

NCHC Blockchain Construction Platform (NBCP): Rapidly Constructing Blockchain Nodes around Taiwan

Lo-Yao Yeh

Network and Security Division,
National Center for High-performance
Computing (NCHC)
Taichung 407, Taiwan.
lyyeh@narlabs.org.tw

Peggy Joy Lu

Software Technology Division
National Center for High-performance
Computing (NCHC)
Taichung 407, Taiwan.
peggylu@narlabs.org.tw

Jen-Wei Hu

Network and Security Division,
National Center for High-performance
Computing (NCHC)
Tainan 741, Taiwan.
hujw@narlabs.org.tw

ABSTRACT

Blockchain is an emerging technology that can be utilized to break ground for secure provenance through the use of a centralized-based application. The method of distributed ledger can serve as the trust machine mechanism to prevent the malicious attacks. This paper introduces a novel service to complement some open-source blockchain protocols. A vital point of adopting blockchain technology is to encourage more and more parties to join for higher security and better efficiency. National Center for High-performance Computing (NCHC) has initiated a service, named NBCP, for rapidly constructing multiple blockchain nodes around Taiwan. With several pros, users can easily construct private blockchain nodes, catering to the need of developing various prototypes of blockchain-based applications.

Keywords

Fintech, Blockchain, docker swarm, smart contract, security.

1. INTRODUCTION

Bitcoin [5] is the most popular cryptocurrency since 2009. To eliminate the centralized bank, blockchain technology serves as the underlying protocol to withstand the double spending problem. Basically, four features are provided by blockchain technology.

- (1) Immutable: each transaction on the blockchain cannot be tampered without notice.
- (2) Quick settlement: each transaction can be settled by about fifteen minutes in Bitcoin.
- (3) Security: several cryptographic properties, including hash function, Merkle hash tree, and digital signature, are used in blockchain technology for higher security assurance.
- (4) Traceable: each block and transaction are linked with previous ones.

Actually, Bitcoin is just one of the applications for blockchain. A lot of promising exercises can be used in blockchain, such as crowdfunding, e-voting, and intelligent appliances [4], stock transaction platform. Therefore, some organizations [1][2][3] have released their own open-source blockchain protocols to promote the usage of blockchain technology.

Ethereum protocol [1] proposed in late 2013 is the first improvements to the traditional blockchain approach of Bitcoin.

Ethereum protocol offers the Turing complete scripting languages to bind contract. The token of Ethereum is called ether, often referred to as gas, which can be used to prevent spam on the blockchain. In late 2005, Hyperledger [2] sponsored by Linux foundation offers blockchain-based distributed ledgers for global business transactions. Several different projects are included in Hyperledger, and a lot of famous companies are members of them such as IBM, Cisco, Intel, Fujitsu, Hitachi, ANZ Bank, J.P. Morgan, and Wells Fargo etc. In 2006, Gcoin [3] blockchain-based protocol is presented by Professor Liao Shih-Wei in National Taiwan University. The 'G' represents Governance and Global. The use of a permissioned blockchain is the key feature of Gcoin. Several different roles with different functions are introduced in Gcoin, e.g. alliance, full node, coin issuer and simple wallet. Nevertheless, the most important spirit of blockchain is decentralized so a vital requirement of establishing a blockchain application is to involve as many as different blockchain nodes for enhancing security and efficiency. Therefore, how to introduce different organizations to join a blockchain is a key issue to new blockchain applications.

Our organization, National Center for High-performance Computing (NCHC), is a governmental non-profit organization (NPO) and extremely suitable to serve as a part of blockchain nodes to improve its performance and impartiality. Moreover, NCHC is responsible of maintaining supercomputers and cluster computers among Taiwan, which means NCHC can launch a large number of blockchain nodes in different places. Now, we are embarking on building a service platform to rapidly setup blockchain nodes around Taiwan. Our customer, companies or organizations, can construct their own blockchain nodes in three different different places, including north, middle, and south Taiwan. Currently, NCHC will provide the choice of three different open-source blockchain protocols. The platform users can easily realize and maintain the status of each node. To sum up, the merits of using our platform are listed as follows.

- (1) Rapidly constructs public and private blockchain nodes without expensive staff and maintenance cost.
- (2) Distributedly keeps several blockchain nodes around different places.
- (3) Efficiently runs the underlying blockchain protocol in high bandwidth network.

In the future, we plan to develop some unique features to complement the open-source blockchain like privacy. The details of our architecture will be explained in the Section II

2. System Architecture

2.1 National Center for High-performance Computing (NCHC)

National Center for High-performance Computing (NCHC), founded in 1991, is Taiwan's only national-level supercomputing center. The NCHC possesses a large computing and 100G-back bone networking platform. The NCHC integrates high performance computing (HPC), storage, and networking to provide cloud services in storage, big data analysis, and scientific and engineering simulation. As shown in Fig. 1, the headquarter of NCHC is at Hsinchu in north Taiwan, and Taichung branch in middle Taiwan as well as Tainan branch in south Taiwan



Fig. 1 The locations of NCHC branches

2.2 The Architecture of NCHC Blockchain Construction Platform (NBCP)

In Fig.2, the platform architecture of our NCHC blockchain construction platform is presented. We use the technique of docker swarm as the underlying architecture to dynamically balance the burden of different servers. The gray parts are the physical servers among different places. The above of servers are the docker containers for different open-source blockchain protocols.

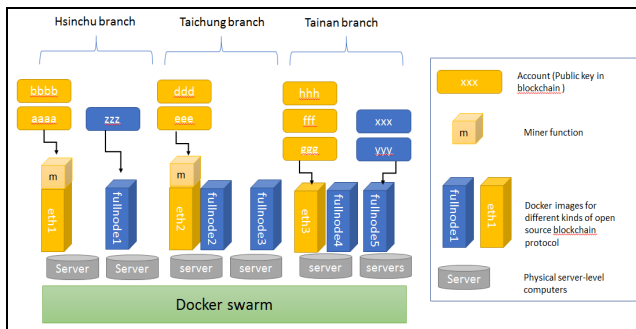


Fig. 2 The architecture of our platform

For example, we have Ethereum, and Gcoin images in Fig.2. In Ethereum, users can initiate the function of mining, and users, in Gcoin, can choose the different roles based on their own requirements.

3. System Implementation

Here, we briefly introduce the system GUI of our platform service. First, a user needs to acquire the account of our NBCP. Then, we will build a portal for users to construct their own blockchain nodes, as shown in the left part of Fig. 3. Basically, the users are recommended to construct the nodes in multiples of 3 for redundancy that takes advantage of the NCHC branches. In the right part of Fig. 3, we demonstrate the single dashboard for different blockchain wallets. We will list the functions of

blockchain protocol including create blockchain account, make a transaction, and write a smart contract.

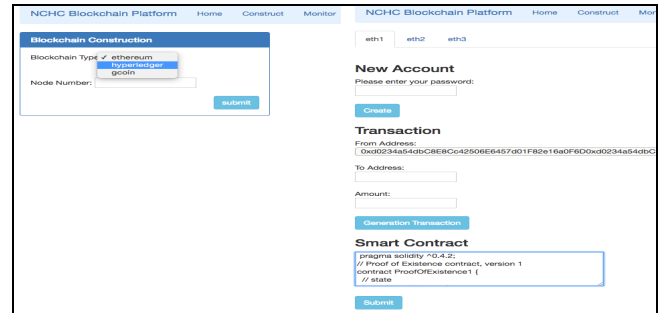


Fig. 3 The schematic diagram of NCBP portal and dashboard

4. Blockchain for Digital Library

For digital library, blockchain can play a key role in rapidly distributing new collected publication lists. For example, assume the national Taiwan library has joined the digital library blockchain as a member, and the national USA, UK and Canada libraries are also the members of this blockchain. While a new book published in Taiwan is collected by national Taiwan library, Taiwan library will make a transaction in blockchain to distribute the information to all members. As a result, the collected publication lists of each library can easily share among members. If two libraries are in the same alliance, the Blockchain can help to save the unnecessary copyright fee for the same digital publication.

5. Conclusion

Blockchain Technology has a promising future. Not only academic and research realms but industry and government fields are investigating a lot of resources to realize it. How to rapidly develop a blockchain-based application will be a foreseeable problem in certain fields. Therefore, several different kinds of open-source blockchain technology have been proposed. However, constructing a blockchain node could be tedious for non-technical persons or companies. Moreover, the number of blockchain nodes also plays important roles for the success of blockchain applications. Now, National Center for High-performance Computing (NCHC) in Taiwan will launch a service to rapidly construct multiple blockchain nodes around Taiwan. By our platform, a start-up blockchain application can be easily established and promoted it to the public.

6. REFERENCES

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