CoderChain: A BlockChain Community for Coders

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***Abstract*— An online community based on blockchain is proposed for software developers to share, assess, and learn codes and other codes or software related knowledge. It involves three modules or roles, namely: developer (or coder, or more generally, knowledge contributor), code (or knowledge contribution), and jury (or assessor, who is usually a developer with advanced skills), in addition to the blockchain based database. Each full node of the blockchain hosts a copy of all activities of developers in such community, including uploading contributions, assessing others' contributions, and conducting transactions. Smart contracts are applicable to automate transactions after code assessment or other related activities. The system aims to assess and improve the value of codes accurately, stimulate the creativity of the developers, and improve software development efficiency, so as to establish a virtuous cycle of a software development community.**

Keywords—blockchain, software engineering, code review.

I. INTRODUCTION

As more and more applications are transferred to the cloud, open source based code libraries and version control systems have become the preferred methods for software development. The traditional software development community has changed the model of project development and greatly improved the development efficiency. However, certain new and difficult problems have also emerged: the value of the code has not been explored, the enthusiasm of developers is low, and applications of intelligent technologies are still rare. Firstly, codes written by developers have not been fully utilized, resulting in problems such as re-inventing the wheel, poor maintainability of project codes. Due to the limitations of the traditional development community, code reuse and learning still require a lot of time and effort and are not widely applied. Secondly, the motivation of developers is generally driven by tasks, rather than pursuit of code quality.

To solve the above problems, we propose an online software development community based on blockchain, namely, CoderChain. This community mainly involves three parts: developer, code, and jury. The development process of the community is as follows: we assume that a programming task is a cycle in which developers should finish the tasks such as requirement analysis, software/code/algorithm design, and later code review by the jury. After each review, the jury (assessors/reviewers) and developers can evaluate each other to guarantee the equivalence between the two roles. Finally, all information of such review will be made public and recorded on the blockchain, including but not limited to review score, conclusions/suggestions, and the jury's other related activities. In addition, all later related activities, including code reuse by other developers, are also recorded on the blockchain. Compared with the traditional development community, CoderChain contains the following advantages. Firstly, based on the concept of smart contracts in blockchain technology, we can automate many developer actions and promote the value of the code. Secondly, we propose a novel concept which is based on the consensus in the broad sense – the jury, which stimulates the creativity of developers. This community stores important information on the blockchain. In addition to the main data of all uploaded contributions, all activities of developers, including uploading contributions (or in any kind of requirements, demands, questions, and answers), assessing others' contributions, and conducting transactions, are also uploaded to the blockchain and are important data to keep the community agile and active, fair and equitable, virtuous and sustainable.

In particular, we also adopt the concept of digital tokens in CoderChain. Digital tokens play a role of an incentive scheme in many blockchain projects, which encourage a disparate group of people who do not trust each other to organize their activities to achieve the mission of a special blockchain. Similarly, we design a credit certificate in our blockchain as a kind of token to encourage developers to contribute, make good use of, and share all knowledge.

II. REALTED WORK

As a decentralized and public ledger, blockchain hosts all information as they are packaged in blocks in the chain in the chronological order and in a tamper-proof way. Each participant can retain a copy of such ledger and keep track of all transactions without central record keeping. Blockchain technology has three primary advantages: security, transparency and decentralization. Blockchain uses asymmetric encryption to secure the transaction and data records, making data cracking impossible. Smart contracts permit trusted transactions and agreements to be carried out among disparate, anonymous parties without the need for a central authority [1].

Software development community, such as Github [2], gives users the space to store codes while making it easy to see others' excellent codes. However, the only way we could judge a piece of code/project is the number of "stars" assigned to it, which cannot reflect the quality of the code comprehensively. Compared with traditional software development communities, CoderChain not only can record, review, and assess codes but also can greatly increase the enthusiasm of developers to contribute more quality codes, or knowledge in general.

III. ARCHITECTURE

As we can see from Fig. 1, in addition to the blockchain as the database, CoderChain involves three important parties, namely, developer, code, and jury (and possibly, expert). In order to ensure the transparency of information in the developer community, CoderChain records the codes and all related information and activities about their review/assessment/usage. After the review, the code and the review result information is also recorded on the blockchain. Information transparency as the basis of this system guarantees that no one can modify the data on blockchain.

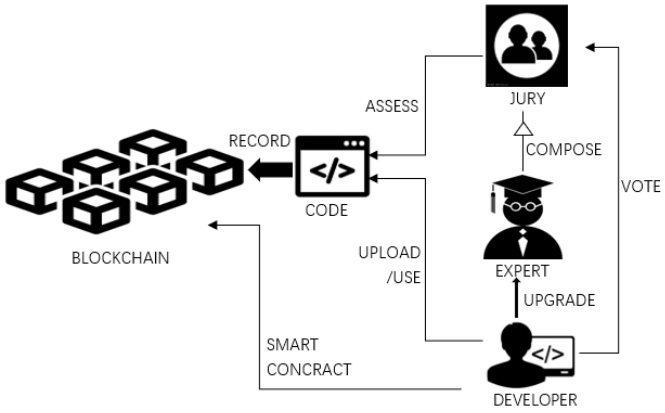

Fig. 1. Architecture of CoderChain

A. The Consensus Mechanism

CoderChain uses the parity POA as the consensus mechanism. We also propose an anonymous review and accountability guarantee system. The anonymous review ensures fairness in the review process. The accountability guarantee system establishes a link between a jury member and the code he/she has reviewed/assessed. After each review, the reviewer can continuously adjust its own assessment criteria based on feedback from the review results, so as to establish a virtuous cycle of a software development community. Facilitated by the consensus mechanism of blockchain, the jury following the rules of anonymous review and transparency of the review results can ensure the fairness of the whole system.

B. Developer

Each developer is considered as a full node of the blockchain, which communicates with each other and performs many activities, such as programming, uploading, reusing, and voting on codes. In particular, we use smart contracts to simplify most of the tedious transaction operations, such as learning other developer's code on blockchain. Token is an important indication of the node and is an embodiment of the capability of the developer as more tokens are rewarded to the top coders.

C. Code

Code is the core module of the entire community, based on which all other modules are designed. During each cycle of system development, developers receive special tasks and must write codes based on the requirements of the task. All the codes are recorded on the blockchain. Developers can easily find and learn codes from the blockchain. It is worth noting that the value of a piece of code in the system is dynamic, compared with traditional project development system. If the code is used extensively, the value of the code is increased. On the contrary, if the code is criticized by many developers after reviewed, the value of the code declines.

D. Jury

We propose a novel concept in CoderChain, the jury. The members of the jury are selected from the developers, which means that every developer is given the opportunity to become a member of the jury. Specially, the jury has two key roles. Firstly, the jury performs anonymous review. The review process is double-blind, neither the developer knows who is assessing/reviewing his/her code, nor the jury knows whose code is being reviewed. Secondly, the jury guarantees the accountability of the code review result. We advocate that the jury needs to be responsible for the review result. In order to embody the reviewer's recognition of the code, the reviewer must pay a certain amount of tokens as his votes and his confidence on the code. For keeping the internal mobility of the jury, the jury members are reselected from developers after each cycle.

In addition, in order to ensure the quality of code review result, we introduce expert review mechanism which refers to inviting experts to review the code during the code review process and obtain the corresponding tokens according to the contribution of the experts.

IV. CONCLUSION

We have proposed an online community based on blockchain, in which software developers, or coders in short, or more generally, knowledge contributors, can share, assess (or more particularly, evaluate or vote for), and learn codes and other code or software related knowledge, or in general, knowledge contributions. Particularly, smart contracts are applied to help all parties to automatically keep their promises and keep their reputations and credits. The community aims to assess and improve the value of codes accurately, stimulate the creativity of developers, and improve the software development efficiency, so as to establish a virtuous cycle of a software development community.

In the future, we will seek to expand our application scenarios and introduce more new elements, such as paper review, project review. WISChain is deployed currently on 11 full nodes within our organization and can be tested at [3]. All tests and feedbacks are welcome.

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