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SISSLE in Consensus-Based Ripple: Some Improvements in Speed, Security, Last Mile Connectivity and Ease of Use

Authors : Mayank Mundhra, Chester Rebeiro

Abstract : Cryptocurrencies are rapidly finding wide application in areas such as Real Time Gross Settlements and Payments Systems. Ripple is a cryptocurrency that has gained prominence with banks and payment providers. It solves the Byzantine General's Problem with its Ripple Protocol Consensus Algorithm (RPCA), where each server maintains a list of servers, called Unique Node List (UNL) that represents the network for the server, and will not collectively defraud it. The server believes that the network has come to a consensus when members of the UNL come to a consensus on a transaction. In this paper we improve Ripple to achieve better speed, security, last mile connectivity and ease of use. We implement guidelines and automated systems for building and maintaining UNLs for resilience, robustness, improved security, and efficient information propagation. We enhance the system so as to ensure that each server receives information from across the whole network rather than just from the UNL members. We also introduce the paradigm of UNL overlap as a function of information propagation and the trust a server assigns to its own UNL. Our design not only reduces vulnerabilities such as eclipse attacks, but also makes it easier to identify malicious behaviour and entities attempting to fraudulently Double Spend or stall the system. We provide experimental evidence of the benefits of our approach over the current Ripple scheme. We observe ≥ 4.97x and 98.22x in speedup and success rate for information propagation respectively, and ≥ 3.16x and 51.70x in speedup and success rate in consensus.

Keywords : Ripple, Kelips, unique node list, consensus, information propagation
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