Management of a Decentralized Storage Network

The digital world is increasingly reliant on vast amounts of data, necessitating robust and scalable storage solutions. Traditional centralized systems have inherent vulnerabilities, including single points of failure, censorship risks, and privacy concerns. Decentralized storage offers a compelling alternative, distributing data across a network of independent nodes.

While decentralized storage is a powerful concept, it brings about its own set of challenges. One particular aspect is the management of the storage network, defining the topology of the network, handling the remuneration or penalization of the nodes based on their performed work, and tracking user credits for writing and accessing data. These aspects are challenging because users and nodes may act in their own interest or even maliciously and the management system itself must be decentralized.

The goal of this Master's thesis is to design management components for a prototype of a decentralized storage system on the Internet Computer, a decentralized blockchain network. Details about the storage system will be made available when starting the project. Concretely, the tasks are the following:

- Acquire knowledge about the storage network PoC and the Internet Computer.
- Design the management system functionality to be executed in one or more canisters.
- Implement the designed management system and integrate it with the storage network.
- Analyze the guarantees provided by the management system with respect to user and storage node behavior and evaluate its performance empirically.

Requirements

High motivation and strong foundation in distributed systems. A solid mathematical background is essential, and prior exposure to areas like blockchain technology and game theory is helpful. To ensure your ideas will work in practice, implementing prototypes and benchmarking performance will complement the theoretical part of the thesis. We will provide weekly guidance and discussion sessions to support you.

Contact

Interested? Please reach out with a brief description of your motivation in the project, along with any relevant courses or prior projects (personal or academic).

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