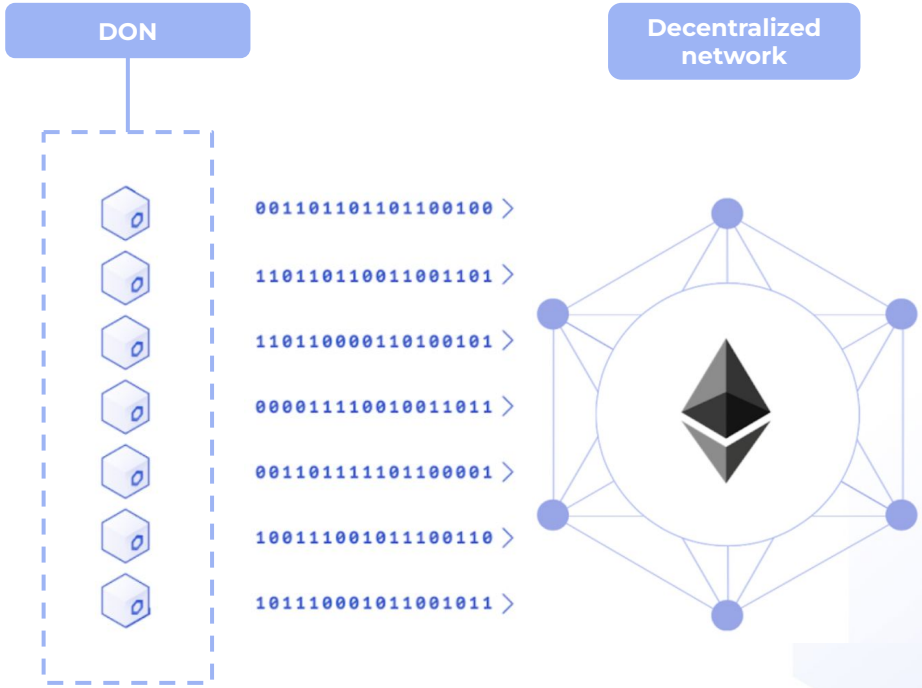
# Decentralized Oracle Network (DON)




**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.

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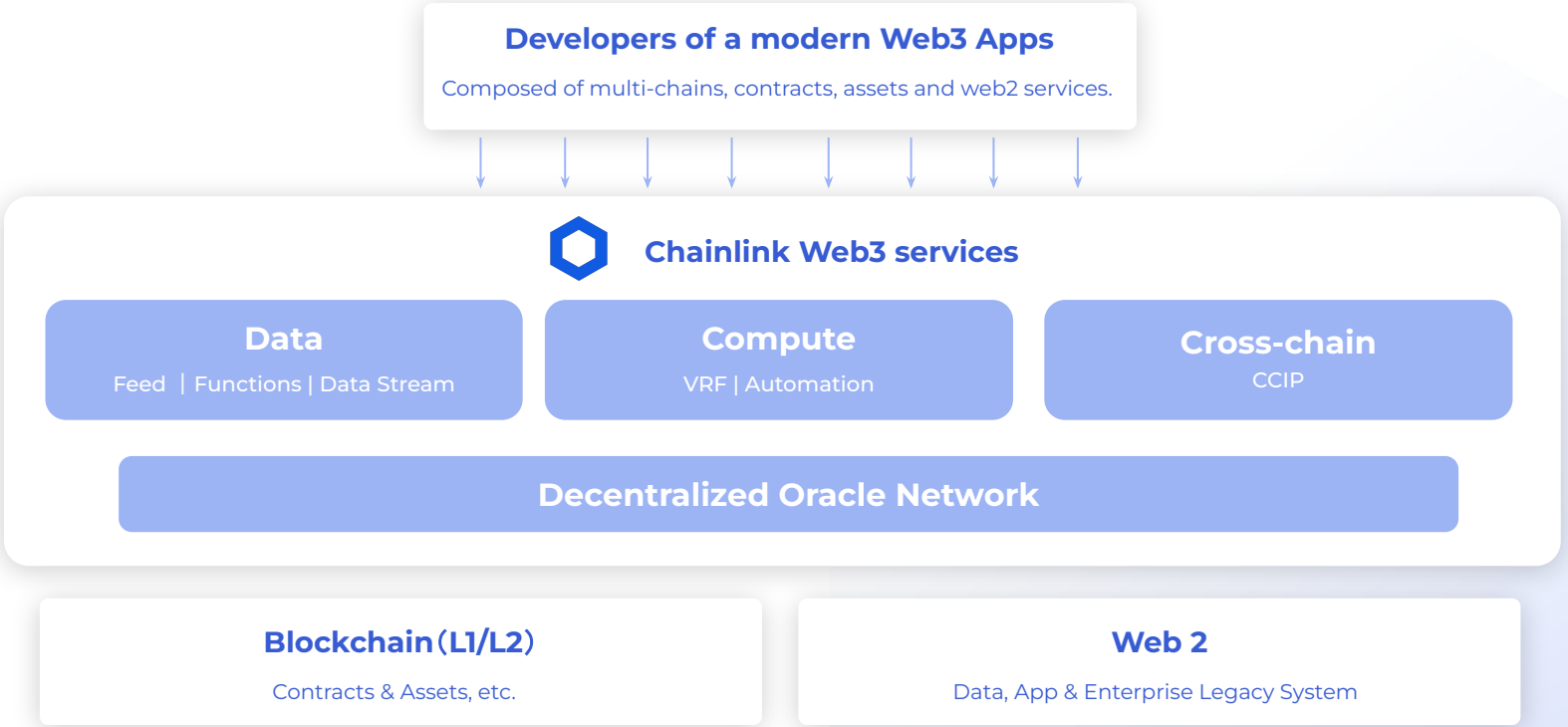
Developers of a modern Web3 Apps
Composed of multi-chains, contracts, assets and web2 services.
Chainlink Web3 services
Data
Feed | Functions | Data Stream
Compute
VRF | Automation
Cross-chain
CCIP
Decentralized Oracle Network
Blockchain（L1/L2）
Contracts & Assets, etc.
Web 2
Data, App & Enterprise Legacy System

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Chainlink oracle data services

# Chainlink DON & services

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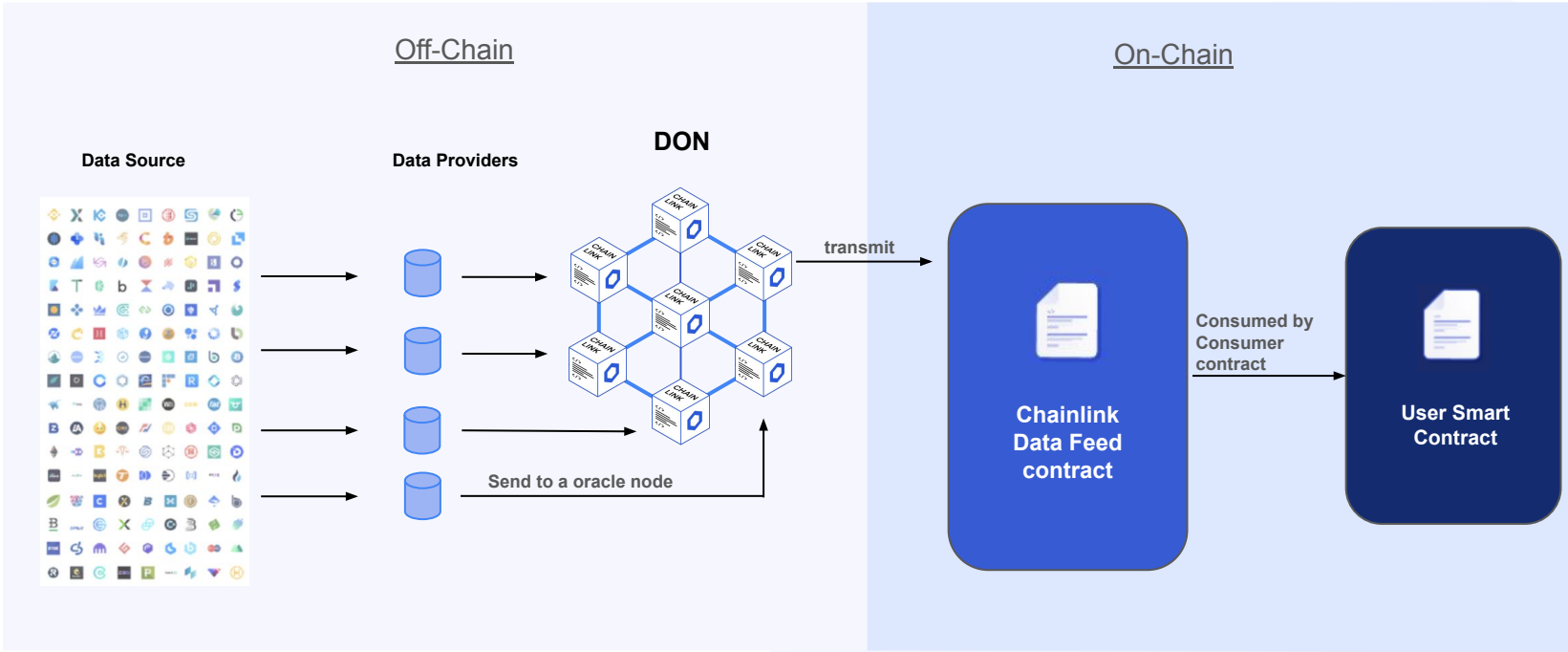
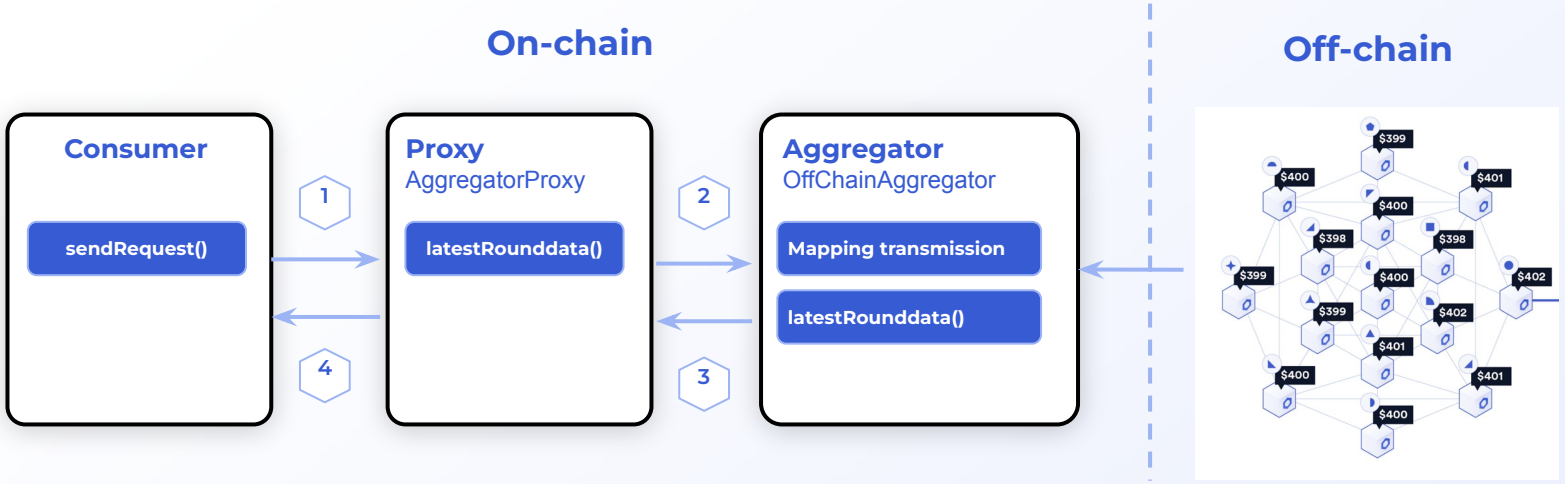
# Data Feed Workflow



# Data Feed Architecture




1. **Consumer** calls *latestRoundData()* in **Proxy**
2. **Proxy** calls *latestRoundData()* in Aggregator
3. **Aggregator** returns *Transmission* to Proxy
4. **Proxy** returns result to **Consumer**

Data feed triggered based on:

1. **Heartbeat** time
2. Token price alternate more than **deviation threshold**

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# Data Feed Use Cases

## Lending & borrowing

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

## 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.

## Stable Coin

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

## Asset management

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

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Chainlink oracle data services

# Chainlink Functions

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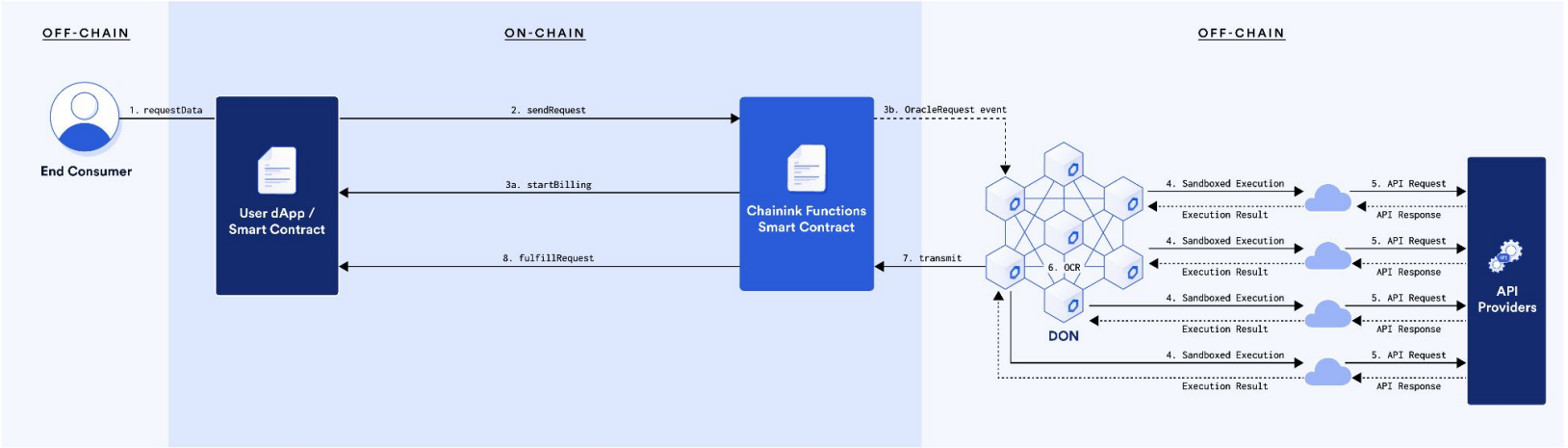
# Chainlink Functions Workflow



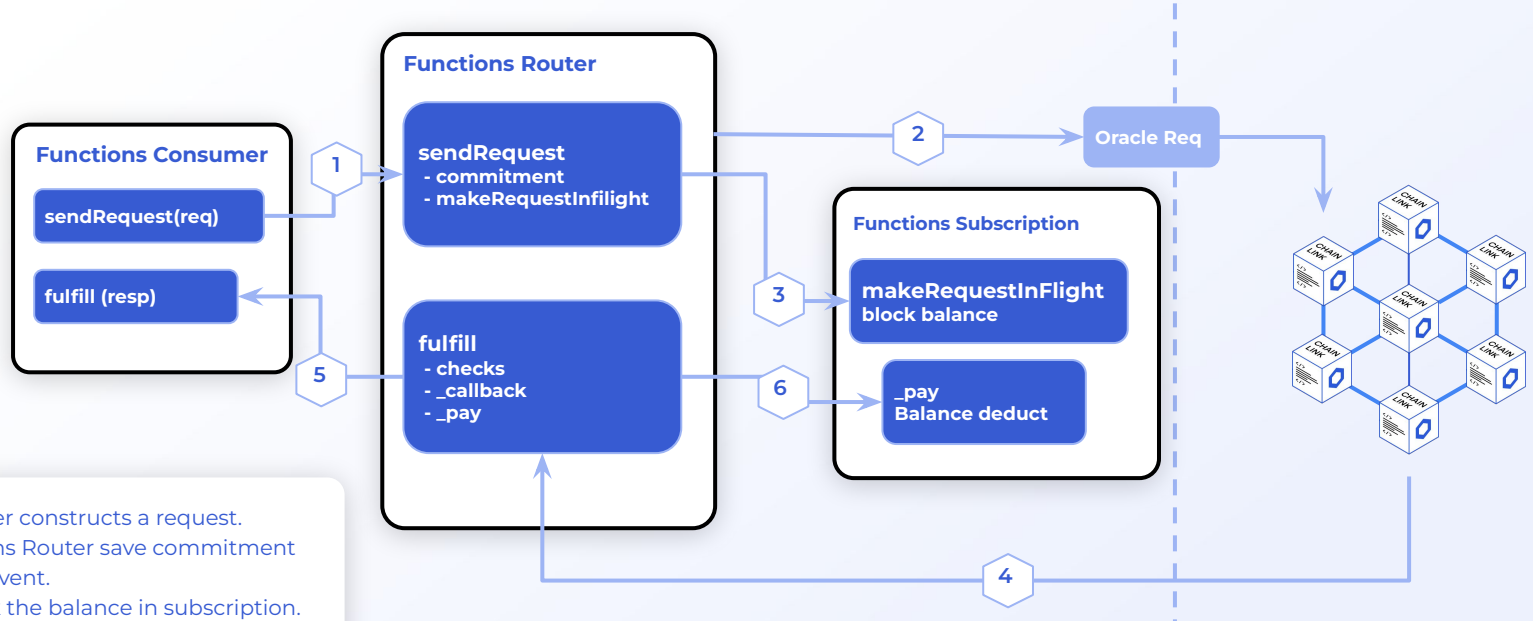

1. An end user initiates the Chainlink Function embedded within the dApp.

2. The dApp makes an 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

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# 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

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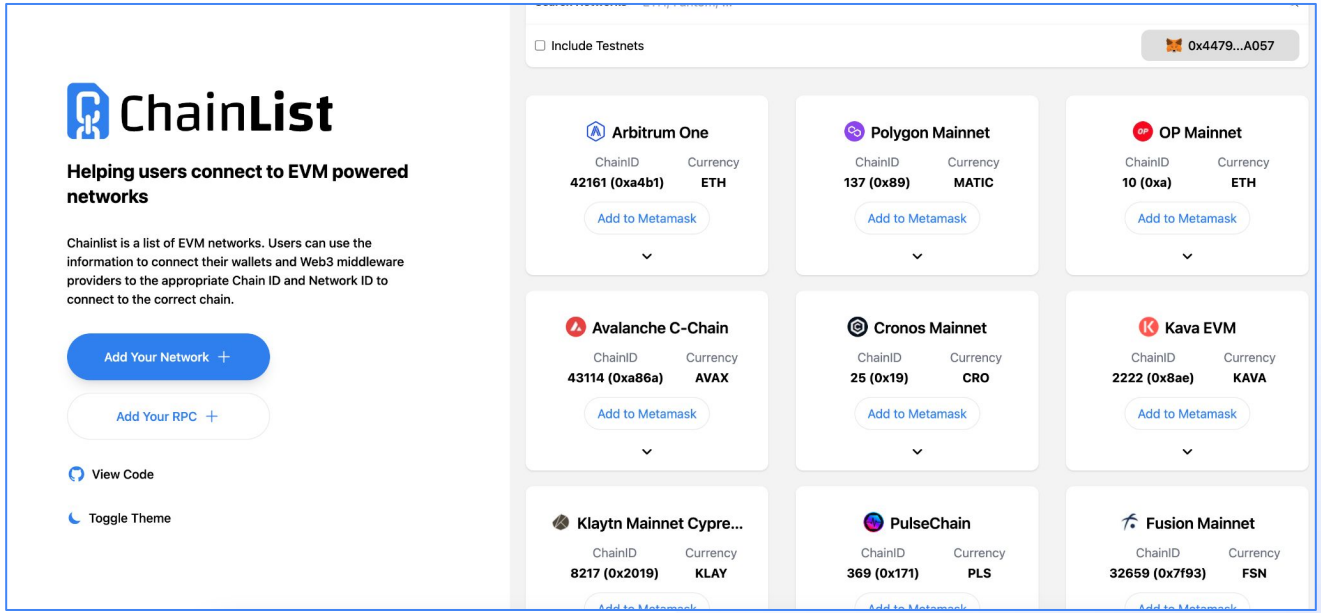
Chainlink oracle data services

# CCIP
# (Cross-chain interoperability protocol)

# Think Cross-chain

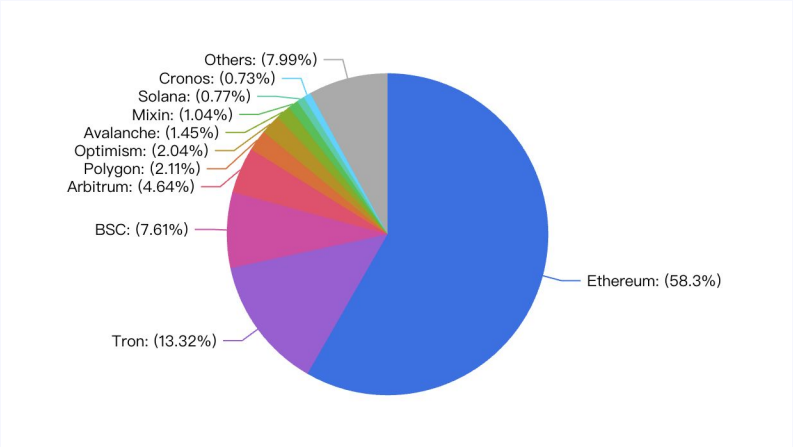
## Number of Chains is increasing



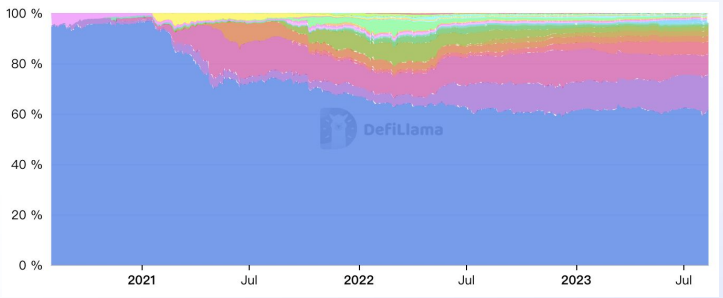

There are **more than 500** EVM chains in Chainlist

# 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

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# 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

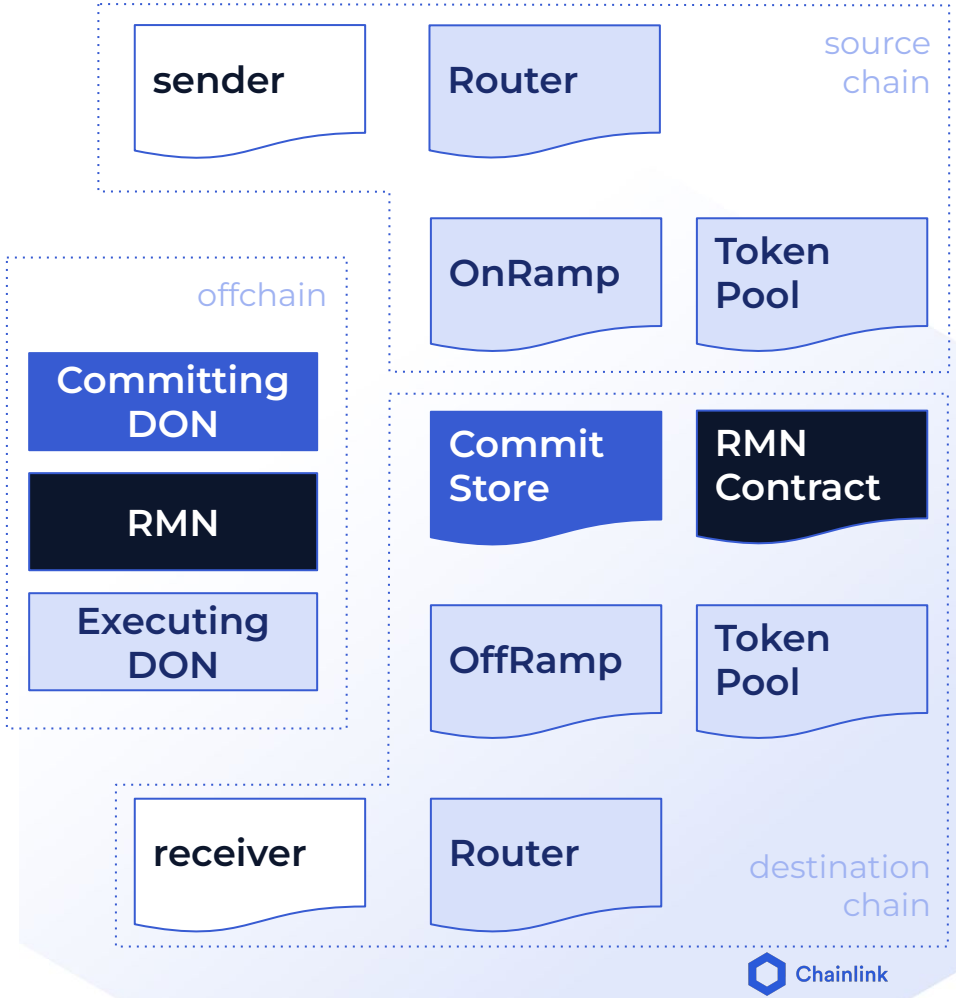
Transfer tokens along with instructions what to do with them, to a receiving smart contract on a different blockchain.

### Arbitrary Messaging

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

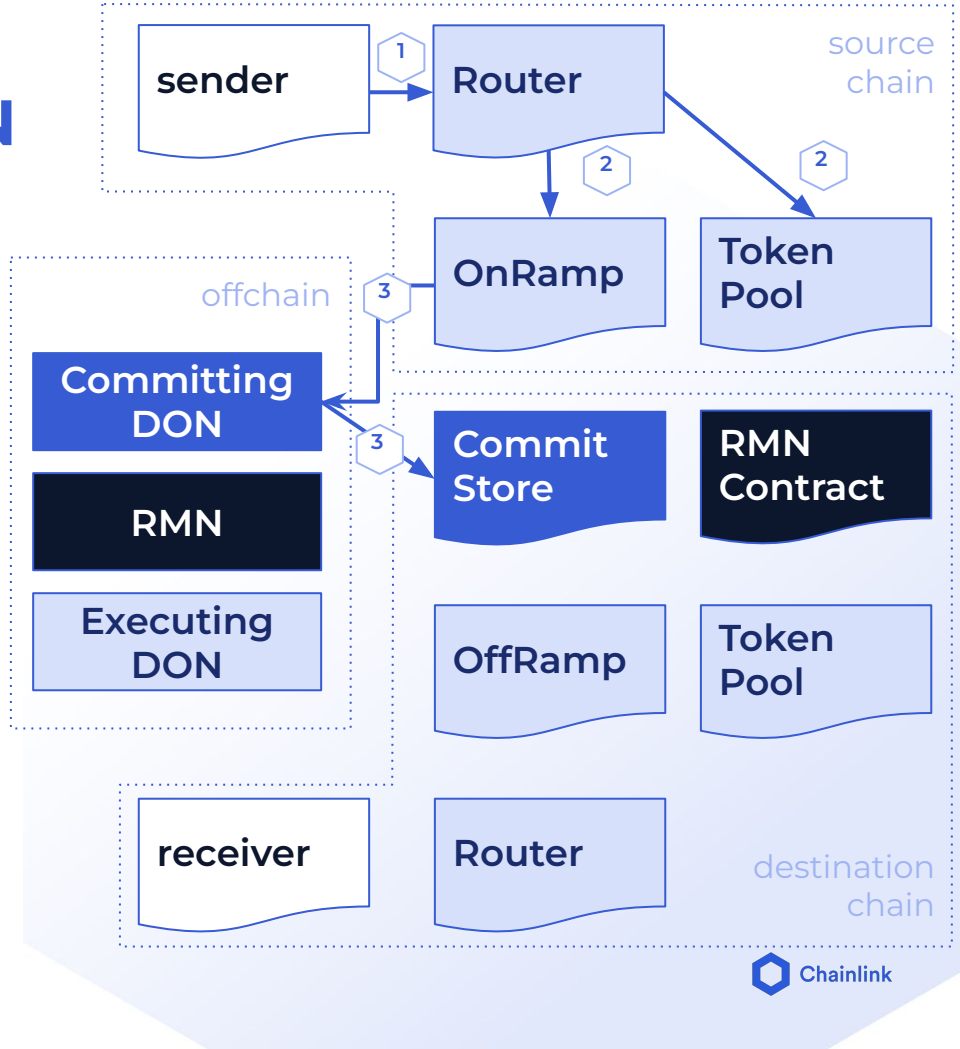
# Major Components

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



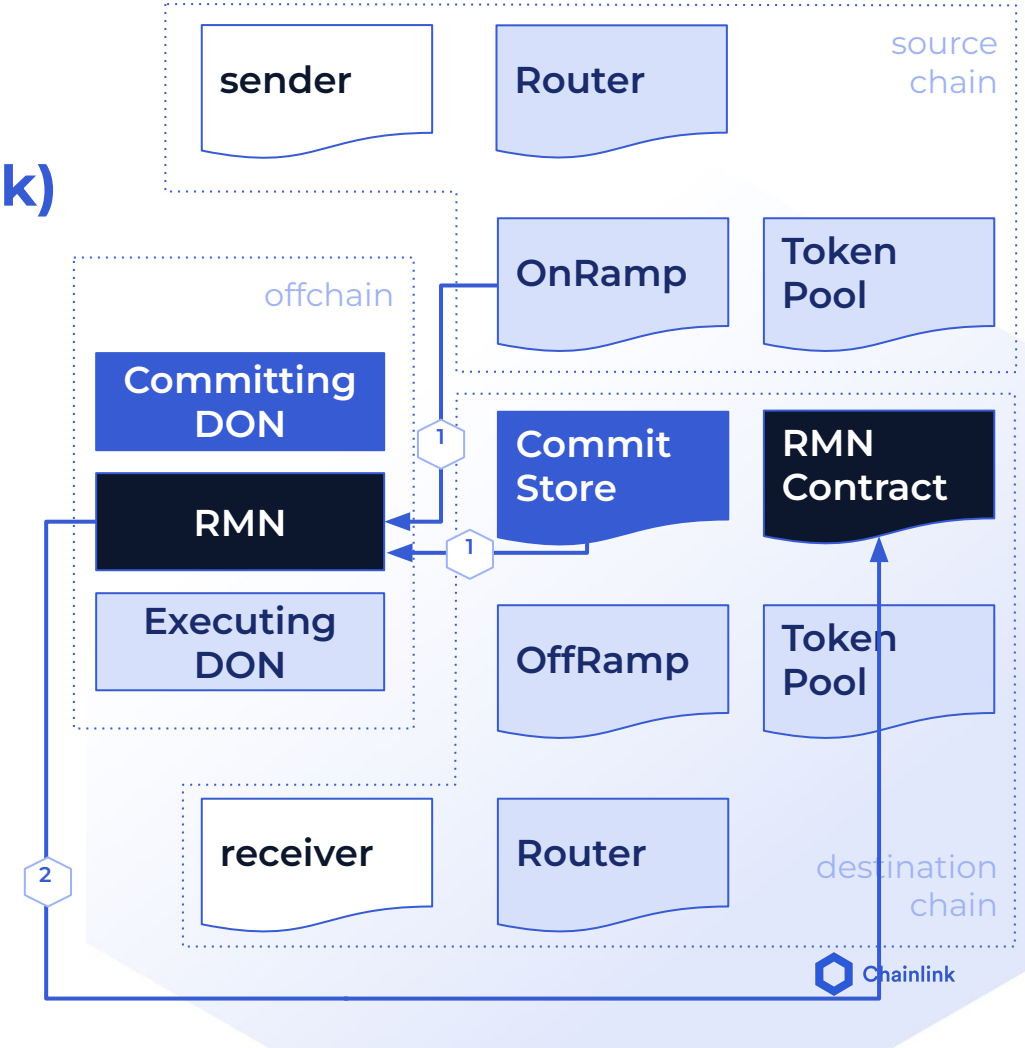
# Commit: committing DON

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



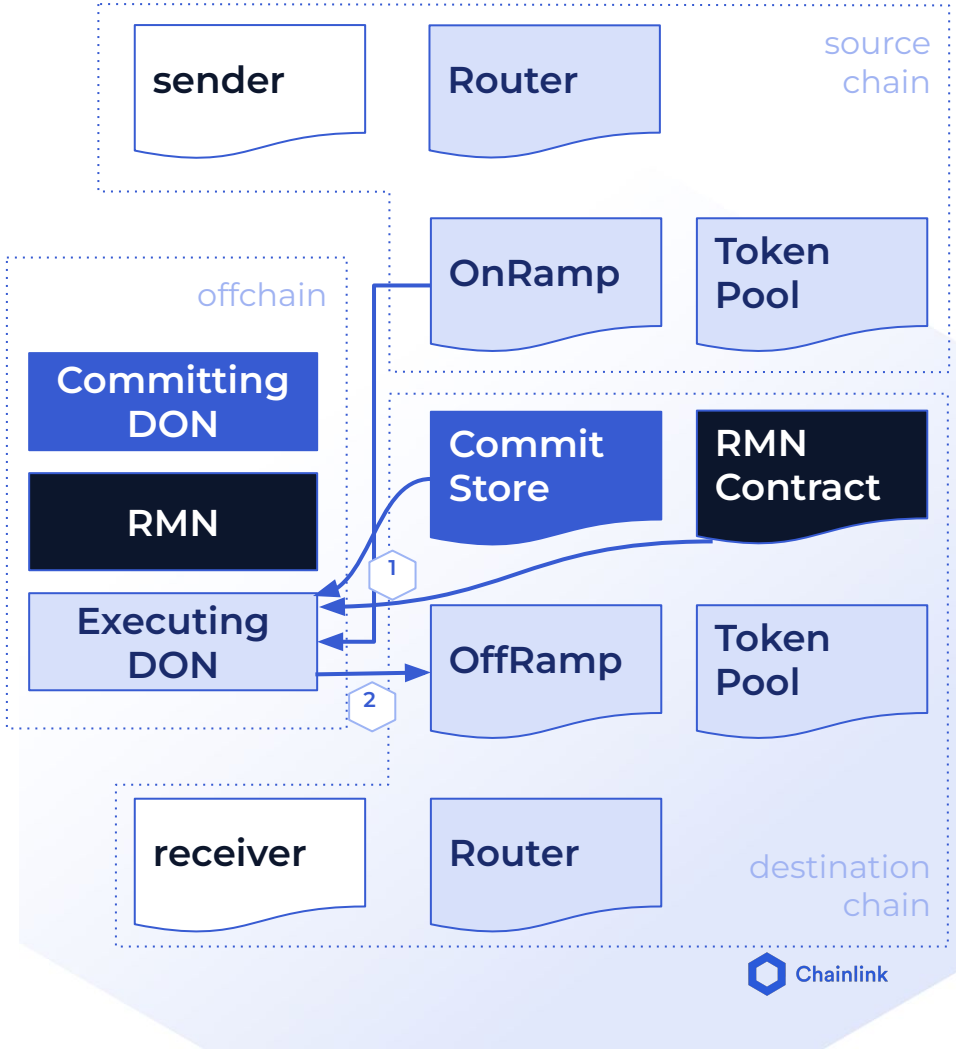
# Bless: RMN
## (Risk Management Network)

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



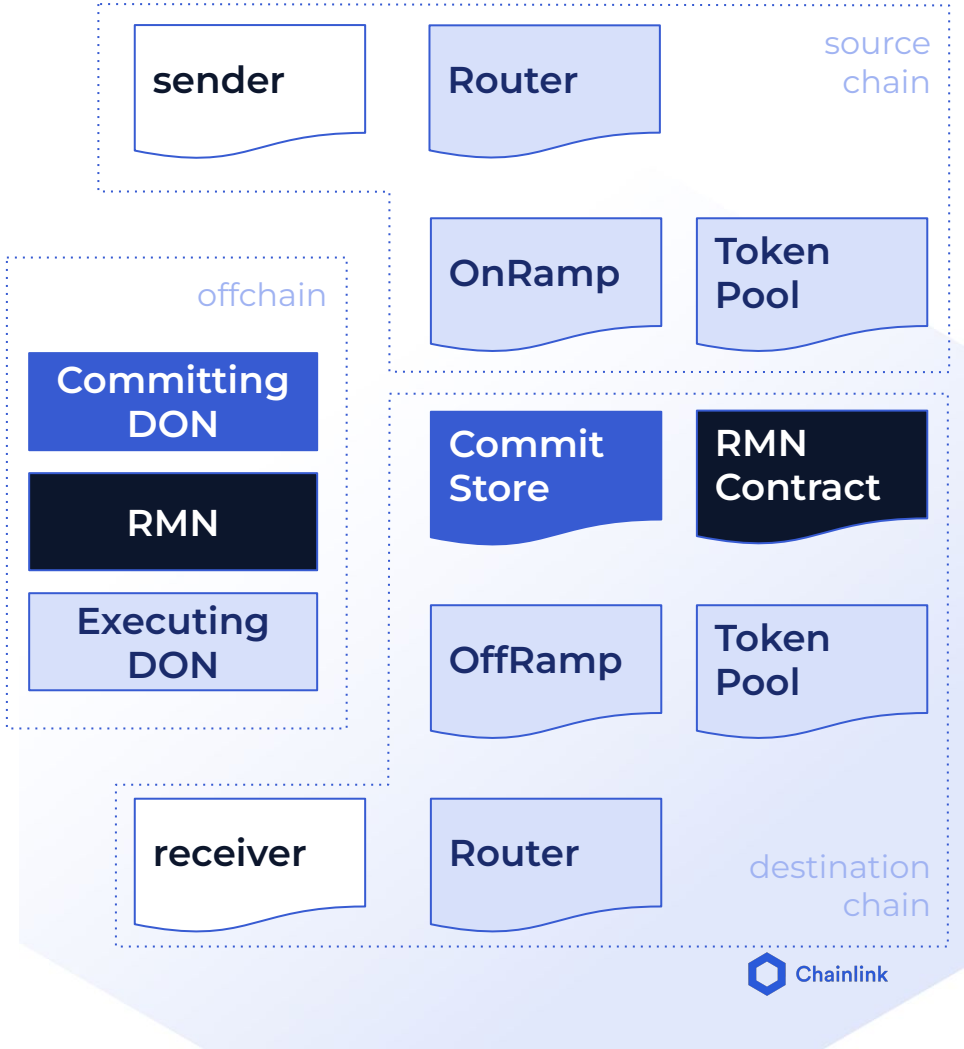
# Execute: Executing DON

- 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

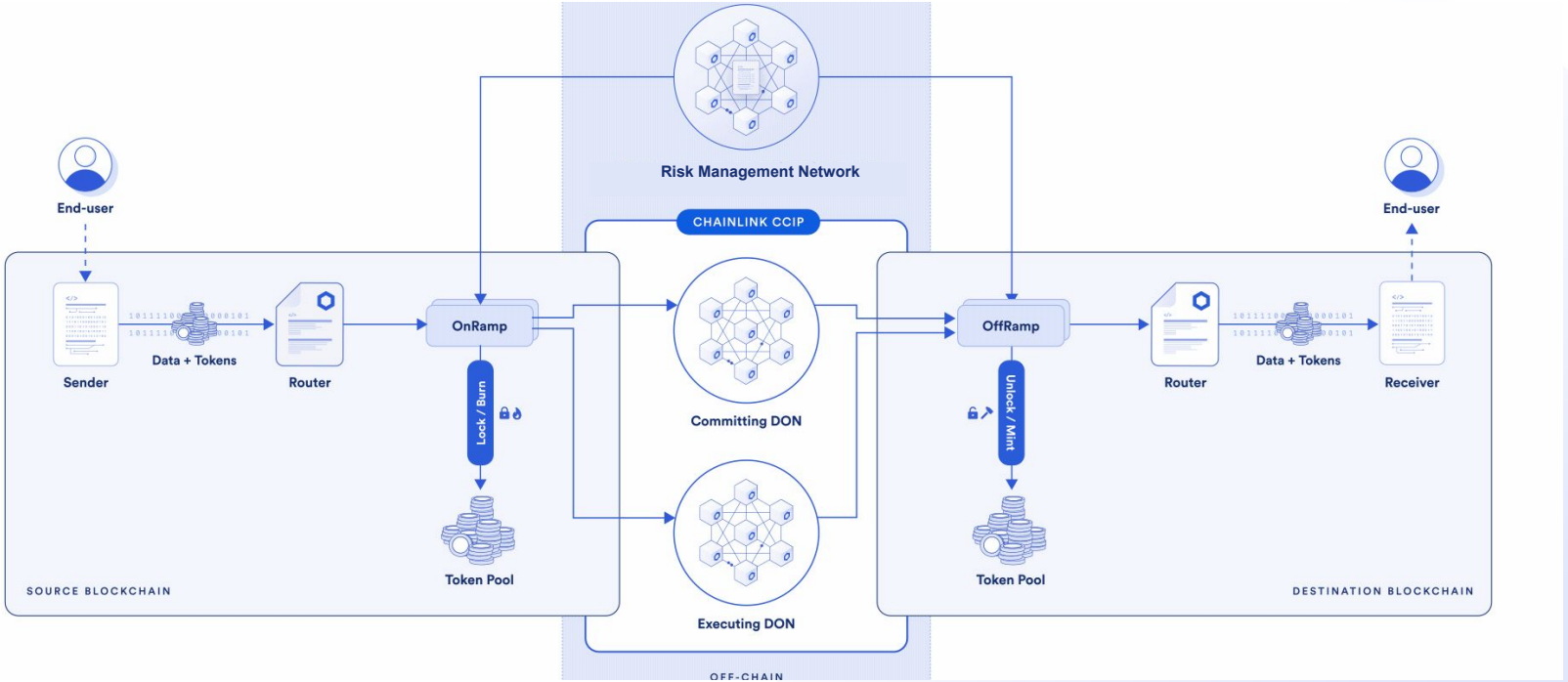


# Separate Commit & Execution

- Efficiency through batching:
  - Large Committing DON
  - Commiting 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

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# Chainlink CCIP Use Cases

## Collateral

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

SYNTHETIX

## Governance

Automatically disseminate governance decisions across many chains.

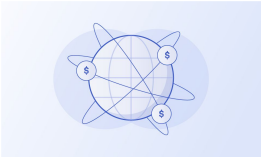
AAVE

## 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.

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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

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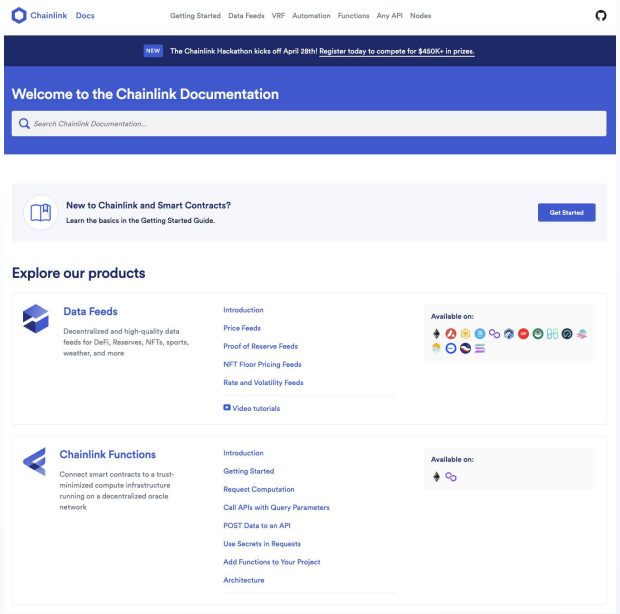
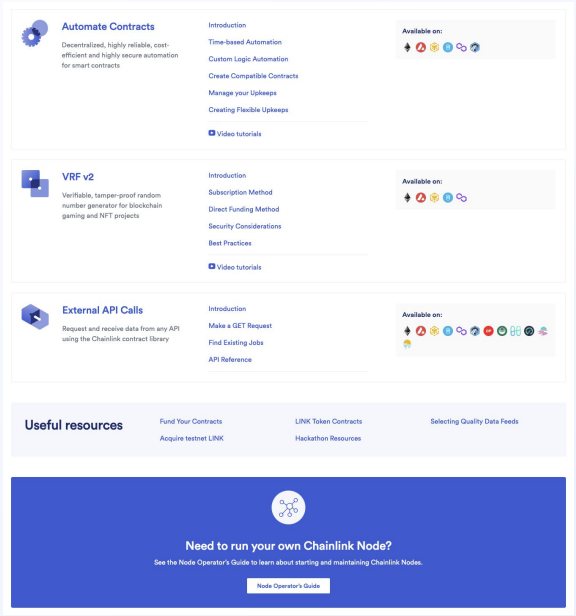
# Developer Community

# Documentation

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

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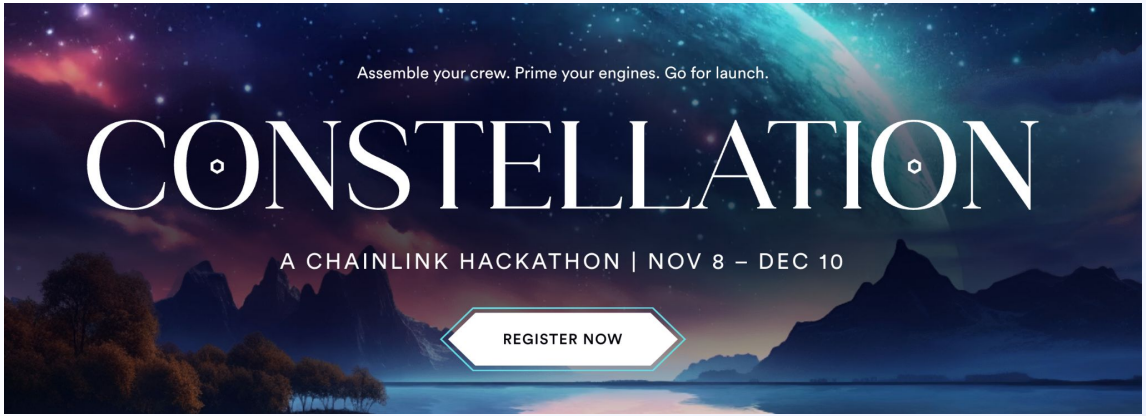
# Hackathon

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

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# 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

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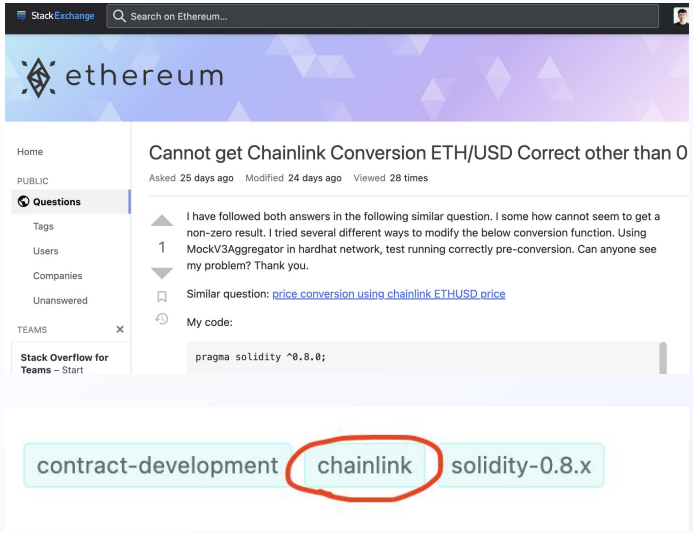
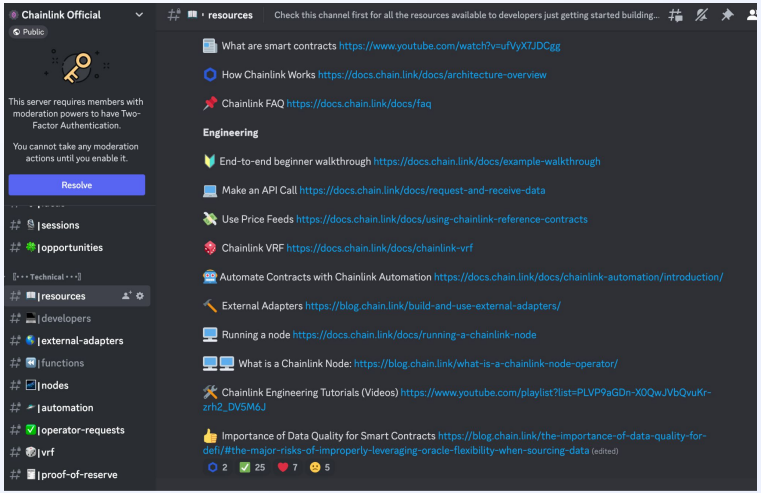
# What to get help?

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

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# What to get help?

Find Frank here:

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# Thanks