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A reflection report on Green ICT Hackathon

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1 Introduction

The Green ICT Hackathon is part of a series of activities investigating ICT's role in sustainability. This year, the hackathon was organized by the University of Eastern Finland and Luleå University of Technology, Sweden. The students of these two universities develop prototypes, make presentations, and present them two times during the hackathon by forming groups. Since it was a marathon, the students had to do all of the tasks under a set time limit (48 hours). The PhD and Postdoctoral researchers of Luleå University of Technology selected and presented the topics.

2 Learning summary of the hackathon

The hackathon started with a lecture describing the concept of Green ICT, and some case studies by professor Agbo Friday Joseph from the University of Eastern Finland. I became familiar with the idea of green ICT. ICT is supposed to contribute significantly to global warming due to energy usage and other unintended consequences, however I found that utilizing green ICT has two advantages. We may first develop energy-efficient solutions, then use these solutions to really improve people's lives in a range of contexts. One illustration is the use of ICT by African doctors to treat patients in remote locations. The use of ICT in this case saves a lot of time, energy, and other resources because the patients and the doctor do not have to travel. I was better able to understand how researchers in Luleå are tackling challenging problems to meet various SDG goals and improve people's quality of life, such as reducing energy consumption by monitoring energy use, advantages of using a decentralized approach for documentation, or developing an autonomous process to remove bias when taking feedback. Next, we formed groups and I was delighted to work closely with the students from Finland in group 11. Our assigned topic was Green Decentralized Reports. Despite the fact that it was a new subject for the team, by pooling our soft skills, we were able to collectively gain more knowledge.

3 Background

Today, several important Internet-related services, including domain name resolution, e-mail, social networks, and online storage, are centralized and/or under the authority of lobbies, huge corporations, or governments. Moreover, the architectural constraints of centralized systems (e.g. single point of failure components), even when they have high redundancy, make these systems vulnerable to Denial of Service (DoS) attacks, data misuse, and exfiltration attacks. In this context, users are forced to follow a set of rules sometimes unclear to use such systems. To overcome that situation and paired with the recent hype of Distributed Ledger Technologies (DLTs), decentralized architectures are gaining momentum. Nevertheless, decentralized architectures are not novel. The benefits of such architectures were explored in the early '60s to eliminate single point of failure issues as well as to increase the robustness and redundancy of the systems.

4 Decentralized System

With decentralized storage, data is encrypted and stored across multiple locations, or nodes, that are run by individuals or organizations that share their extra disk space for a fee. Only the data's owner holds the private encryption key; storage providers cannot access the data. In many cases, the files are also sharded and spread across multiple locations, providing yet another layer of storage security. Decentralized data storage products often use blockchain to track storage transactions. Blockchain is a distributed ledger technology that can automatically synchronize and validate storage transactions across distributed nodes. The blockchain ledger might record shard hashes, data locations, leasing costs or other transaction-specific information. Blockchain can also match users looking for storage with hosts that offer it.

5 Green Decentralized Reports

Monitoring environmentally harmful industrial activities is a well-known issue. All members can write about and distribute reports like experiences and activity tracking without violating any third parties' rights. Another issue must be the need for a system that offers free record storage but is also challenging to modify and update. Users may be encouraged to compete in these systems to gain incentives. For individuals who share reports with others and aid in and explain the actions, for instance, a specific token can be used in place of money as payment. Our task was to propose a system that can manage free and open storage without the help of any centralized party.

6 Our Solution

Our proposed solution is developing a system using blockchain using decentralized storage and peer-to-peer communication and file sharing systems. Decentralized storage networks are based on blockchain or similar technologies and deliver benefits such as data immutability, enhanced privacy and better overall security. Decentralized networks are resilient because the storage does not have a single point of failure. With P2P sharing, files aren't stored in a single place. Instead, they're distributed across a network of many nodes. Each file, or piece of a file, is given a unique cryptographic hash. This means all versions are tracked across the network. When a user requests the data, the network finds the nodes holding a perfect match to the unique hash or hashes. Using hash addresses distributed across multiple nodes means the content is immutable yet permanently available. It doesn't matter if a single node goes down because other nodes may instantly deliver a duplicate. The overview of the system is described in the following figure.

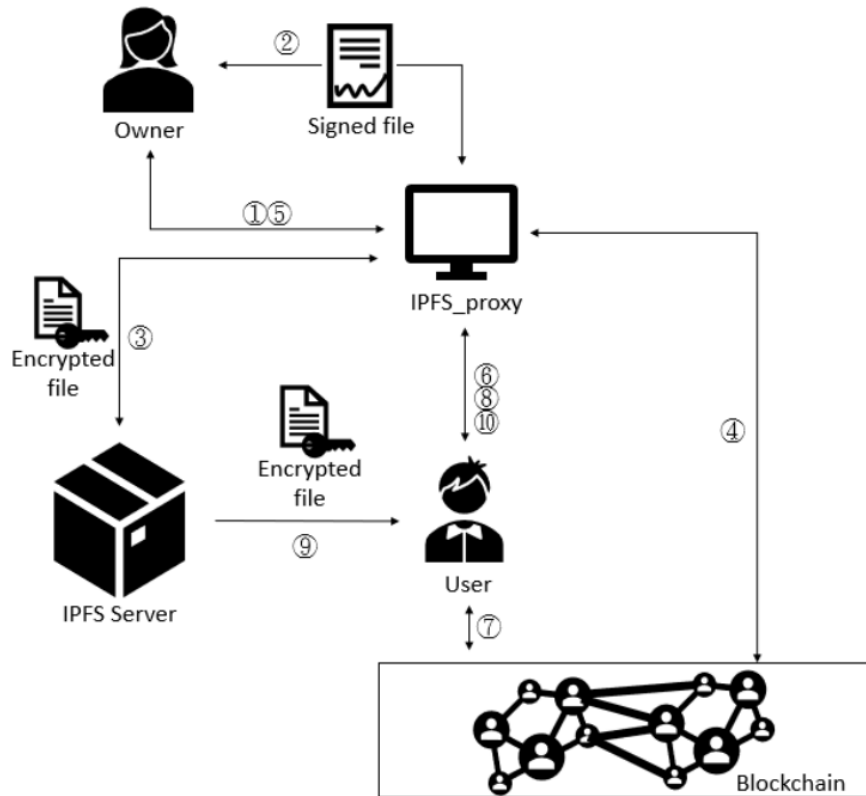


Figure 1: System overview

7 Functionality

There are two types of users (General Users and Community Members). The functionality of the general users are:

1. Search and Download Report
2. Upload Report and earn coins
3. Be a community member with coins

The functionality of the community members are:

1. All access of a General user
2. Request Report
3. Share report within groups
4. Upvote, Downvote, and make comments