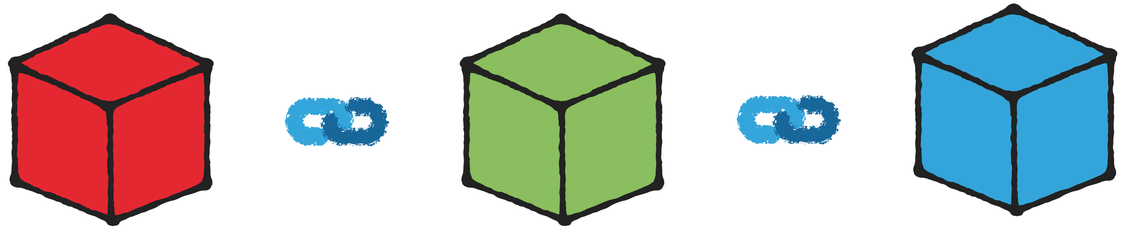

The Writing is on the Wall: Analyzing the Boom of Inscriptions and its Impact on EVM-compatible Blockchains

MAX PLANCK INSTITUTE FOR SOFTWARE SYSTEMS

Imperial College London

NOVA IMS Information Management School

Matter Labs

Universität Zürich[UZH]

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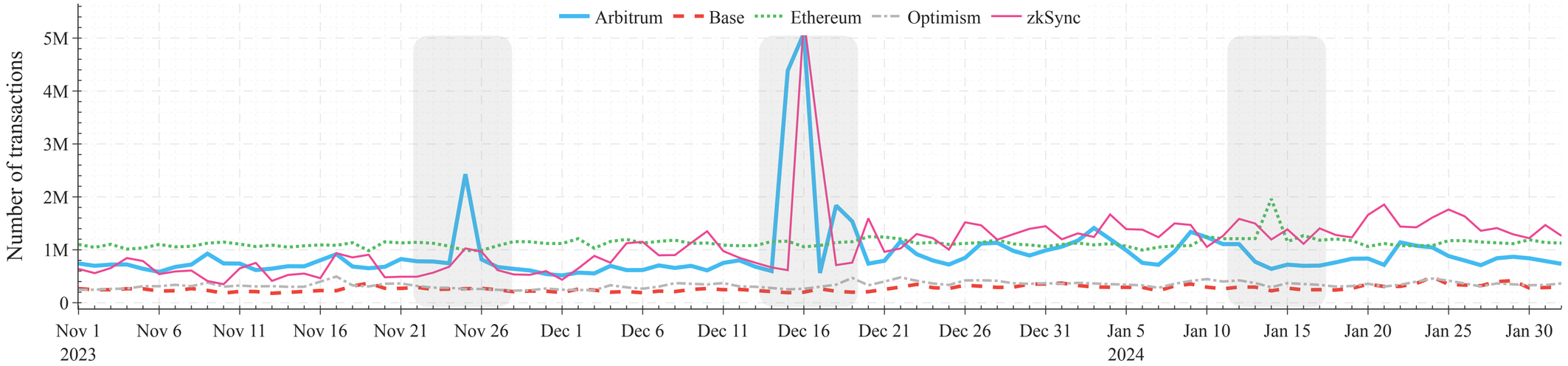
CAAW–FC in Miyakojima, Japan

April 18th, 2025

Joint work with Krzysztof Gogol, Maria Inês Silva, and Benjamin Livshits

johnnatan-messias.github.io

Transactions Boom 💥



Transactions Boom

CoinDesk

TECH

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Arbitrum Hit by 'Partial Outage' Due to Traffic Surge

The layer-2 blockchain stopped working as intended Friday morning.

BY DANNY NELSON | EDITED BY NICK BAKER

Updated Mar 8, 2024, 6:45 p.m. UTC Published Dec 15, 2023, 4:46 p.m. UTC

Arbitrum booth at ETHDenver (Danny Nelson/CoinDesk)

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Arbitrum's sequencer stalled "during a significant surge in network traffic," according to posts across the network's social media on Friday. "We are working to resolve as quickly as possible and will provide a post-mortem as soon as possible," read a post on Arbitrum's status webpage.

COINTELEGRAPH
The future of money

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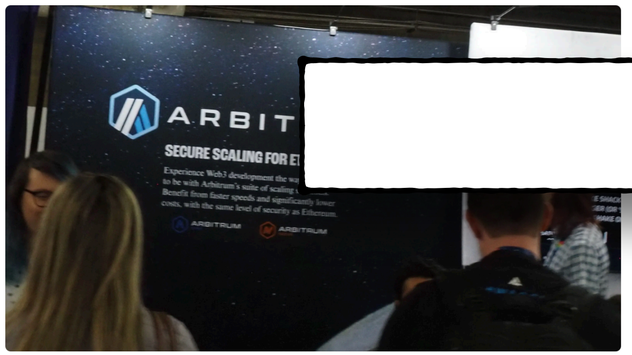

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And many more...

Transactions Boom 💥

What are these transactions?

- **Understanding these transactions** is key to **understand our ecosystem**!
- We must **gain insights** from these transactions.

Who issued these transactions?

- We need to **better understand our users** and the **projects deployed on-chain**.
- What do they **reveal** about our **community** and **emerging trends** within our **ecosystem**?

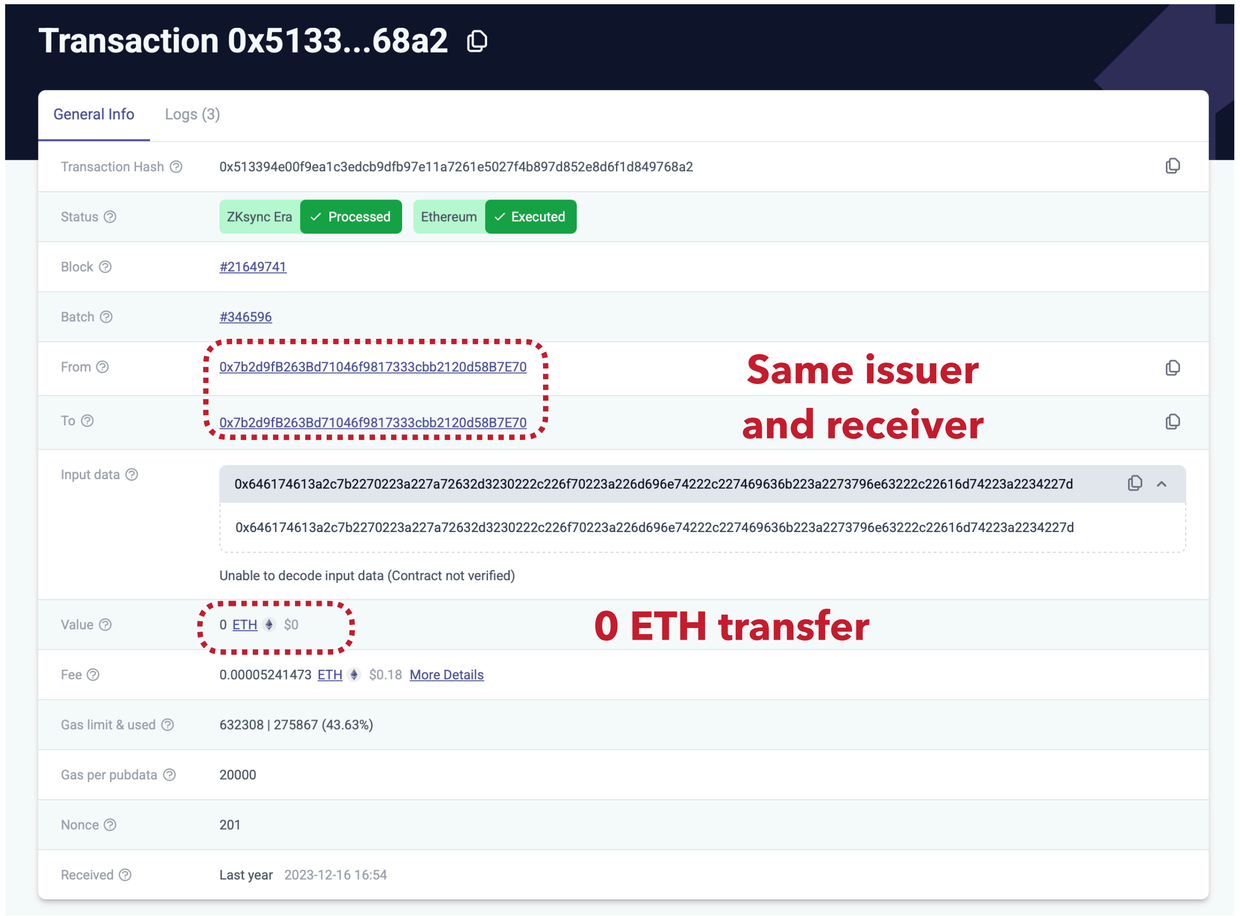
What is the lifecycle of these transactions?

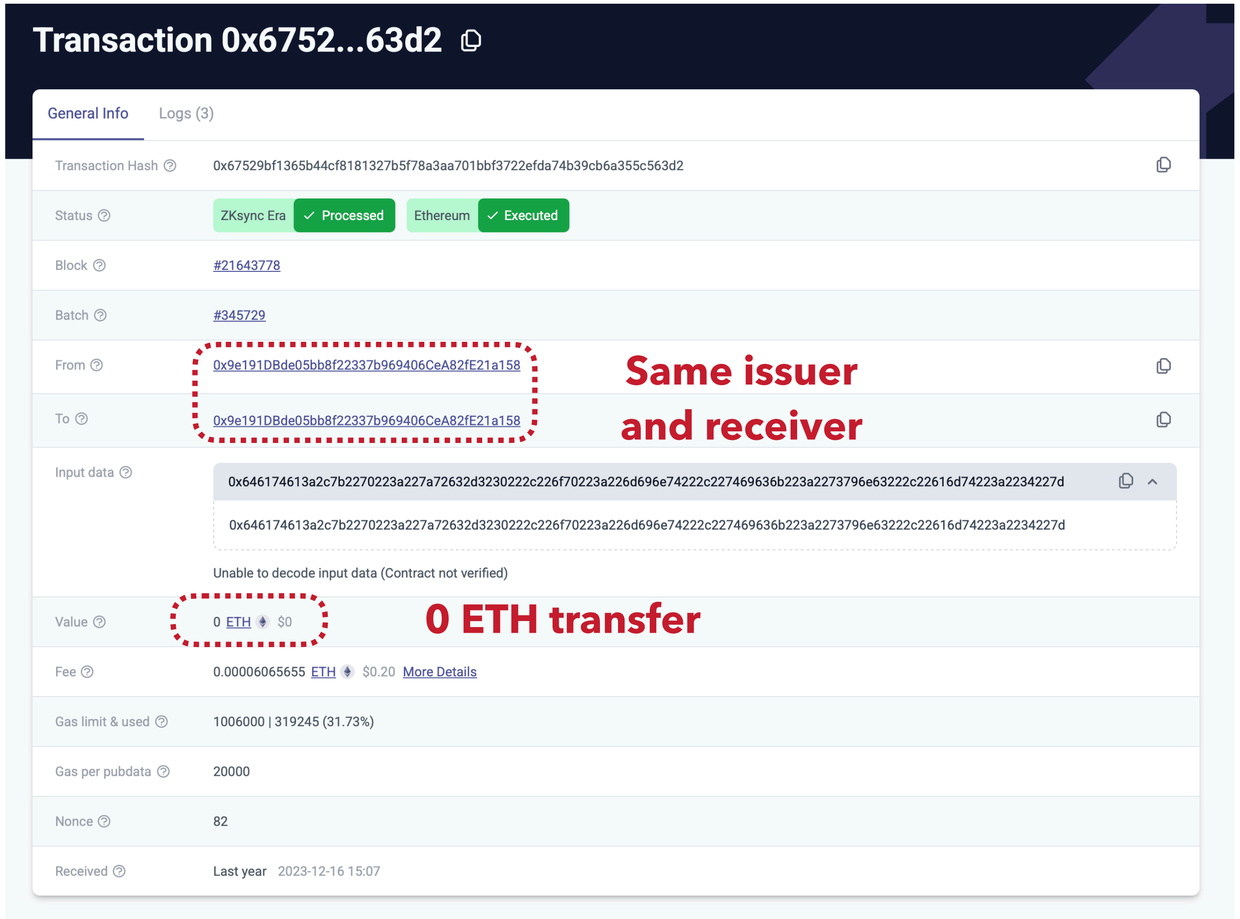
- Is the **boom** coming to an **end**?
- We need to **ensure our infra scales** to support them accordingly.

How much are they spending on fees?

- Why are **users spending too much on** these **transactions**?
- Which **chain collected the most**?

What Are These Transactions?





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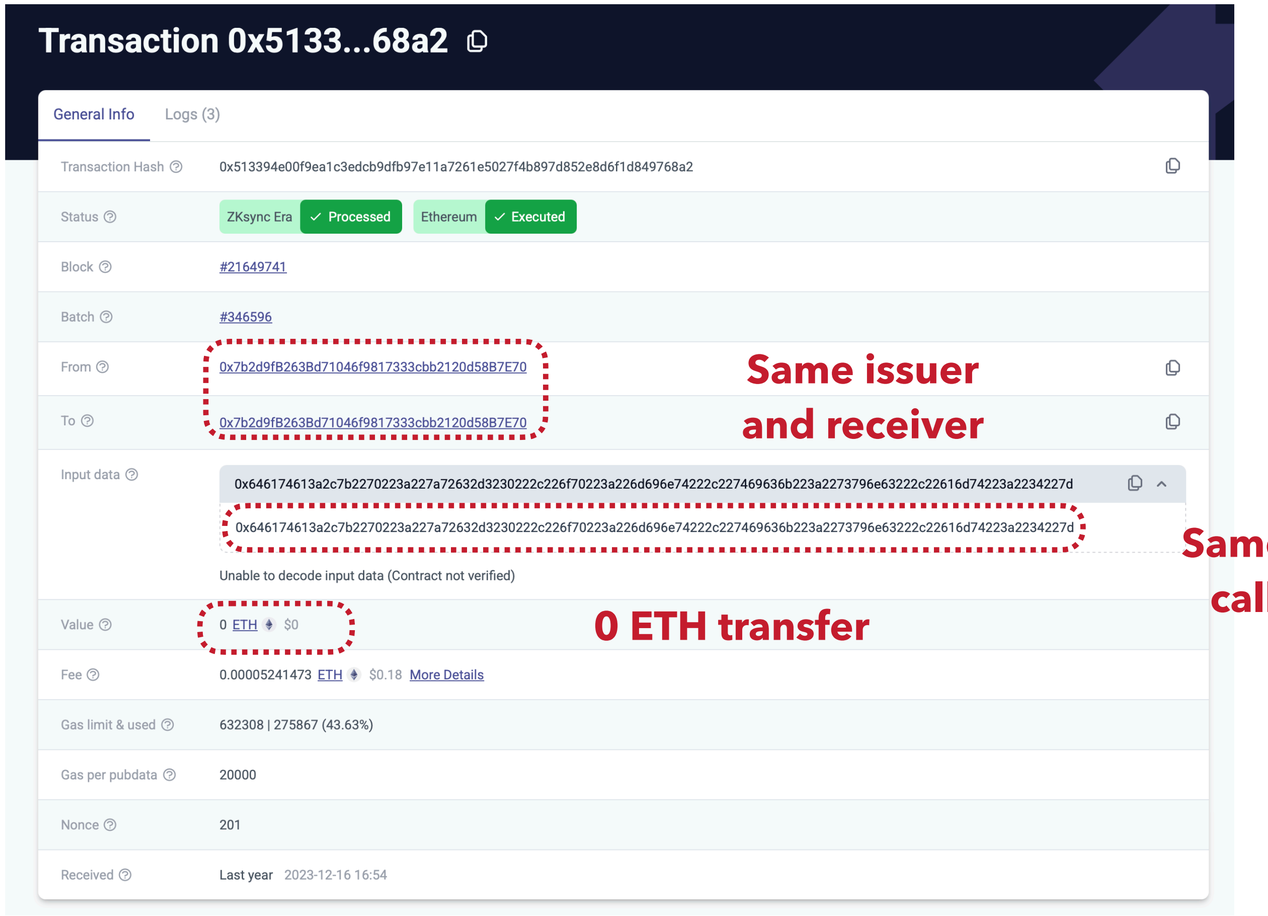
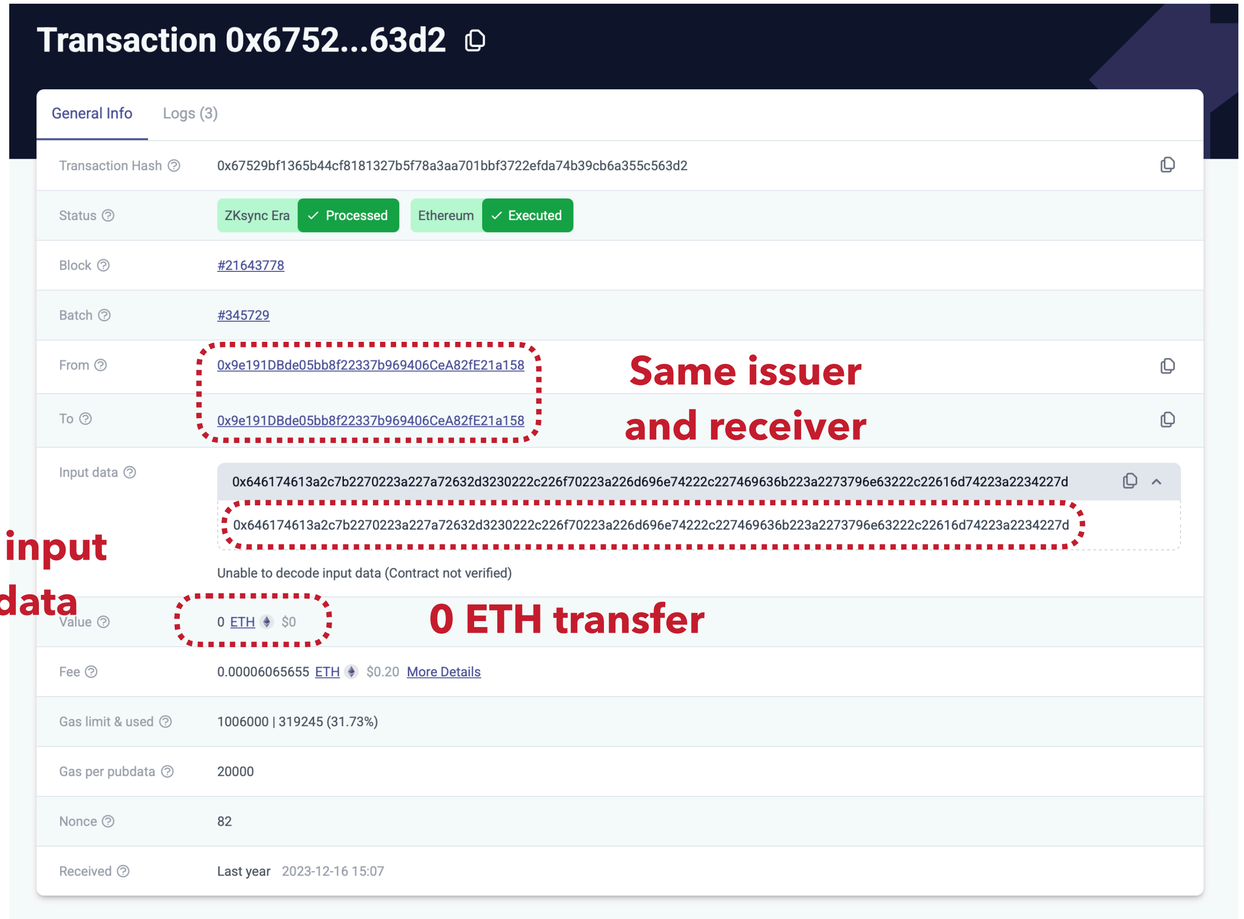


Same input call data



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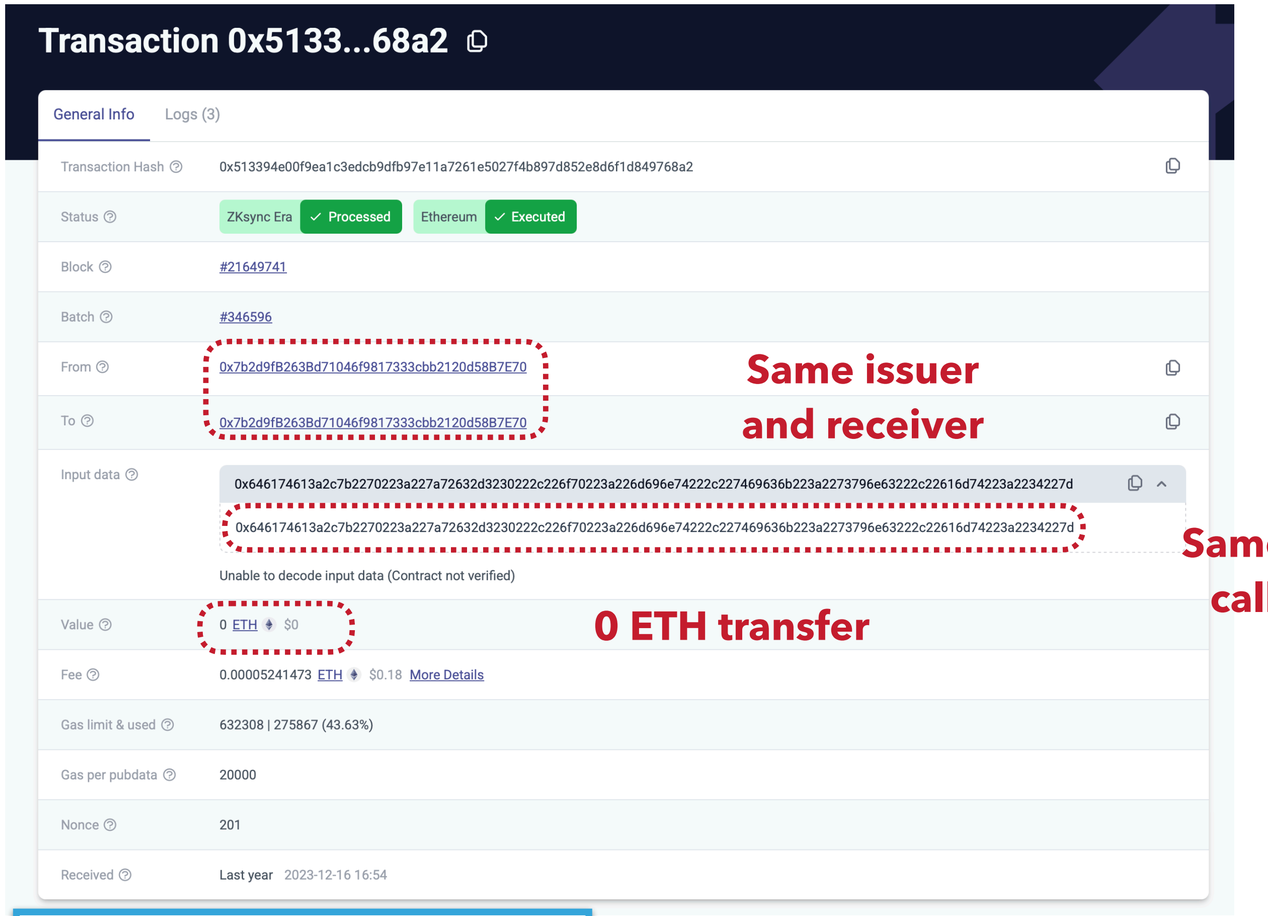
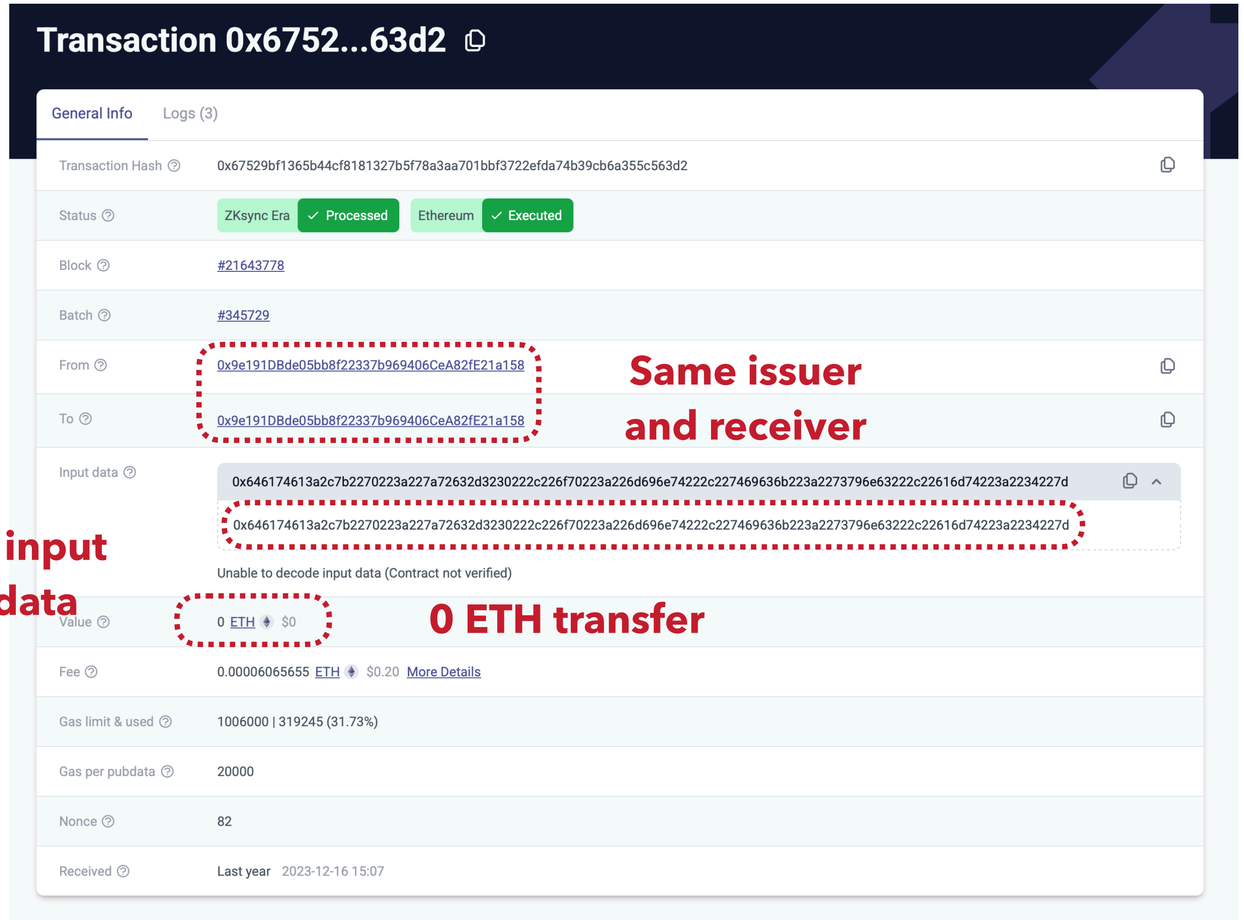




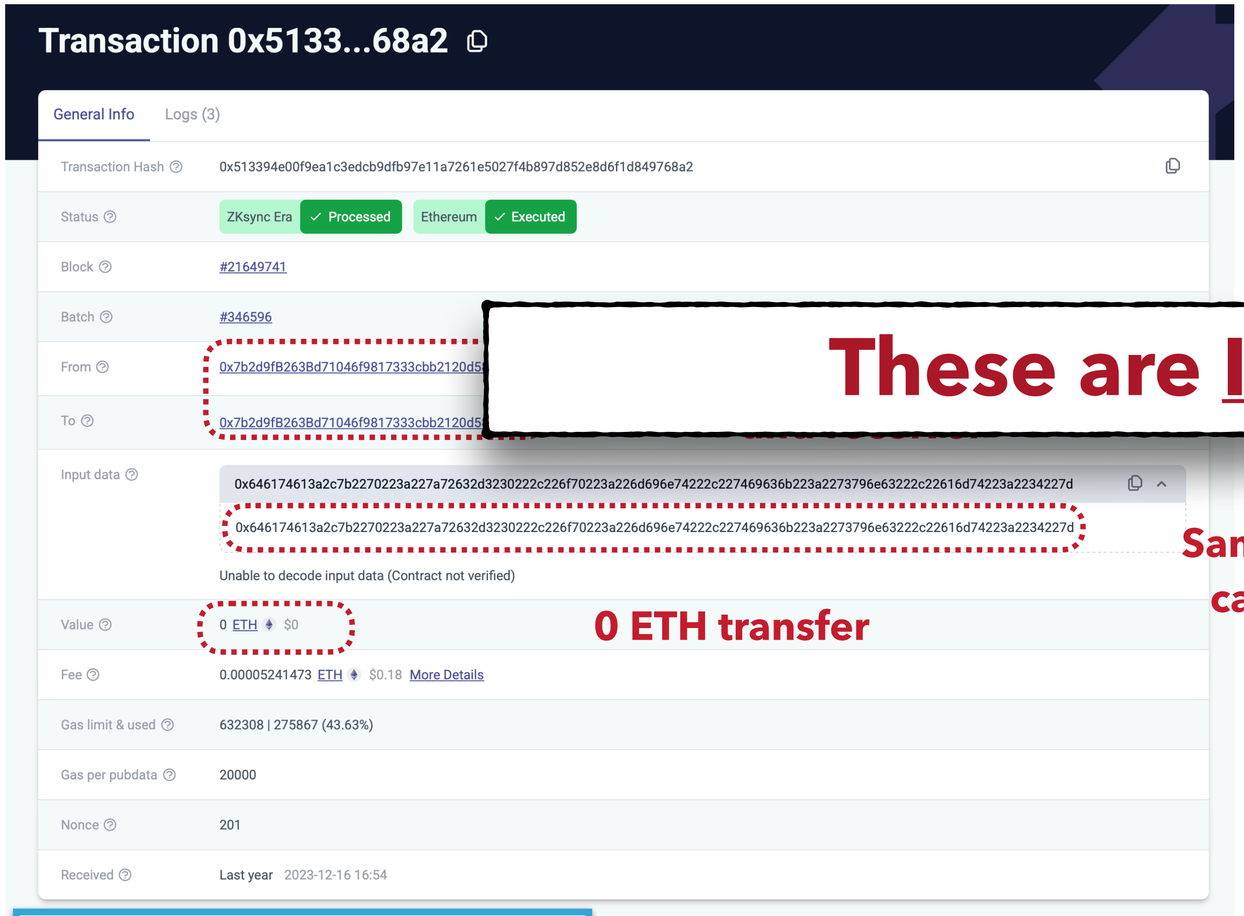
Same input call data

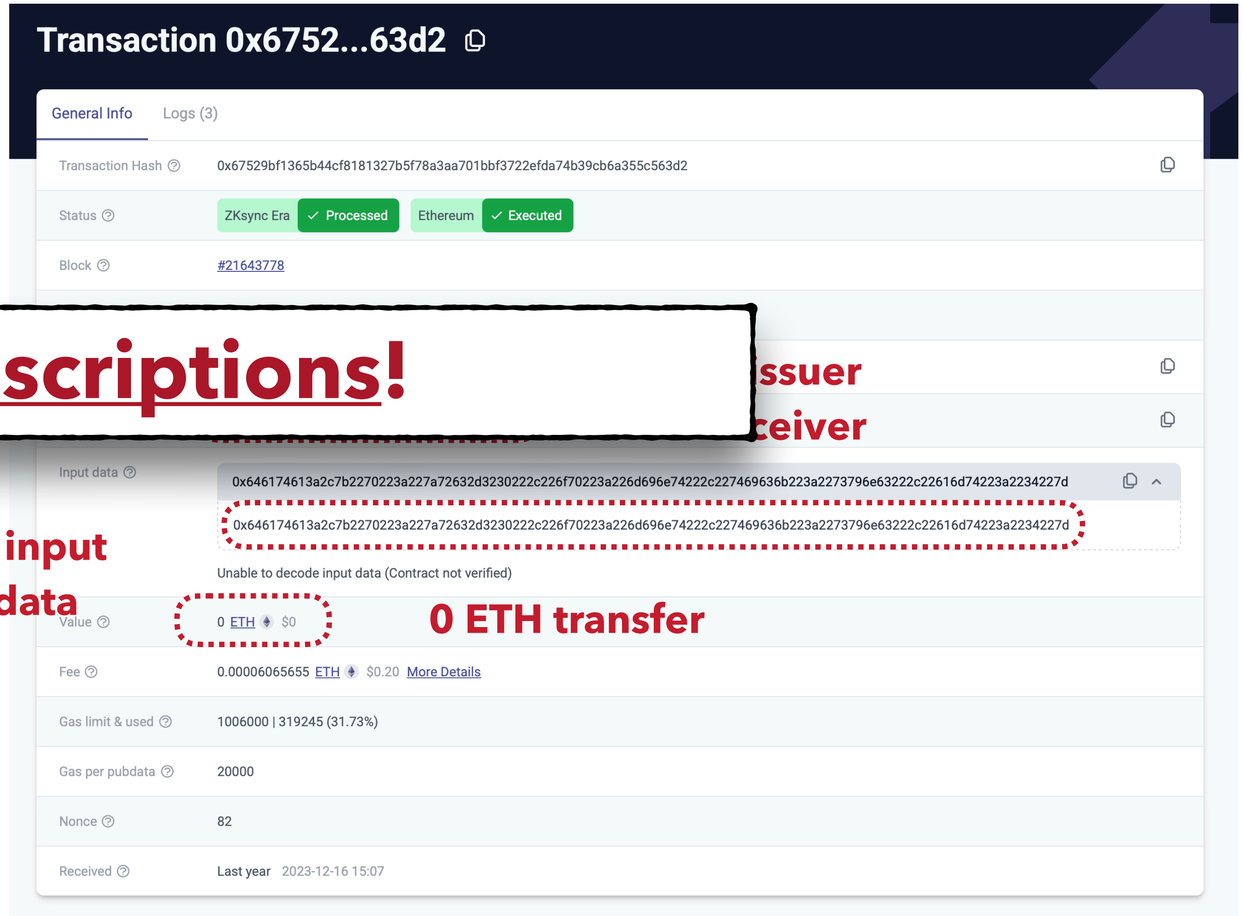
```
input_data =
"0x646174613a2c7b2270223a227a72632d3230
222c226f70223a226d696e74222c227469636b2
23a2273796e63222c22616d74223a2234227d"
```

```
web3.Web3.to_text(input_data)
'data:,{"p":"zrc-20","op":"mint","tick":"sync","amt":"4"}'
```

🔎 **Filter transactions by "0x646174613a" == "data:"**

What Are These Transactions?





These are Inscriptions!

Same input call data

0 ETH transfer

0 ETH transfer

```
input_data =
"0x646174613a2c7b2270223a227a72632d3230
222c226f70223a226d696e74222c227469636b2
23a2273796e63222c22616d74223a2234227d"
```

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'data:,{"p":"zrc-20","op":"mint","tick":"sync","amt":"4"}'
```

🔎 **Filter transactions by "0x646174613a" == "data:"**

What Are Inscriptions 📜?

- {"p":"zrc-20","op":"deploy","tick":"sync","amt":"21000000","limit":"4"}
- {"p":"zrc-20","op":"mint","tick":"sync","amt":"4"}
- {"p": "zrc-20", "op": "transfer", "tick": "sync", "amt": "4"}
- {"p":"era-20","op":"list","tick":"bgnt","amt":"250","price":"1500000000000000"}
- {"p":"era-20","op":"buy","tx":"0xda..."}

Definition 🤔

- The idea originated with the introduction of *ordinals* in Bitcoin.
- Arbitrary data embedded in blockchain transactions (text, images, code).
- Stored in the transaction input call data, encoded in HEX.
- They do not rely on a smart contract. Upgrades are unsure.

BigInt.
ZKSMARKET

Key Operations ⚙️

Deploy

- **Initializes** a new **inscription token** by specifying the **protocol name, token identifier (tick), total supply**, and the **maximum number of tokens** that can be minted per transaction.
- **Example:** Deploying a **ZRC-20 token** with a **total supply** of **21 million** and a **mint limit** of **4 tokens per transaction**.

Mint/Claim

- **Allows users** to **generate (or claim ownership of) inscription tokens** based on the **previously deployed inscription rules**.
- Users must specify the **token identifier** and the **amount** they want to **mint**, adhering to the **deploy operation's limits**.

Transfer

- **Facilitates** the **movement** of **inscription tokens** between **users** by **encoding the transaction** with the relevant **token details**.
- **Ownership** changes hands upon **successful completion** of the **transaction**.

List

- **Enables users** to **place** their **inscription tokens for sale** on **marketplaces** by specifying the **token quantity** and **desired price**.
- Primarily used to **facilitate trading** in the absence of **smart contract functionality**.

Buy or Sell

- **Allows users** to **purchase** or **sell inscription tokens** listed on a **marketplace**.
- The **buy** and **sell operations** references a previous **list transaction** and **executes** the **purchase** or **sell** at the **defined price**.

Data Pipeline

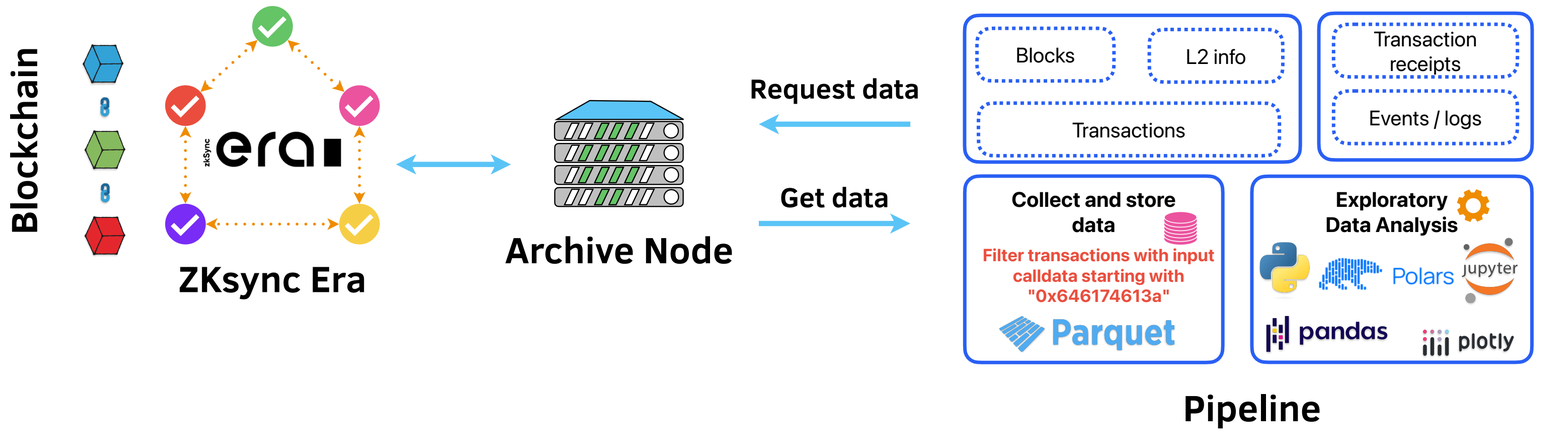
5 chains

ARBITRUM BASE ethereum OPTIMISM zkSync era

Dataset

2 data sources

zkSync era



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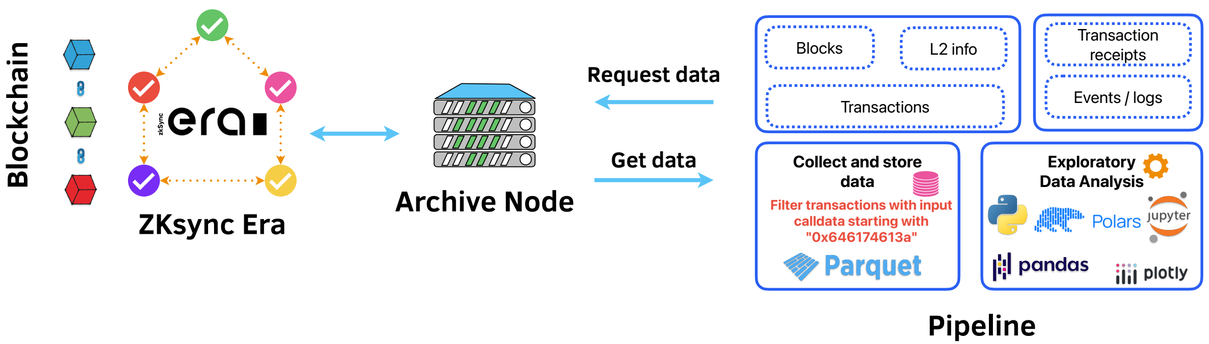

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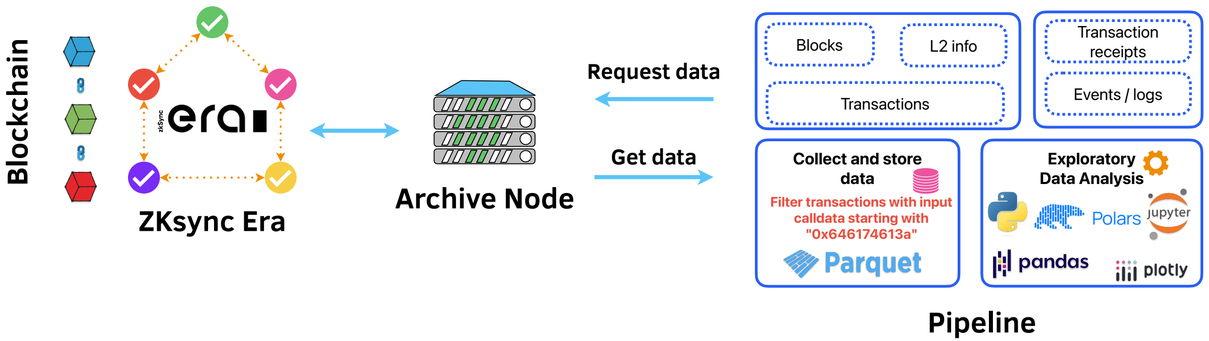
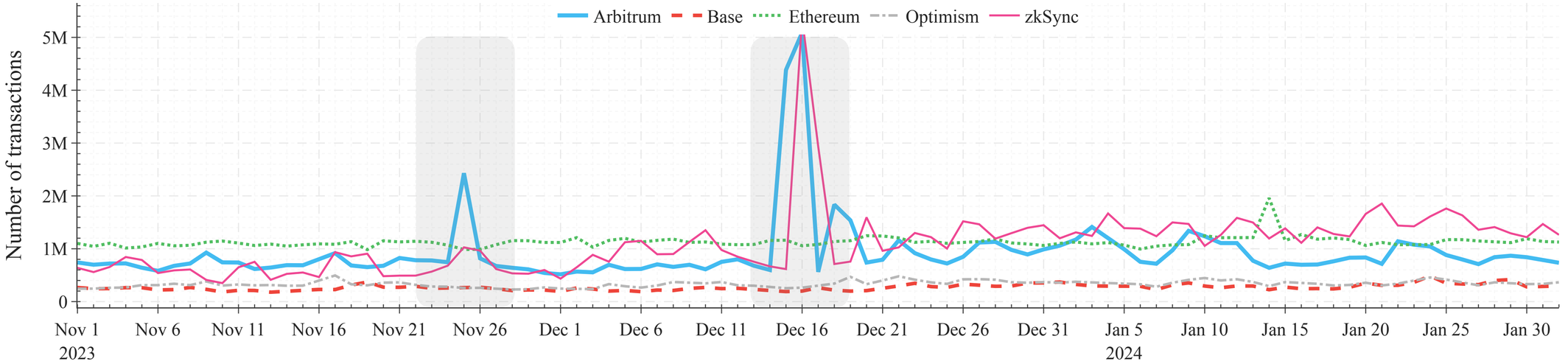


Pipeline

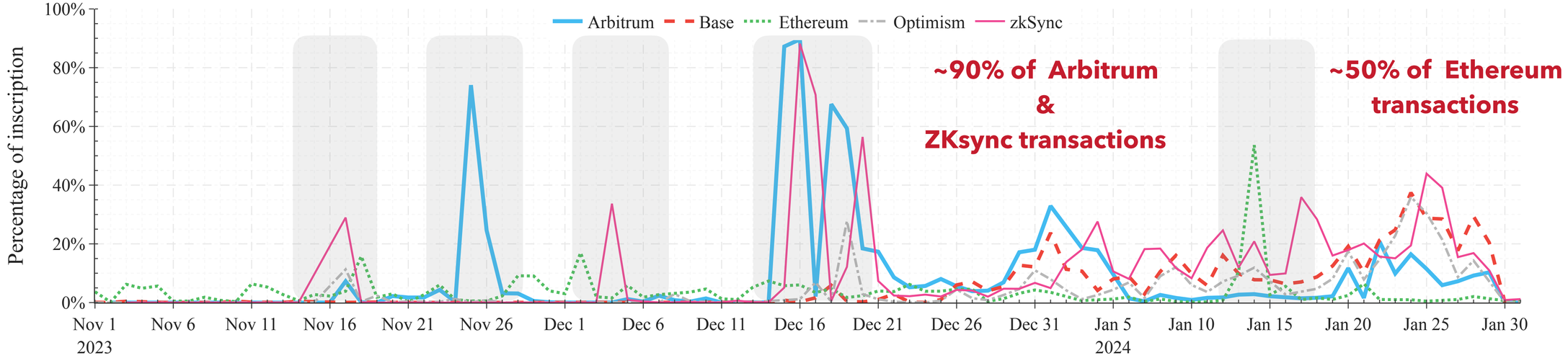
Blockchain	Start date (2023)	End date (2024)	# of issuers	# of blocks	# of inscriptions
Arbitrum	June 17	April 30	118,544	3,575,299	16,309,035
Base	July 28	April 30	79,573	780,770	2,020,661
Ethereum	June 14	April 30	245,008	930,824	6,493,580
Optimism	June 18	April 30	49,112	588,053	1,475,663
ZKsync Era	June 18	April 30	481,687	2,809,054	17,161,306

Data set used to analyze inscription events on five blockchains

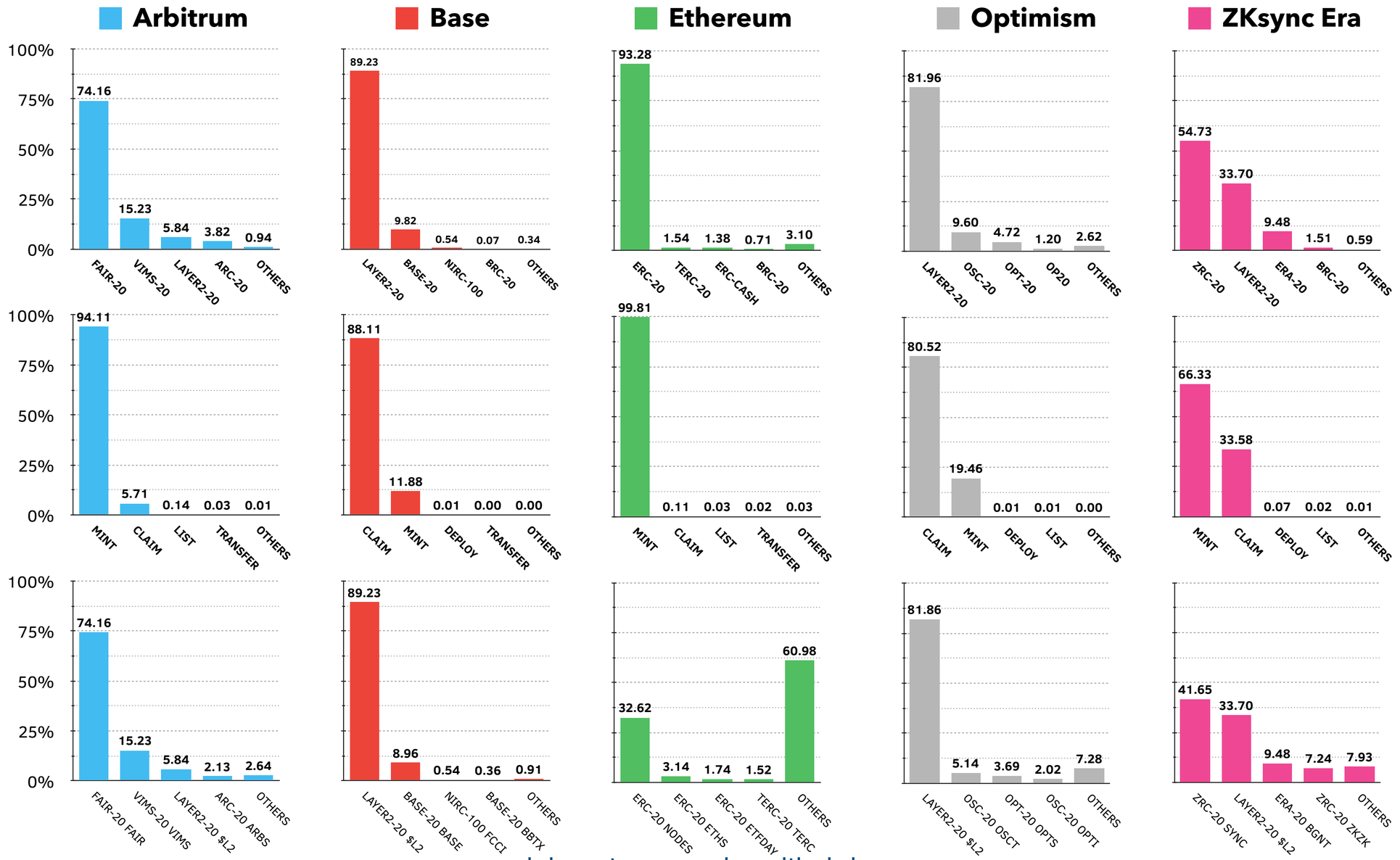
Inscriptions Boom 💥



How representative are these inscriptions 📊?



Inscriptions Boom 💥 — Operation Types



Inscriptions Boom 💥 — Issuers

Who issued these transactions 🤔?

Blockchain	# of issuers	Mean	Std.	Median	Min.	Max.
Arbitrum	118,544	137.57	676.76	6	1	38,050
Base	79,573	25.39	154.91	3	1	19,674
Ethereum	245,008	26.50	245.60	3	1	67,713
Optimism	49,112	30.04	168.05	3	1	19,612
ZKsync Era	481,687	35.62	245.35	3	1	40,770

Inscription transactions per issuer

Inscriptions Boom 💥 — How Much Spent on Fees 🤑?

Blockchain	Token	Operation	Total (in ETH)	Mean	Std.	Median	Min.	Max.
Arbitrum	fair-20 fair	mint	0.77	74.10	305.72	60.87	0	488,849.89
Arbitrum	layer2-20 $L2	claim	0.03	40.12	18.83	34.77	0.57	500.85
Base	layer2-20 $L2	claim	0.0016	1.03	8.27	0.02	0	2199.20
Ethereum	erc-20 nodes	mint	0.19	176.70	7015.97	99.32	0.01	1,351,757.78
Optimism	layer2-20 $L2	claim	0.0009	0.78	3.04	0.11	0	1617.84
ZKsync Era	zrc-20 sync	mint	**88.86**	12,684.59	3795.42	12,748.95	0	1,097,718.16
ZKsync Era	era-20 bgnt	mint	11.31	7114.49	2525.91	6292.83	0.32	244,836.15
ZKsync Era	era-20 bgnt	list	0.015	4839.49	9528.53	272.57	0	60,807.70
ZKsync Era	layer2-20 $L2	claim	0.017	29.63	6.90	28.38	0.42	2001.14

Inscription operations cost in GWei for major tokens

Users spent alone 88.86 ETH
in just one inscription.

The Future of Inscriptions

- **Inscriptions: Good or Bad?**
  - Rollups experienced **downtime**, impacting users.
  - This **stress-tested** their ability to handle transaction surges.
  - Blockchains need to scale further for **global adoption**.
- **Challenges & Opportunities in Trading**
  - Inscriptions **cannot be traded on AMMs**.
  - **Ownership tracking is unclear**—who really owns what?
  - Improved **standards and transparency** are needed to define ownership.
- **Hope or Hype?**
  - Social media engagement fueled the trend.
  - Early surge followed by **declining user interest**.
  - No mechanism to prevent **re-purchasing of previously sold inscriptions**.
  - **Bots dominate minting**—should inscriptions be airdropped directly to wallets instead?

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