Picolo: Fast, Decentralized Globally Distributed Database Network[☆]

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Abstract

Picolo is a fast, scalable, verifiable, fully-decentralized, globally distributed transaction oriented database for blockchain-based Applications. Picolo uses a probabilistic replication framework on top of DHTs to achieve a O(1) lookup latency for most queries. Its the first and so-far only system of its kind to distribute data at a global scale will full-decentralization and externally-consistent distributed transactions.

- Allows for verifiable transaction logs.
- Token economics that gamify honest participation from nodes over malicious intent.

Keywords: Decentralization, Blockchain, Crypto economics, Database, Distributed, SQL

1. Introduction

- What are Dapps. Dapps will grow, but need to store data.
- Solutions today provide file storage semantics which might not work for all application types.
- Introduce the database problem on the blockchain. What are the requirements for a decentralized database.

[☆]Work in progress, Version 0.1 Draft.

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- Overview of current approaches and limitations (details in the Background and Related work section).

1.1. Picolo's Features

- Network layer Scales with O(log N) overhead for N nodes.
- Network lookup using O(1) amortized lookup cost for DHT.
- Horizontally scalable
- Automated data sharding
- Transactions can be applied across rows, columns and tables across machines
- Client controlled replication and data placement
- Synchronous replication and external consistency, the strongest form of consistency any database can support
- SQL like interface
- Supports storage of typed data
- Supports semi-relational structure for tables
- Configurable backups and restore mechanisms
- Verifiable legder for transactions.

2. Background

- item

3. Overall Design

- Overall Picolo architecture.
- Token economics.

4. Network Subsystem

- DHT layer for lookup. Replication and caching for O(1) lookups for popular items.
- Token economics for incentivized participation.
- Building with BFT.

5. Database Subsystem

5.1. Cluster

5.2. Versioning

5.3. Consensus, Replication and Token economics

5.4. Handling Failures

5.5. Recovery from failures

5.6. Clients

5.7. Query execution

5.8. Sharding

5.9. Transactions and hybrid time

Treatments	**Response 1**	**Response 2**
Treatment 1	0.0003262	0.562
Treatment 2	0.0015681	0.910
Treatment 3	0.0009271	0.296

Table 1: Table caption

$$e = mc^2 \tag{1}$$

Some factors that affect prices of cryptos are listed below. These factors are by no means exhaustive but provide a framework within which mechanisms to analyze them can be discussed. See the sub sections where some techniques are presented. [1] Factors affecting the prices of crypto assets:

6. Verifiable data structures, encryption, data sovereignty

7. Attacks on the system

8. Conclusion

Initial implementations of AI algorithms that analyze structured and unstructured data are discussed. Unstructured data is analyzed in two steps: first, at a unit level and second as a sequence by feeding it to an LSTM. Structured data consisting of live feed from exchanges, current and past bets on the platform amongst others is represented as a game state where an independent decision making agent learns to take actions that maximize its game score. A method of determining payouts to platform users is discussed where they are determined by the magnitude as well as the category of contribution.

9. References

[1] Adi Kancherla and Arunesh Mishra. Picolo: Fast, decentralized globally distributed database network. `https://picolo.network/Whitepaper.pdf`.