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ABSTRACT

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KEYWORDS

Open source development, Open source, Software development, Development initiative, Browser extension, Chrome extension, GitHub, Blockchain, Ethereum

1 INTRODUCTION

1.1 Open source development on GitHub

Open source development is a type of software development in which a decentralised and collaborative community develops software publicly and transparently. Open source development enables the creation of innovative and free software through the collaboration of many people, and it also provides free access to the software for everyone [8, 9]. Some examples for such significant projects are the Linux Kernel [10] and the Mozilla Firefox browser [5], which are used by many people every day. A particular difficulty in open source development is the coordination of the many developers who contribute to the development of the projects with their own extensions or improvements. Changes have to be tracked, traced and, if necessary, reversed [9]. These problems occur not only in open source development, but also in normal software development. As in normal software development, version control is used to solve these problems [9, 11].

In particular, the version control protocol Git is ideally for open source development, because with Git it is possible to have several distributed remotes that can access and manage the same source code [1, 11]. Projects that are coordinated via git are called repositories. The developers have a local copy of the repository on their systems and can push their changes to or pull the current status from the main repository. These actions are coordinated via a so-called git server, which has to be hosted somewhere so that the developers can work with it [1]. It is important that this server is permanently accessible, otherwise the actions mentioned will no longer work. and coordination of the repository will be interrupted [11]. Hosting services such as GitHub were created so that such problems can be prevented and not everyone has to set up their

own git server if they want to start an open source project [2, 11]. GitHub is the largest git hosting provider today, with over 56 million registered developers and over 100 million repositories. [2] The service is also used by large IT corporations such as Microsoft, Facebook and Google and hosts a large number of the largest and most important open source repositories [3].

Normally, an open source project on GitHub starts with a user creating a repository for it. The user who created the repository is the owner of it. This user has full control over the repository and can push changes, decide which changes are accepted (merged) and even delete the repository. In addition, he can add so-called collaborators to the repository, who have read and write rights in the repository [4]. Normal users who do not have collaboration rights can contribute to the open source project by creating a pull request with their change. Another user with the necessary rights can then decide whether the change is useful or not. Depending on his decision, he can merge (accept) or reject (reject) the changes. The described process is the typical approach to how the community develops for an open source project.

1.2 Problem

The described workflow for managing repositories on GitHub but also on other hosting services such as GitLab or Bitbucket has some significant disadvantages. Firstly this approach is not necessarily decentralised or democratic. Very few people usually have the necessary rights to merge pull requests, and they can decide over the head of the general community whether to merge or reject a pull request. So it doesn't matter what the general community thinks, as long as the administrators have a different opinion. Rejecting good or useful pull requests is bad, but not a direct threat to the project. The opposite is to merge a critical bug into the main repository, which can cause enormous damage, as in the example of the Heartbleed bug in the Open SSL repository [6]. This danger exists mainly because it only takes one person with the necessary rights to overlook the bug and decide to merge the flawed pull request. Less critical problems, which nevertheless complicate the work in the communities of open source projects, are the lack of initiative for developers to review pull requests or to create pull requests themselves. If an open source repository is not financially supported by a company or a large community, they usually live on developers who work on these projects in their spare time, which means that further development sometimes takes a very long time.

1.3 Solution

To solve these problems, this paper presents the development of a chrome browser extension that uses the GitHub API and the Ethereum blockchain to enable decentralised management of pull requests in GitHub repositories with a financial incentive for the

community. Using the Ethereum Blockchain, the community can vote on which pull requests should be merged or rejected, with decisions to merge good requests and reject bad ones being rewarded. In addition, the community can use a crowdfunding mechanism to pool Ether, the native currency of the Ethereum blockchain, to pay developers for solving problems or bugs. The functioning of the protocol on which the browser extension is based is explained in detail in *3. Protocol*. Our goal with this browser extension and this paper is to solve the problems mentioned and to improve the way open source development is done.

2 RELATED WORK

Related work falls into three areas: *repository governance*, *decentralised voting* and *developer initiative*. Previous work has already looked at decentralised approaches to manage GitHub repositories. One work pursues the idea that a repository always belongs to the ownerless protocol and that pull requests can only be merged or rejected by the community via this protocol. This should prevent the danger that users with writing rights misuse them [11].

Furthermore trustless and decentralised voting on the blockchain is a topic that has been addressed in several papers and which also plays a critical role in this paper [7, 11].

In addition, the lack of financial incentive to implement problems or changes in a repository is an issue that has been investigated. The research looked at what is important to the developer who solves the bounty and what is important to the financial backer of the bounty. [12]

3 PROTOCOL

- Wieso gibt es zwei Protokolle?

3.1 First iteration

- Jeder konnte ein Voting starten - Voting ohne Kommentar - Bild des Protocolls

3.2 Second iteration

- Admin starten Bounty - Restliches Protocl

4 IMPLEMENTATION

5 DISCUSSION

First and second iteration
- Was sehe ich für Probleme

6 CONCLUSION AND FUTURE WORK

- Anbindung an Torbens

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