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Renovating Blockchain with Distributed Databases: An Open Source System

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Abstract

A blockchain is a decentralised linked data structure that is characterised by its inherent resistance to data modification, but it is deficient in search queries primarily due to its inferior data formatting. A distributed database is also a decentralised data structure which features quick query processing and well-designed data formatting but suffers from data reliability. In this work, we showcase ChainSQL, an open-source system developed by integrating the blockchain with the database, i.e. we present a blockchain database application platform that has the decentralised, distributed and audibility features of the blockchain and quick query processing and well-designed data structure of the distributed databases. ChainSQL features a tamper-resistant and consistent multi-active database, a reliable and cost effective data-level disaster recovery backup and an auditable transaction log mechanism. The system is presented as an operational multi-active database along with the data-level disaster recovery backup and audibility features. A comprehensive experimental evaluation is performed to demonstrate the effectiveness of the system.

Keywords: Blockchain, Distributed Databases, Blockchain Application

1. Introduction

Digital or crypto currencies such as, Bitcoin [1], Ethereum [2], Ripple [3] and others, have recently witnessed a tremendous interest from the user as well as the developer community [4, 5, 6]. The crypto currencies are essentially smart contracts between users which are executed using a data structure referred to as 'blockchain'. Thus, a blockchain stores transactions whilst satisfying the following two constraints: (i) anyone should be able to write to the blockchain, and (ii) there should not be any centralised control.

A blockchain is a database and an application software on top of it [7] that dictates the data definition and data update mechanism for the blockchain. A blockchain not only allows

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