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Blockchain Technology is Being Utilized for Developing a Secure E-Coupon Service

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ABSTRACT:

Electronic coupons, sometimes known as "e-coupons," are increasingly used as the popularity of online shopping increases. The majority of e-coupon systems manage the information of e-coupons on a single server. However, due of its centralization, e-coupon services are usually at risk of security problems. For instance, it might be challenging to match the user and the owner of an expired e-coupon when the information which is maintained in a centralized e-coupon server is forged. This method is known as double-spending. We suggest a new e-coupon service to address this problem, enhancing the product's security by utilizing a blockchain technology. Because of this, we must first create a server that can run the e-coupon service and interact with the blockchain technology. To ensure the accuracy of the e-coupon business logic and its data, we secondly create a smart contract on the blockchain system. On a blockchain system based on Ethereum, we implemented the suggested service. The results of the experiment show that, when compared to an existing e-coupon service, our proposed service increases security while just slightly affecting performance.

KEYWORDS:E-Coupon, Blockchain technology, Smart Contract and Security

1.INTRODUCTION

Electronic coupons, or e-coupons, are becoming popular as a marketing technique with the expansion of the electronic commerce market [1],[2].E-coupon suppliers, like retailers and marketers, have an effective management method thanks to the electronic form of these coupons, which is also convenient for consumers. For instance, because an e-coupon is offered by a digital code, e-coupon providers can simply disseminate the e-coupon to the customers online and gather information about how many people download and use e-coupons. Additionally, users can simply manage their e-coupons on their computers or mobile devices. E-coupons have these benefits, and according to Global Mobile Coupons Market 2016-2020, the market will expand at a compound annual growth rate (CAGR) of 73.14% from 2016 to 2020 [3].

Even while the e-coupon business is growing and offers a number of advantages, there are still some difficulties. Most e-coupon services maintain e-coupon data in a centralized system for ease of management. The data from the central database system is utilized to validate an

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e-coupon when it is used. On the other hand, because of the centralization, an administrator can quickly change the data, allowing for the forged and fraudulent use of an e-coupon. For instance, a malicious attacker may modify the discount rate or an e-coupon could be used more than once (doubling up on purchases). Real e-coupon crime costs in the United States are estimated by Penn Live to be between $300 and $600 million annually [4].

Hsueh et al.'s [5] proposal for an e-coupon system that combines block chain and hash chain technology to increase e-coupon security is based on a hash chain. Our research supports previous work by using block chain technology to ensure the accuracy of e-coupon data. On the other hand, by creating a secure smart contract, we provide the confidentiality of both activities (such as managing e-coupons, etc.) and the security of e-coupon information.

In order to increase the security of the service, we suggest an e-coupon service based on a block chain system in this study. To accomplish this, we first create a server that can interface with the block chain system and enable e-coupon service. Second, to ensure the accuracy of the operations (i.e., business logic code [6]) and e-coupon data, we design an e-coupon smart contract for the block chain system. For convenience for customers, we also automatically deploy an e-coupon smart contract to the block chain.

On the Quorum block chain system [7], we apply and implement the suggested service for the security of e-coupon data and business logic code (i.e., downloading, delivery, and utilizing an e-coupon). The results of experiments show that, in comparison with present services, the proposed service increases security while having a relatively low performance overhead. The following are the contributions made by our work: V

- In terms of security and e-coupon trade, we look into the current processing system for e-coupons.
- We suggest a brand-new service that deploys the e-coupon smart contract automatically and allows for secure e-coupon trade via a block chain system.
- In comparison to the current services, we show that the proposed e-coupon service is more secure.

2.LITERATURE SURVEY

Agarwal et al [12] suggest a solution based on a third-party centralized coupon mint, which checks for duplicating expenditures. There are previous studies and for providing secure e-coupon. Blundo et al. [2] propose new e-coupon models and e-coupon protocols using message authentication code (MAC) for e-coupon protection. Hsueh et al. [5] employ hash functions to verify all of the e-coupon's electronic signatures and sign the document with digital signatures (PKI). They also use hash functions to check the correctness of the data. Chang et al.'s use of the one-way hash function and MAC enables e-coupon providers to stop customers from using the same e-coupon twice without paying more computing costs on mobile phones and tablets.

Using these methods and a user can determine whether or not a hostile attacker has changed an e-coupon. They successfully handle e-coupon issues and e-coupon use as a result, preventing e-coupon fraud and fabrication. However, these methods are ineffective since the e-coupon server database may be altered by a hostile attacker. Furthermore, these methods are unable to stop an administrator's harmful behaviour. Our research is consistent with these pieces and in terms of strengthening the security of e-coupons. On the other hand, our attention is directed towards enhancing the security of the database that stores e-coupons and combating e-coupon forgeries.

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For the purpose of confirming the fake versions of e-coupons, Hsueh et al. [5] present a hash chain that is integrated with blockchain technology. They depend upon blockchain technology to ensure the integrity of e-coupon data. Regarding the use of blockchain technology for maintaining the integrity of e-coupons, our study is consistent with the work [5]. As an alternative, we use a smart contract to ensure the integrity of the e-coupon business logic, including downloading, utilizing, and giving an e-coupon.

Podda et al.'s [29] analysis and comparison of several blockchain-based coupon systems. A generic architecture for digital coupons is also suggested, along with a list of the fundamental guarantees that a coupon system must provide. In order to develop a safe e-voucher system, Hsu et al. [30] analyse to demonstrate that the security criteria of the system are met and look at ways to use blockchain technology and cryptography to do so. Furthermore, they put up a workable application model that incorporates blockchain technology in the context of vouchers to support the campus welfare lunch voucher system. Our research is consistent with these strategies [29], [30] in terms of delivering the e-coupon security aspects (non-repudiation, unique usage, distributed verification, etc.) by utilizing a blockchain technology and establish contract. In contrast, we concentrate on employing an e-coupon smart contract template to investigate the performance and cost of development. Additionally, we take into account a general-purpose e-coupon system with an e-coupon smart contract template rather than a use case-specific one (such as a campus benefit a meal voucher system)

3.PROBLEM STATEMENT

Using message authentication code (MAC) for e-coupon security, Blundo et al. [2] suggest unique e-coupon models and e-coupon protocols. Agarwal et al.'s approach [12] is built on a third-party centralized coupon mint that identifies double-spending. The e-coupon is signed by Hsueh et al. [13] using electronic signatures (i.e., PKI) and hash functions to check the accuracy of the data and validate each electronic signature. Hang et al.'s [15] use of the one-way hash function and MAC allows e-coupon suppliers to stop customers from using their coupons twice without spending additional computing costs on mobile devices.

Our study follows in agreement with the work [5] in terms of using blockchain technology to protect the integrity of e-coupon information, but we utilize a smart contract to provide the integrity of the e-coupon business logic, such as downloading, utilizing, and giving an e-coupon. Hsueh et al. [5] provide a hash chain which is combined with the blockchain technology to verify the forgery of e-coupons.

Several blockchain-based coupon systems are analysed and contrasted by Podda et al. [29]. Additionally, it suggests a generic structure for electronic coupons and lists the fundamental guarantees that a coupon system should provide. In order to create a safe e-voucher system, Hsu et al. [30] investigate how to use blockchain technology and cryptography. Additionally, they encourage the development of a practical application model that involves blockchain technology in the context of vouchers to promote the campus safety refreshments voucher system.

4.METHODOLOGY

The suggested approach protects the integrity of the e-coupon business logic by taking advantage of a smart contract feature. Ethereum is one of the well-known blockchain-based platforms in the proposed system that offers smart contracts. A smart contract is a series of digital promises that users carry out.

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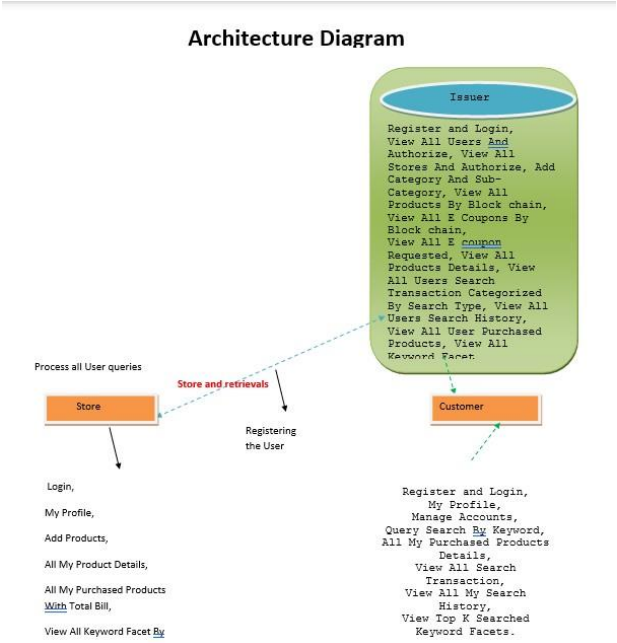
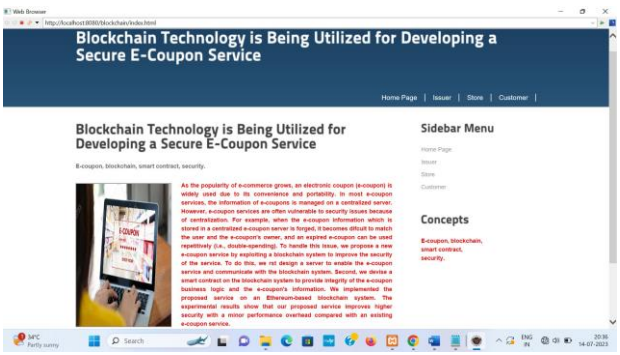
5.ARCHITECHTURE



6.RESULTS



7.CONCLUSION

We looked into e-coupon systems that keep e-coupon data on a centralized server. We discovered that a hostile attacker or administrator might change the information included in the server's e-coupon database. To address this problem, we introduce an alternative e-coupon service that increases security by using e-coupon smart contracts in a blockchain system. The planned service was put into practise on the Quorum blockchain, and its performance was assessed using a forged benchmark. Our test results show that the suggested service prohibits the manipulation of e-coupon data with greater safety and minimal performance overhead.

REFERENCES

[1] (2019). Wikipedia: E-coupon. [Online]. Available: https://en.wikipedia. org/wiki/E-coupon

[2] C. Blundo, S. Cimato, and A. De Bonis, ‘‘Secure E-coupons,’’ Electron. Commerce Res., vol. 5, no. 1, pp. 117–139, Jan. 2005.

[3] (2016). World Mobile Coupons Market to Grow at 73.1% CAGR to 2020. [Online]. Available: https://www.prnewswire.com/newsreleases/world-mobile-coupons-market-to% -grow-at-7314-cagr-to-2020- 603320306.html

[4] (2017). Coupon Fraud is Crime, Even if it Feels Harmless: Coupon Counselor. [Online]. Available: https://goo.gl/2emab1.

[5] S.-C. Hsueh and J.-H. Zeng, ‘‘Mobile coupons using blockchain technology,’’ in Proc. Int. Conf. Intell. Inf. Hiding Multimedia Signal Process. Springer, 2018, pp. 249–255.

[6] A. Knight and N. Dai, ‘‘Objects and the web,’’ IEEE Softw., vol. 19, no. 2, pp. 51–59, Mar. 2002.

[7] (2018). Quorum. [Online]. Available: https://github.com/jpmorganchase/ quorum

[8] (2017). Coupon Statistics: The Ultimate Collection. [Online]. Available: https://blog.accessdevelopment.com/ultimate-collection-couponstatistic%s

[9] (2017). emphDigital Coupon Marketing—Statistics and Trends. [Online]. Available: https://www.invespcro.com/blog/digital-coupon-marketing

[10] (2019). Digital Coupons Continue to be the Fastest Growing Method of Redemption due to Shoppers' Increased Demand for Convenience. [Online]. Available: https://www.globenewswire.com/news-release/2019/ 02/13/1724510/0/en/Digi%tal-Coupons-Continue-to-be-the-FastestGrowing-Method-of-Redemption-Due-to-Sho%ppers-IncreasedDemand-for-Convenience.html

[11] (2017). The Coupon Insider: Digital vs. Paper Coupons. [Online]. Available: https://livingonthecheap.com/coupon-insider-digital-papercoupons//

[12] R. G.-P. M.-V. Agarwal and N. Modani, ''An architecture for secure generation and verification of electronic coupons,'' in Proc. USENIX Annu. Tech. Conf., Boston, MA, USA, Jun. 2001, p. 51. [13] S.-C. Hsueh and J.-M. Chen, ''Sharing secure m-coupons for peergenerated targeting via eWOM communications,'' Electron. Commerce Res. Appl., vol. 9, no. 4, pp. 283–293, Jul. 2010.

[14] R. Rivest, ''The MD5 message-digest algorithm,'' Tech. Rep., 1992.

[15] C.-C. Chang, C.-C. Wu, and I.-C. Lin, ''A secure e-coupon system for mobile users,'' Int. J. Comput. Sci. Netw. Secur., vol. 6, no. 1, p. 273, 2006.

[16] M. Crosby, P. Pattanayak, S. Verma, and V. Kalyanaraman, ''Blockchain technology: Beyond bitcoin,'' Appl. Innov., vol. 2, nos. 6–10, p. 71, 2016.

[17] S. Nakamoto, ''Bitcoin: A peer-to-peer electronic cash system,'' Tech. Rep., 2008.

[18] M. Szydlo, ''Merkle tree traversal in log space and time,'' in Proc. Int. Conf. Theory Appl. Cryptograph. Techn. Springer, 2004, pp. 541–554.

[19] M. Castro and B. Liskov, ''Practical Byzantine fault tolerance,'' in Proc. OSDI, vol. 99, 1999, pp. 173–186.

[20] N. Szabo, ''Smart contracts: Building blocks for digital markets,'' Tech. Rep., 2018.

[21] V. Buterin, ''A next-generation smart contract and decentralized application platform,'' Tech. Rep., 2014.

[22] V. Buterin, ''A next-generation smart contract and decentralized application platform,'' White Paper, vol. 3, p. 37, Jan. 2014.

[23] U. Maurer, ''Modelling a public-key infrastructure,'' in Proc. Eur. Symp. Res. Comput. Secur. Springer, 1996, pp. 325–350.

[24] D. Hankerson, A. J. Menezes, and S. Vanstone, Guide to Elliptic Curve Cryptography. Springer, 2006.

[25] (2019). Apache JMeter—Apache JMeterT. [Online]. Available: https://jmeter.apache.org/

[26] K. Wolter and P. Reinecke, ''Performance and security tradeoff,'' in Proc. Int. School Formal Methods Design Comput., Commun. Softw. Syst. Springer, 2010, pp. 135–167.

[27] H. Dang, T. T. A. Dinh, D. Loghin, E.-C. Chang, Q. Lin, and B. C. Ooi, ''Towards scaling blockchain systems via sharding,'' in Proc. Int. Conf. Manage. Data, Jun. 2019, pp. 123–140.

[28] J. Wang and H. Wang, ''Monoxide: Scale out blockchains with asynchronous consensus zones,'' in Proc. 16th USENIX Symp. Netw. Syst. Design Implement. (NSDI), 2019, pp. 95–112.

[29]A. S. Podda and L. Pompianu, "An overview of blockchain-based systems and

smart contracts for digital coupons", *Proc.* IEEE/ACM 42nd Int. Conf. Softw. Eng. Workshops, pp. 770-778, Jun. 2020.

[30]C.-S. Hsu, S.-F. Tu and Z.-J. Huang, "Design of an E-voucher system for supporting social welfare using blockchain technology", Sustainability, vol. 12, no. 8, pp. 3362, Apr. 2020.

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