INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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SHORT ABSTRACT

The Payment Channel Network, a layer two solution, serves as an alternative for improving the scalability of a blockchain network. The number of transactions on the network will rise in conjunction with its expansion. However, because they are static, the current distributed routing algorithms can't efficiently schedule multiple transactions at the same time. This thesis proposes distributed routing strategies for payment channel networks to address concurrency, attacks, deadlocks, and cost minimization. We have developed the maxECW and maxSCL approaches, which are superior in managing concurrent transactions. We enhance these strategies to present a new algorithm, maxREE, which efficiently handles concurrent transactions with minimal overhead and avoids the limitations of previously proposed algorithms. We prove that routing two transactions in PCN is NP-complete by deriving it from a two-commodity flow problem. The proposed DEPR method circumvents deadlock problems, unlike other approaches that mitigated deadlock through the utilization of locking mechanisms or priority queues. We present Swift, a decentralized routing algorithm that emphasizes the minimization of fees. We have analyzed the impact of wormhole and flood-loot attacks on distributed routing systems. We assessed the impact of the attack on routing algorithms by analyzing attack gain, attack cost, and attack transaction ratio. Furthermore, we have developed a simulator, DRLNsim, to assess our algorithms in comparison to existing methodologies.