

The Influence of Blockchain Implementation for Virtual Meetings at Home Learning Indonesia

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Abstract—Online learning is currently one of the popular learning concepts in schools. The results of online learning are still not as expected. This is due to the lack of reliability of teachers in mastering learning platforms and the lack of virtual meetings between teachers and students. Home Learning Indonesia (HLI) is a Learning Management System with virtual meetings and blockchain technology is an alternative to solving this problem. This research utilizes blockchain technology to minimize the shortcomings of existing virtual meeting platforms. In this study, testing HLI virtual meetings and several other platforms. The results of the HLI Virtual meetings test when the requests given are getting higher, and the throughput is decreasing following the number of requests given. These results can show that the use of blockchain in virtual meetings can increase network stability in its use.

Keywords—virtual meetings, Learning Management System, blockchain

1 Introduction

The Covid-19 pandemic has triggered online learning to become a popular choice of learning concepts in many schools. Online learning encourages independent learning [1]. Online learning becomes popular due to its potential privilege in providing more flexible access and content, so that online learning offers several advantages, namely: (1) increasing a flexible learning experience according to each user, (2) the existence of efficiency in creating and disseminating learning content, (3) supporting existing learning facilities, (4) supporting participatory based learning, (5) enabling learning participants to study the same material at different understanding speeds or to achieve different learning objectives [2].

In addition, online learning that has been carried out so far received many negative responses for its incapability to meet the participants expectation, which resulted in the participant's final score not being optimal. This is due to several obstacles such as the lack of reliable teachers mastering the platform [3] causing lack of face-to-face interaction whilst interaction plays a fundamental role in online education [4]. Online learning, that brings together teachers and participants everywhere, cannot be separated

from the need for virtual meet as a mean of learning. It was also proven by research conducted by Amelia [5], from all teacher respondents whose data was taken, 53.95% of teachers could not make the most of the available platforms due to (1) Difficulties in using the online learning platform, (2) difficulties in the quality of online learning meetings, and (3) difficulties in developing learning designs.

Apart from the lack of teachers understanding to existing platforms, participants also encountered obstacles in the online learning process itself such as: (1) the internet was unstable, (2) signal difficulty for conducting virtual meetings, and (3) difficulty to reach internet access [6]. Meanwhile, the research conducted by Hamidy, [7] showed that the scores of both students who took Zoom Meetings and face-to-face learning was classified as very high. Meanwhile, the score of students who took Google Classroom only are still in the low and very low categories. It is possible that the unstable quality of meetings platform and the internet during online learning greatly affects the quality of learning.

Hence, it can be concluded that the virtual meet platform is highly effects the quality of online learning today. Unfortunately, the virtual meet platform that is available now hold some annoying drawbacks for users, such as: (1) Limited usage time, except for premium payment, (2) Limited number of participants, (3) Consume high user-quotas, and (4) Requires high and stable signal quality [8].

Then we need a virtual meet platform that can support online learning properly. This research will solve the need for high signal quality in having virtual meetings, in order to improve the quality of online learning. Virtual meeting is a face-to-face activity between teachers and students virtually via video conference that can be accessed by PC, laptop or smartphone [8].

This research utilizes blockchain technology to minimize the shortcomings of existing virtual meet platforms. Blockchain technology provides a secure and robust information-sharing system because it records all transactions that occur permanently and is spreaded across all blockchain networks. Various cases related to data are resolvable using blockchain technology. By using blockchain technology, the education system can now be monitored easily and reliably, and a lot of online learning based on blockchain technology are now available [9]. The distinctive advantages of Blockchain are trust, transparency, and immutability which are not only used in cryptocurrencies but also in other fields. This has caused the increasing number of Blockchain-based applications and development for various fields [10]. However, no one has utilized blockchain in a virtual meet platform.

Blockchain research has been widely carried out for application in LMS (Learning Management System), for instance, to find out blockchain security in storing student data or facilitating students and teachers during the teaching and learning process [11]. Another implementation of blockchain in the field of LMS (Learning Management System) is at Raharja University, in order to improve the quality of LMS (Learning Management System) for its more perfect data management system model compared to the previous educational data management [9]. So it can be seen that the implementation of blockchain in LMS has potential further research. The purpose of this study, which is different from existing research, is to find out how influential the blockchain is in improving the quality of virtual meets of the Home Learning Indonesia (HLI)

platform in order to support the quality of existing online learning, so that the quality of online learning outcomes can be further improved.

2 Methodology

2.1 System topology

Presenting the blockchain topology design in this research. Blockchain has contributed to the development of today's technology in the era of disruption. Blockchain is a peer to peer data recording technology and connected to each other in a decentralized manner, where each activity in the form of a transaction will be secured using cryptographic techniques composed of blocks and transactions, with these two types of things stored in a chain of blocks that are will be related [12]. Blockchain works when the teacher hold a meeting at Home Learning Indonesia (HLI), it will be directed then to the blockchain first to get an id and then sent to the HLI database. Furthermore, if there is a request to do a virtual meet from students or teachers, the id will be sent through several security layers – gateways – HLI Teacher / HLI Students as shown in Figure 1.

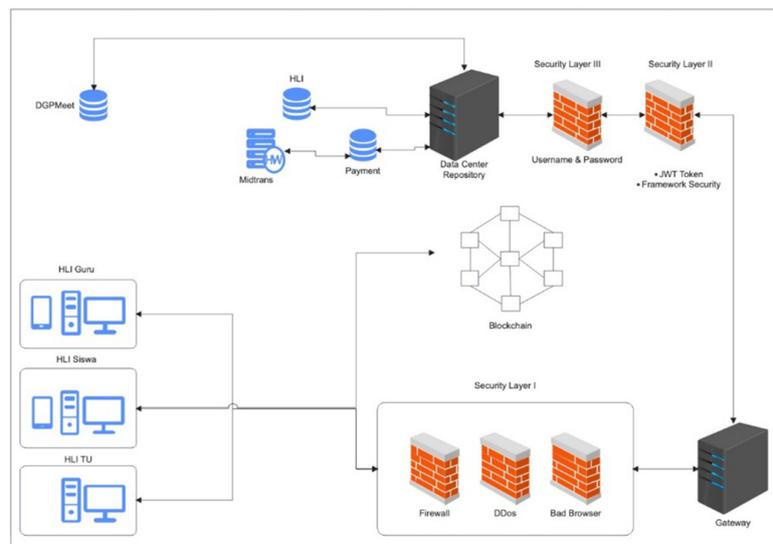


Fig. 1. System topology of Home Learning Indonesia (HLI)

The results of the design in the form of a data transaction process design using blockchain can be seen in Figure 1. The algorithm for the data transaction process is as follows:

- The teacher creates a meeting on the HLI platform which will then automatically get a virtual meet link after the meeting is submitted.
- Data will be sent first to the blockchain which then from the blockchain will get an id for the virtual meeting.

- c. Then the id will be sent through the firewall, DDOs, and Band Browser until it reaches the gateway. Then id passes through the level II security layer to check the user token and level III security layer by checking the user username and password.
- d. After passing through the three security layers, the id will be stored in the HLI database.
- e. When there is a request to do a virtual meet from a user, teacher or student, the id will be sent back. At security layers III and II, if the conditions are met, the ID will pass and be transferred to the gateway. At the security layer I after passing through the firewall, the virtual meet id can be accepted by students and teachers.
- f. Because the HLI platform uses blockchain technology, data that has been embedded in the system cannot be deleted and recorded permanently, according to the characteristics of the blockchain.

2.2 Testing experiment

Virtual meetings at HLI are used for face-to-face meetings between teachers and students. The teacher interacts with students in such form as presentation of teaching materials, explanation of assigned tasks and other learning activities (Figure 2).

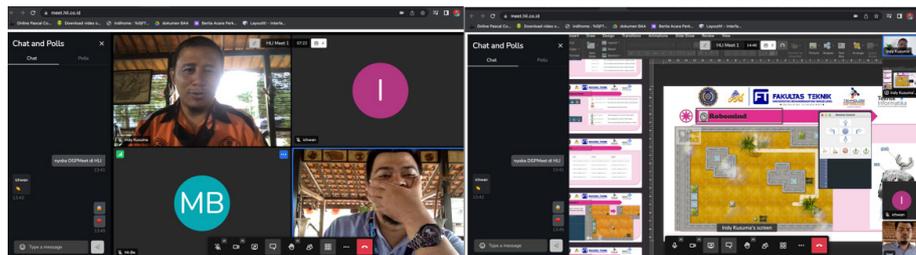


Fig. 2. Virtual meetings of Home Learning Indonesia (HLI)

In this study the HLI platform uses blockchain and was tested using siege <https://www.joedog.org/siege-home/>. Siege is used to test predetermined scenarios. Siege is an open source stress or regression test and benchmark utility that can be addressed in a single URL using a specified number of users in the simulation or can read multiple URLs into memory and viewed simultaneously. The program will report the number of hits that have been recorded, bytes transferred, response time, concurrency and return status [13].

Tests using siege were carried out to obtain a comparison of throughput and response time results between some virtual meet by comparing blockchain-based virtual meet with Zoom, Google Meet and Jit.si platforms which are widely used today (Figure 3). The results of each test scenario will be presented as shown in Figure 4. Criterias are classified to be good if the response times are stable and the throughput results are lower.

```
mr-pink — siege -c 100 -r 100 -t 2M https://8x8.vc/vpaas-magic-cookie-5376fd4961d64...
mr-pink@indys-MacBook-Air ~ % siege -c 100 -r 100 -t 2M https://8x8.vc/vpaas-magic-cookie-5376
fd4961d64038aa6239ad7ce9da3b/HLI-Meet-1
[error] CONFIG conflict: selected time and repetition based testing
defaulting to time-based testing: 120 seconds
** SIEGE 4.1.5
** Preparing 100 concurrent users for battle.
The server is now under siege...
HTTP/1.1 200 0.59 secs: 12878 bytes ==> GET /vpaas-magic-cookie-5376fd4961d64038aa6239a
d7ce9da3b/HLI-Meet-1
```

Fig. 3. System testing using siege

```
mr-pink — zsh — 94x24
HTTP/1.1 200 0.25 secs: 564 bytes ==> GET /vpaas-magic-cookie-5376fd4961d64038aa6239a
d7ce9da3b/images/twitter.svg
HTTP/1.1 200 12.35 secs: 835819 bytes ==> GET /vpaas-magic-cookie-5376fd4961d64038aa6239a
d7ce9da3b/images/welcome-jitsi.png
HTTP/1.1 200 0.26 secs: 746 bytes ==> GET /vpaas-magic-cookie-5376fd4961d64038aa6239a
d7ce9da3b/fonts/inter.css
HTTP/1.1 200 0.24 secs: 1031 bytes ==> GET /vpaas-magic-cookie-5376fd4961d64038aa6239a
d7ce9da3b/images/android.svg

Lifting the server siege...
Transactions: 3357 hits
Availability: 100.00 %
Elapsed time: 120.23 secs
Data transferred: 366.61 MB
Response time: 2.62 secs
Transaction rate: 27.92 trans/sec
Throughput: 3.05 MB/sec
Concurrency: 73.17
Successful transactions: 3357
Failed transactions: 0
Longest transaction: 78.34
Shortest transaction: 0.16

mr-pink@indys-MacBook-Air ~ %
```

Fig. 4. The result of system testing using siege

3 Result & discussion

Testing on virtual meet HLI was conducted to see the blockchain's ability to process virtual meet more efficiently. The number of requests to test web server performance in this study is 100, 100, 200, and 500 [14]. The test scenarios discussed in this study are Transaction, Response Time, Transaction Rate, Throughput. Each test is 120.70 secs, 120.31 secs, 120.54 secs, and 120.03 secs in duration.

The test results with the specified scenarios are presented in graphical form as shown in Figure 5. The graph (Figure 5a) shows that the number of transactions tends to decrease as the number of requests increases. The overall number of transactions is higher when using HLI with block-chain compared to others virtual meetings. At the time of testing with 100 of requests, the number of transactions on the blockchain increased a lot in the calculation results $(3974-892)/892 \times 100\%$. At 100 requests, the increase is 3.45%, and at 200 requests, the growth is 9.02%.

The test results in Figure 5b show the response time from HLI with blockchain. When the number of requests increases, the response time remains stable. It can be seen from the HLI response time graph that is horizontal, in contrast to the zoom that goes down and up depending on the number of requests.

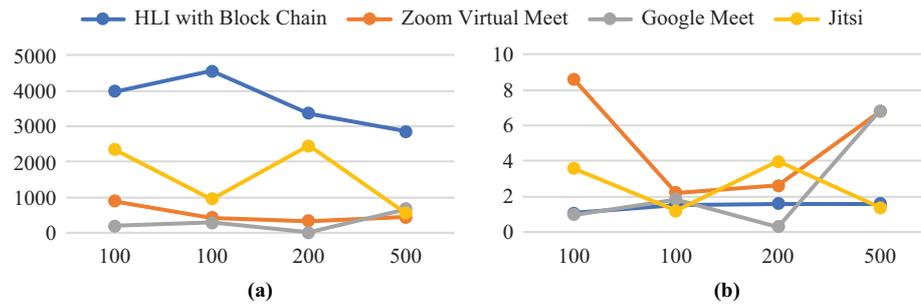


Fig. 5. Comparison chart of test result: (a) Transaction (b) Response time

The test results in the transaction rate graph (Figure 6a) show that the average transaction tends to increase with an increase in the number of requests made. The results of the transaction rate overall measuring show that the average number of transactions is higher when the system uses blockchain compared to zoom. The results of the throughput test (Figure 6b) show a decrease as the number of requests given increases. The results of the overall throughput measurement show that the throughput is more significant when the system uses blockchain compared to zoom.

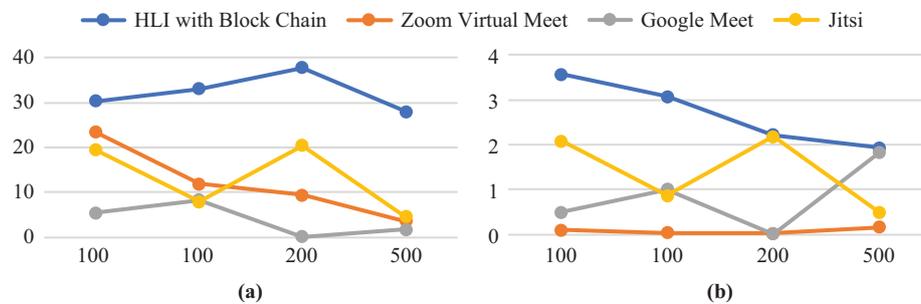


Fig. 6. Comparison chart of test result: (a) Transaction rate (b) Throughput

4 Conclusion

Testing result of blockchain-based virtual meet servers on Home Learning using siege to determine network stability when used shows that the response time remains stable even when requests given are higher, and through put decreases following the number of re-requests given. These results can show that the use of blockchain in virtual meet can increase the stability of the network in its use. In addition, virtual meet on HLI can provide a solution to the shortcomings of the existing virtual meet platform.

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