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Is Blockchain Ready to Revolutionize Online Advertising?

Blockchain

2019.04.16

SeoulTech

Jose Costa Sapalo Sicato

코스타

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OUTLINE

Abstract

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Abstract

- The 200-billion-dollar per annum online advertising ecosystem has become infested with thousands of intermediaries exploiting user data and advertising budgets. All key stakeholders in the value-chain are infected: advertisers with fraud, publishers with their diminishing share of advertising budgets, and users with their right to privacy. Blockchain presents a possible solution to addressing the critical issues in the online advertising supply chain.
- Blockchain presents a possible solution to addressing the critical issues in the online advertising supply chain.
- Evidence from this research points out that blockchain is not yet ready to be widely implemented in online advertising.

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1-Introduction

Online advertising is a vital stakeholder of the Internet's economy. A growing trend in online advertising in recent years has been the move towards programmatic media trading. Programmatic advertising is designed for small advertisers and publishers to ease access to the online advertising market.

Programmatic advertising has the disadvantage of being opaque and exposed to threats such as fraudulent activity. The detection of fraudulent activities is a challenging task due to the large volume of transactions [3]

The online advertising ecosystem has become infested with thousands of intermediaries, whose business models range from exploiting user data to verification companies promising to help advertisers secure their advertising budgets

- We claim that blockchain can be a practical solution to addressing issues burdening online advertising.
- At the same time, we disagree with those claiming that blockchain technology is ready to be applied to solving online advertising problems.
- Other concerns regarding the utilization of blockchain technology in online advertising include energy consumption and the rapid growth of the global carbon dioxide equivalent (CO2e) footprint of the Internet.
- The contribution of this study: to create a solution for overcoming the issues in online advertising, we identified six requirements that a possible solution must fulfill.

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II- Materials and methods

The aim is to present the current state of knowledge on blockchain technology and its possibilities in online advertising. This paper is a review article.

We first review relevant articles previously published on blockchain, and secondly analyze the blockchain-based publicly available solutions to online advertising.

III- Blockchain technology

The world is undergoing rapid change. This change is accelerated by the development of Internet technologies and the exponential growth of data.

A blockchain is a distributed peer-to-peer database, which provides a technology for the decentralization of systems. Blockchain alone does not guarantee decentralization, but it does guarantee the distribution of data storage and transactions.

The decentralized model has the potential for increased equality in storage, and the availability of information and resources.

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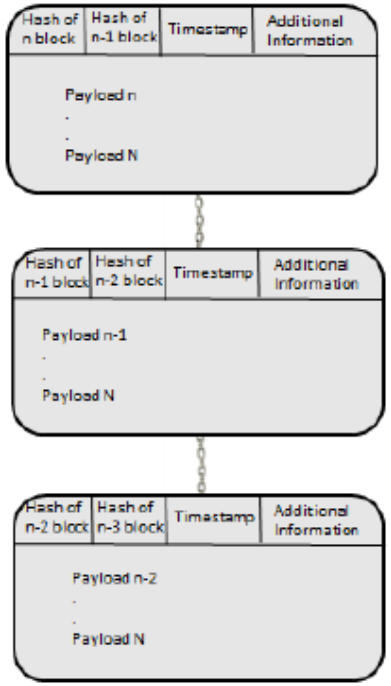
A. Decentralized Architecture

There is a well-established taxonomy for decentralized architectural objects that are the following:

- Decentralized applications (DAPP) utilizes a network in a distributed fashion
- Decentralized autonomous organizations (DAO) originates from articial intelligence.
- decentralized autonomous societies (DAS) consist of many smart contracts, or multiple DAPPs and DAOs operating autonomously.

B. Blockchain Technology overview

- Blockchain technology includes three essential components: the application, the protocol, and the cryptographic solution. A blockchain consists of blocks, hashes, and hash functions.



The fundamental principle of a blockchain

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In blockchain storage, there is no double-send problem; each node is assigned with a private key and a public key.

There are three different kinds of blockchain: private, public, and hybrid.

- private blockchain, write permissions are monitored by a centralized decision making entity, and read permissions are either public or restricted.
- Public decentralized blockchains are accessible to every Internet user. Public blockchains, especially those using the trustless PoW consensus algorithm, consume vast amounts of energy compared to a trusted private blockchain.

The evolution of blockchain can be described by three signicant release:

- The first-generation blockchains are currency related, whereas the second-generation blockchains are smart contracts-related and the third generation concentrate on justice and other administrative applications.

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C. The concept of proof and consensus

- The main consensus mechanisms are PoW, PoS, delayed PoW (dPoW), Proof-of-burn (PoB), proof-of capacity (PoC), proof-of-activity (PoA), proof-of-existence (PoE), proof-of-intelligence (PoI), proof-of-luck (PoL), ripple ledger, lightning network, and cross blockchains.
- To provide the aforementioned authenticity and security properties, different implementations of blockchain protocols use different types of proofs. The most well-known proof is the one used in the context of Bitcoin, PoW.
- The challenge of blockchain consensus, which the PoW paradigms attempt to address, is that the distributed system must agree on a single shared state. The most popular alternative consensus mechanism to PoW is PoS.

D. On-chain, off-chain and sidechain Technologies

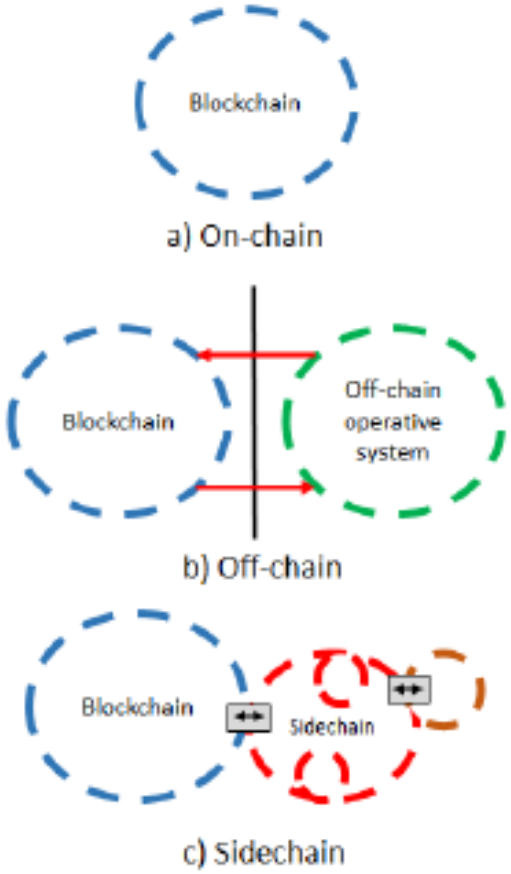

FIGURE 2. The basic idea of on-chain, off-chain, and sidechain, adapted from [25].

- Sidechain is a blockchain that can validate data from other blockchains. Sidechain is a more efficient and exible consensus mechanism with substantially less signicant nodes
- Off-chain transactions have serious risks. Most off-chain systems require that the users trust them.

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E. Energy efficiency and blockchain

- To become as secure as Bitcoin, alternative blockchains must secure their network with equal hashing power.
- Bitcoin mining uses 982 MWh/day, which transforms into an energy cost of $15 million [12]. According to Bradbury, energy consumption per Bitcoin was 240 kWh in 2014, and it has increased since then.

IV-Specific requirements related to online advertising

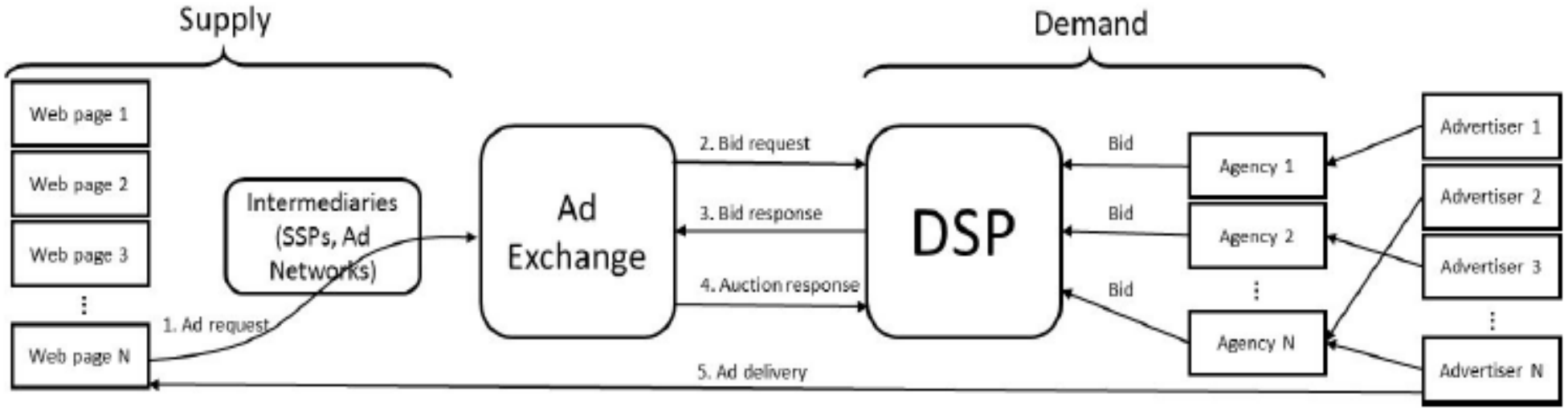

FIGURE 3. Online advertising ecosystem.

The requirements for an online advertising specic implementation of blockchain fall into two categories:

- general requirements for blockchain: scalability, inability to modify blocks, and energy efciency
- online advertising specific requirements

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Requirements of online advertising to blockchain technology

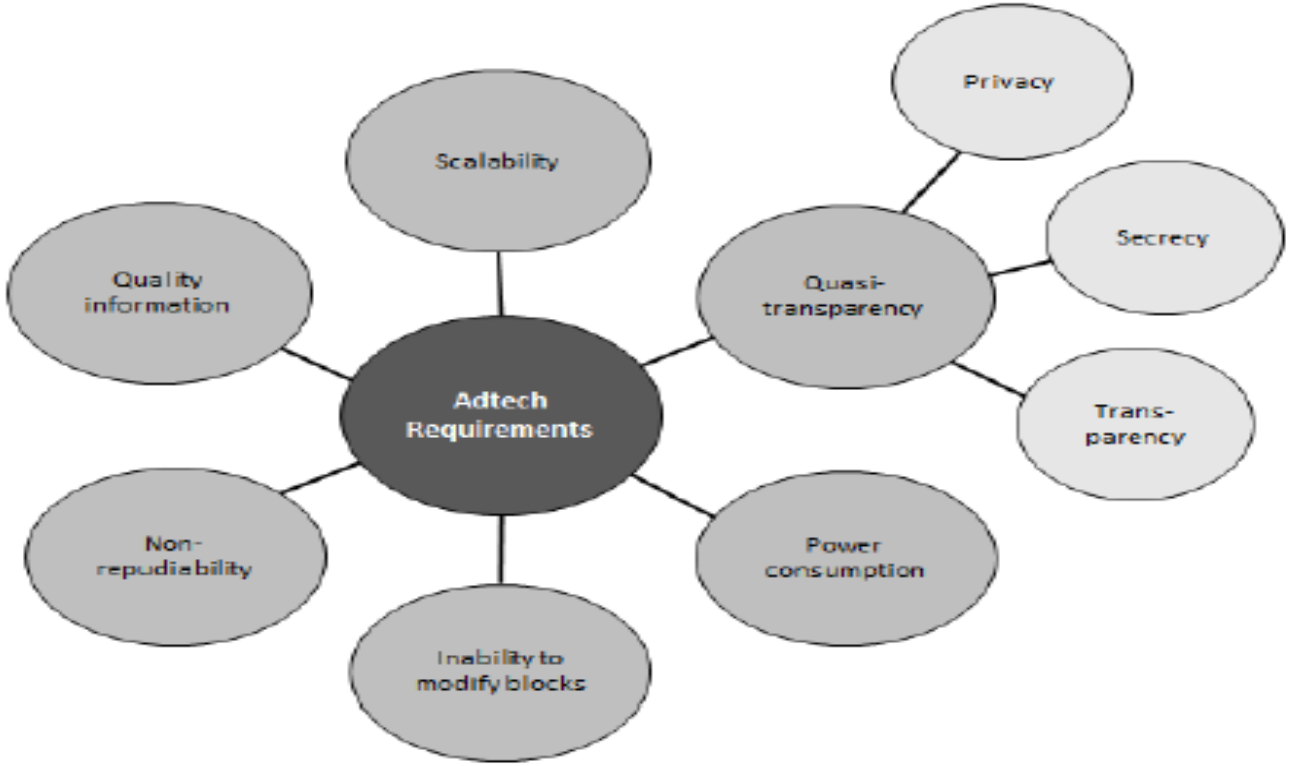

FIGURE 4. The requirements of online advertising to blockchain technology.

V - Review of blockchain platforms and implementation in online advertising

There are many blockchain platforms already available. Developers have implemented various blockchain-based technologies; file storage, communications, file serving, archiving, data processing, bidding, predictions, and recently, online advertising and many other critical digital economy capabilities

- Two main aspects was mentioned for analyzes blockchain platforms and the solutions created for online advertising.

A. Analysis of online advertising vertical blockchain solutions

Blockchain technologies promise to offer solutions to transactional systems. Was analyzed the following solutions: AdChain, AdEx, Comcast blockchain, Madhive, and Papyrus.

- Adchain is an Ethereum-based blockchain solution for online advertising. It is a decentralized solution and uses modified PoS as consensus.
- Comcast is developing a blockchain-based platform with Disney, Channel 4, NBC, and several other large cable TV´companies.
- The MadHive blockchain-based solution is designed for the advertising industry.
- Papyrus is a decentralized solution for online advertising. It is an Ethereum-based blockchain solution with smart contracts, and it uses PoS as consensus.

B. Review of blockchain platforms

Was analyzed the following platforms:

- Bitcoin: is the oldest and most widely used blockchain platform. It uses PoW as a consensus.
- Ethereum: is a blockchain-based decentralized multipurpose cryptocurrency platform, which runs smart contracts.
- Ripple: provides a total solution with a gateway, a payment solution, an exchange solution, a remittance network, and a smart contract system.
- Counterparty: is a decentralized Bitcoin-based platform that was developed to provide enhanced features on top of Bitcoin software. Uses Proof of burn (PoB) as consensus.
- The BitShares: platform is an open source decentralized blockchain-based platform providing smart contracts. It uses PoS as consensus.
- Colored Coins: is a method for transferring metadata to the Bitcoin blockchain and a platform for cryptocurrencies. uses proof-of-ownership (PoO) as a consensus.

VI- Results

A. Results of online advertising vertical blockchain solutions analysis

TABLE 1. A comparison of Adtech-related blockchain solutions.

Factor	Adchain	AdEx	BAT/Brave	NYIAX	Madhive	Papyrus
Description	Ethereum-based platform for decentralized applications for the digital advertising ecosystem	Ethereum-based ad exchange for online advertising addressing fraud and privacy.	Token of exchange in a secure, anonymous, opt-in advertising system based on the Brave browser	Financial trading and advertising technology combined	Blockchain-based ecosystem dedicated to advertising	Decentralized advertising ecosystem
Proof methodology	Modified PoS	PoS	Zero-Knowledge proof	Proof-of-Asset	Byzantine fault tolerance	PoS
Off-chain	No	Yes	Yes	Yes	Yes	Yes
Sidechain	Yes	No	Yes	Yes	Yes	Yes
Two-way peg	Yes	No	Yes	No	No	No
Open source	Partly	Yes	Yes	No	No	Yes
Scalability trans./sec	Only whitelisting of domain names	Trans. off-chain	Latency issues	Batch processing, non-real-time	Transactions logic off-chain	> 1M
Quality information	Whitelist	Yes	Yes, attention score	Yes	Yes	Yes
Non-repudiability	Authentication of nodes with TSL	Proof-of-conversion and User ID	Yes	Yes	Yes	Yes
Quasi-transparency	No	Yes	Yes	Yes	Yes	Yes
Inability to modify blocks	Partly	Yes	Yes	Yes	Yes	Yes
Power consumption	Ethereum-based	Ethereum-based	Ethereum-based	No data	Proof-of-Real-Work	No data
Released	Jul 17	Feb 18 Beta	May 17	Mar 17	Apr 16	Mar 18
Adaptation	Low	Low	Low	Low	Low	Low
Reference	[52]	[53]	[8], [67]	[59]	[30]	[11]

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B. Results of blockchain platform analysis

TABLE 2. A comparison of blockchain platforms.

Platform	Description	Proof methodology	Off-chain	Sidechain	Two-way peg	Open source	Scalability trans./sec	Reference
Bitcoin	Crypto-currency platform	PoW	Yes	Yes	Yes	Core, Yes	6.8	[36], [62]
Ethereum	General purpose crypto-currency platform that runs smart contracts	PoW, PoS	Yes	Yes	Yes	Yes	25	[57], [64]
Ripple	Enterprise blockchain solution for global payments	PoW-based Ripple protocol consensus	Yes	Yes	Inter-ledged	Yes	1000	[19], [23], [65]
Counterparty	An overlay protocol of currency assurance and exchange	PoB	Yes	No	No	Yes	No data	[66]
OmniLayer	Financial derivate platform	Overlay on top of Bitcoin PoW	Yes	Yes	Yes	Yes	13000	[67], [68]
Open Transactions	Untraceable and anonymous transactions without latency	PoW-based	Yes	Yes	Yes	Yes	No data	[69]
BitShares	Decentralized crypto-equity share exchange	Delegated PoS	Yes	Yes	Yes	Yes	100000	[70], [71]
ColoredCoins	Provides Bitcoin asset marking for digital/physical assets	Proof of ownership	Yes	No	No	Yes	1M-25000Bn*	[72], [73]

* Based on Lightning Network

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VII – Discussion

- A. SCALABILITY: To achieve the required scalability, approaches such as PoW or PoS are not feasible options, since both act as a cause of delay even in relatively low-scale environments.
- B. QUASI-TRANSPARENCY: was propose to creating a double cryptographic layer for resolving the anonymity challenge.
- C. INABILITY TO MODIFY BLOCKS: One option to solve the inability to modify the blocks requirement is to limit the time of creation of a block based on timestamps.
- D. NON-REPUDIABILITY: To solve the non-repudiability challenge, was propose using the cryptographic solutions used in existing blockchain protocols.

VIII. Conclusion

Was conducted a review of existing blockchain platforms and blockchain-based solutions addressing online advertising.

- Barriers to adoption in the broad context include token volatility, scalability, excessive power consumption, trust, and the difficulty of producing reliable quality information
- The promise of blockchain is significant for online advertising and could indeed provide the basis for revolutionizing the industry by basing it on trust and authenticity.

Opinion

Risk Fraud

The primary hazard in online advertising is outright fraud, as hackers find increasingly clever ways to create fake web traffic, a phenomenon generated by bots rather than actual human visitors to a site.

What do we need to know about blockchain technology and how can it be used in online advertising?

The main thing to understand is that today it is one of the best technologies for storing and transferring data: it is about any data, not only virtual coins on web purse. And that's why:

- **Transparency.** Data in blockchain cannot be faked.
- **Reliability.** Data cannot be deliberately destroyed.
- **Security.** Data cannot be hacked or read.

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