RSS3: The Open Information Layer

Natural Selection Labs

Contents

***Abstract*—Inspired by the original RSS Standard, this paper presents RSS3, the Open Information Layer for the Open Web. The paper serves as an enhanced version of our initial whitepaper titled "RSS3: A Next-Generation Feed Standard." Following the release of our initial whitepaper, we have adhered to its proposed architecture to conduct experiments and advance the development of the RSS3 Network. The Network has transformed into what is now known as the Open Information Layer, reflecting the evolving dynamics of the Open Web. This paper summarizes our research and development output since then, providing insights into RSS3's vision and its decentralization architecture. Finally, we present the Network's tokenomics and governance model, and discuss the future of RSS3.**

I. Introduction

RSS3 is the Open Information Layer, structuring Open Information for social, search, and AI. The Open Information Layer (OIL) is a conceptual layer where information flows openly without any restrictions, as it is supposed to be.

It is RSS3's mission to construct the Open Web by enhancing the free flow of Open Information.

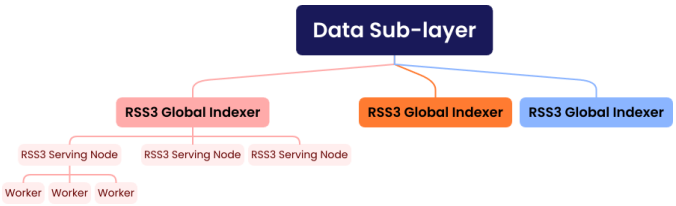

Fig. 1: A topology of the Data Sub-layer.

II. RSS3 Network

The RSS3 Network is a decentralized network that is formed by two sub-layers: the Data Sub-layer (DSL) and the Value Sub-layer (VSL).

Open Information (OI) is typically found across various types of networks, including decentralized, federated, and centralized networks that allow permissionless access. The Data Sub-layer (DSL) is responsible for indexing and structuring OI for interoperability. This is achieved by introducting a crucial standard, known as the Unified Metadata Schemas (UMS), see Section III-C, enabling network-agnostic applications to be built on top of the DSL. The DSL then leverages the Value Sub-layer (VSL), see Section IV, to build an ownership economy on the Open Web (OW).

$RSS3 is the Network's native utility token. It is used to pay query fees, operate nodes, participate in staking, and engage in various network activities.

III. Data Sub-layer

The Data Sub-layer (DSL) is responsible for Open Information life cycle management, which includes indexing, transformation, storage, dissemination, and consumption [1]. In this section we introduce the DSL and its fundamental components, see Figure 1.

The DSL is formed by two components (see section III-A and section III-B), and uses the UMS (see section III-C) to structure the information for applications in social, search, AI and beyond.

A. RSS3 Serving Node (SN)

An Serving Node (SN), also known as an RSS3 Node, is responsible for indexing, transforming, storing, and ultimately serving the Open Information to the end users.

The operation of an SN is permissionless, and is subject to a set of requirements set by the Network.

1) Indexing

Each SN operates a number of workers that index and structure OI from Permissionless Data Source (PDS). Workers are

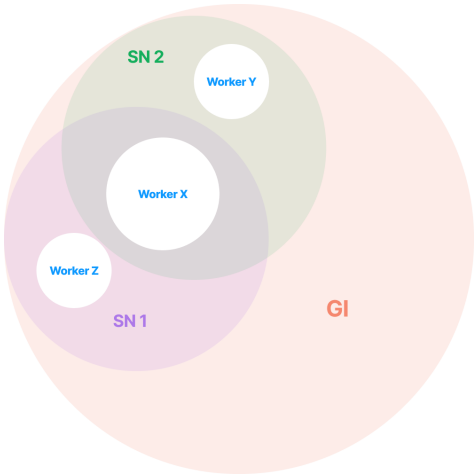

Fig. 2: A venn diagram illustrating the relationship between the worker, the Serving Node and the Global Indexer.

community-maintained "rules" that define how OI is indexed and transformed into the UMS format.

Since each SN is independent, it is possible for different SNs to employ different combinations of workers to cover different PDSs. This design enables node operation to be flexible, accessible and affordable, in turn, offering a high degree of decentralization and robustness.

2) Serving

Each SN operates a standard set of interfaces that serve structured OI in UMS to the end users via an Global Indexer (GI).

Each successful request served on the DSL is recorded and the corresponding fees paid by the requesters are distributed to the SN, see Section IV-C1 for more details.

B. RSS3 Global Indexer (GI)

A GI is responsible for facilitating coordination among SNs and engaging with the VSL, and performs critical functions to ensure the DSL is robust and reliable.

Given the importance of the GI to the Network, its operation is not permissionless and is subject to a set of stringent requirements set by the Network.

1) Performance Assurance

A GI acts as a load balancer and query router for end users to retrieve information from SNs. The unique architecture of the DSL demands GIs to be equipped with more computational capabilities, in order to work out the optimal route for end users to retrieve specific information from SN, and frequently from a group of SNs simultaneously.

2) Quality Assurance

A GI acts as a supervisor for SNs to ensure the quality of service. With the DSL being a permissionless sub-layer, the quality needs to be maintained strictly to ensure RSS3 Network's robustness and reliability. A GI monitors the quality of SNs, and slashes the SN if it fails to meet the requirements.

3) Proof-on-Chain

A GI keeps track of the work and slash records of SNs, and submits them to the VSL for settlement and reward allocation.

C. Unified Metadata Schemas (UMS)

Open Information, indexed from multiple PDSs, is structured by SNs into the UMS format for interoperability.

PDSs use different data structures, within a PDS, there might be multiple products, services and protocols that leverage a different data structure to suit their needs. This means limited interoperability, and developers need to look into each and every data structure, when it comes to building. This lack of standardization means developers must investigate each unique structure individually when building applications, which is not scalable.

The UMS addresses this issue by offering a unified set of data structures that serve as an abstraction. This abstraction simplifies the integration process, making it more manageable and scalable for developers to work with data across various data sources.

For the complete set of the UMS, refer to https://docs.rss3.io/docs/unified-metadata-schemas.

IV. Value Sub-layer

The Value Sub-layer (VSL), commonly referred to as the RSS3 Chain, is an Ethereum Layer 2 blockchain built with OP Stack uisng Celestia as the data availability layer. It is responsible for handling value derived from Open Information activities and applications, establishing a healthy ownership economy for the Network.

In this section, we focus on the intentions behind the VSL's incentive mechanism, which is designed to promote stable Node Operations to maintain the Network, and to encourage network participants to secure the Network via staking $RSS3. We introduce the detailed tokenomics separately in Section V.

The RSS3 Network allocates a portion of $RSS3 total supply to incentivize network participants, the Network Rewards (R), allocated into two reward pools: the Operating Pool (P_o) and the Staking Pool (P_s) for Normal Nodes, or the Public Good Pool (P_p) for Public Good Nodes. See Figure 3 and Section IV-C for details.

A. Node Operation

Node Operators are incentivized to operate and maintain the Network by receiving $RSS3 as rewards.

1) Anyone can become a Node Operator to launch an RSS3 Node and join the RSS3 Network without requiring prior permission.
2) A Node Operator has the ability to configure Node's coverage, which directly influences the Node's capability to respond to various types of requests. A broader coverage means more computational resources are required, and a higher chance of receiving requests.
3) A Node can be operated in either a Normal mode or a Public Good mode. A Normal Node is eligible for Network Rewards, but requires a deposit of $RSS3. A

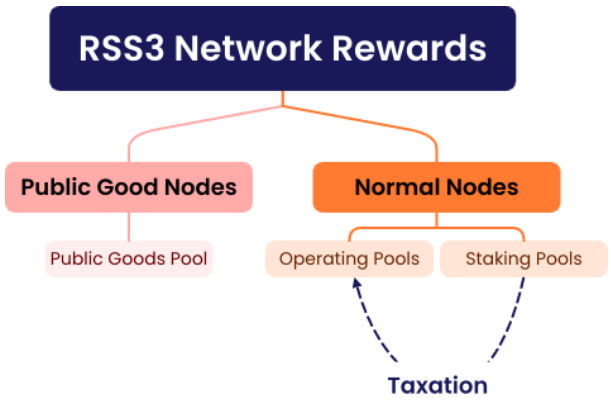

Fig. 3: RSS3 Network Rewards distribution. The Network Rewards are allocated into two reward pools: the Operating Pool (P_o) and the Staking Pool (P_s) for Normal Nodes, or the Public Good Pool (P_p) for Public Good Nodes. See Section IV-C for details.

Public Good Node is ineligible for Network Rewards, but requires no deposit.

4) A Normal Node has a corresponding P_o and a P_s. All Public Good Nodes collectively share a single P_p.

B. Node Staking

Network participants are incentivized to stake $RSS3 to secure the Network by receiving $RSS3 as rewards.

1) A Normal Node accepts staking into its Reward Pool, the amount of staked $RSS3 signifies its quality. Higher quality Nodes handle more requests.
2) A Public Good Node does not have a Reward Pool and does not participate in any form of incentivization. Staking into a Public Good Pool is accepted, and the stakers can assign their trust to any Public Good Node. Higher trust Nodes handle more requests.

C. Reward Pools

This section introduces the three reward pools: the Operating Pool (P_o), the Staking Pool (P_s), and the Public Good Pool (P_p). See Figure 3 for an illustration.

1) Operating Pool (P_o)

An Operating Pool (P_o) is used to store tokens that are allocated to a Normal Node from three sources: 1) fees collected from requests served on the DSL, denoted N; 3) the Network Rewards allocated based on the Node's work; 3) the Operating Tax (τ) collected from the Node's Staking Pool (P_s).

The allocation of Network Rewards into a Node's P_o at the end of each epoch, is determined by the number of requests served on the Data Sub-layer (N), in proportion to the total number of requests served on the DSL.

The Node Operator can set a tax rate, τ, which is applied to its P_s. The tax applies to the Network Rewards allocated to the Node's P_s, not the staked tokens (REP-1: Chip Redemption Tax).

Only the corresponding Node Operator can withdraw tokens from its P_o, and the withdrawal is subject to a waiting period imposed by the Network.

2) Staking Pool (P_s)

A Staking Pool (P_s) is used to store staked tokens for a Normal Node. Network participants can stake tokens into a Normal Node's P_s to increase the Node's chance to receive requests on the DSL.

The allocation of Network Rewards into a Node's P_s at the end of each epoch, is determined by the size of the Node's P_s, in proportion to the total staked tokens on the VSL. A tax is then applied to the received Rewards, with the rate set by its Node Operator.

3) Public Good Pool (P_p)

A Public Good Pool (P_p) is a unique reward pool that is shared by all Public Good Nodes.

V. Tokenomics

VI. Conclusion

At the heart of Natural Selection Labs, we firmly believe in the freedom of information distribution: No organizations or authorities shall prohibit the free exercise of the right of people to create, store, and distribute their information.

Glossary

DSL - Data Sub-layer
: A decentralized network where the Open Information flows from its source to its destination.

GI - Global Indexer
: A Data Sub-layer component that facilitates coordination among Serving Nodes and engages with the Value Sub-layer.

R - Network Rewards
: Tokens allocated by the RSS3 Network to incentivize network participants.

OI - Open Information
: Information that is typically found across various types of networks, including decentralized, federated, and centralized networks that allow permissionless access.

OIL - Open Information Layer
: A conceptual layer where information flows openly without any restrictions.

P_o - Operating Pool
: A pool of $RSS3 that consists of 1) Fees collected from serving Data Sub-layer requests; 2) Network Rewards allocated based on the Node's work; 3) Tax collected from its Staking Pool.

	Node in Normal Mode	**Node in Public Good mode**
Who can operate?	Anyone	Anyone
Can Node Operator specify the coverage?	Yes	Yes
Is a deposit required?	Yes	No
Is the deposit considered as staking, making it eligible for rewards from its own P_s?	No	N/A
Will the Node be slashed?	Yes, its deposit and P_s will be slashed. A Node may be demoted to receive fewer requests.	No, but a Node may be demoted to receive fewer requests.
Does the Node accept staking?	Yes. The staked tokens go to the Node's P_s. RSS3-X (X being the Node's name) Chips are issued to the stakers after staking.	No, as such a Node does not have a Staking Pool. Instead, stakers stake to a Public Good Pool. RSS3-Public Good Chips are issued to the stakers after staking.
Can Node Operator set an Operating Tax (τ)?	Yes	No, a universal tax is determined by the Network.
Does it have an Operating Pool?	Yes	No, operator rewards go to [X]
Does it have a Staking Pool?	Yes	No, but a Public Good Pool with a universal incentive rate.

TABLE I: Comparison of two Node operation modes.

OW - Open Web
: The next-generation Internet where information flows openly without any restrictions, as it is supposed to be.

PDS - Permissionless Data Source
: A repository of data that can be accessed without the need for authorization or authentication.

P_p - Public Good Pool
: A collective pool of staked $RSS3 that is used to improve the RSS3 Network by assigning trust to Public Good Nodes.

SN - Serving Node
: A Data Sub-layer component that indexes, cleans, stores, and ultimately serves the Open Information to the end users.

P_s - Staking Pool
: A pool of staked $RSS3 that is used to improve the RSS3 Network by assigning trust to Normal Nodes.

τ - Operating Tax
: A tax rate set by a Node's Operating Pool, collecting from the Network Rewards that are allocated to its Staking Pool.

UMS - Unified Metadata Schemas
: A unified set of data structures for interoperability.

VSL - Value Sub-layer
: A blockchain where the value created by Open Information activities is recorded and distributed.

REFERENCES

[1] National Institute of Standards and Technology. Information life cycle. https://csrc.nist.gov/glossary/term/information_life_cycle, 2016.