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FairFetched : Fair Quality-of-Service for Decentralized Marketplace Search

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Résumé
Decentralized marketplaces aim to solve censorship and bias issues of established centralized systems (e.g. Amazon, Ebay), notably by using blockchain and decentralized storage systems (e.g. IPFS) as building blocks. In those systems, anyone can contribute resources to be sold, rented, while other users may try to acquire them. A match-making algorithm determines how to match buy and sell orders emanating from each side of the market, as well as the rules when there is competition between multiple buyers on the same resource. Proposing new resources for sale on those marketplaces is resistant to censorship, but current solutions either lack an integrated search mechanism (e.g. OpenBazaar) or use a centralized search mechanism (e.g. OpenSea), thereby reintroducing censorship and bias risks.
Novel decentralized search mechanisms for decentralized marketplaces, DeSearch[1] and HyPeerCube[2], rely on a subset of users contributing their computing resources to run the decentralized search protocol, thereby becoming service providers. Desearch additionally uses Trusted Execution Environments (TEEs) to preserve trust on search results all the way back to the content in the decentralized storage system.
In a context where resources are scarce and valuable, we must ensure that service providers cannot favor themselves or colluding users by slowing down service for non-accomplices. Indeed, potential consumers first need to search available resources. If there exists a significant and intentional delay when providers serve honest consumers, this confers an unfair advantage to malicious consumers and their colluding service providers.
Recent work on decentralized search mechanisms for decentralized marketplaces is vulnerable to such attacks : service providers have the power to throttle responses to honest consumers, in favor of their accomplices. Indeed, even with TEEs, the security properties they provide do not cover timing attacks that enable maliciously differentiated service speeds. This work aims to provide a protection against intentionally delayed service through two main axes : by enabling consumers to optimize their quality of service in an adversarial decentralized environment, and by limitting the severity of unfair Quality-of-Service attacks through consumer-TEE cooperation.

Bibliographie

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