In-Game Economy Based on Blockchain

Gašper Moderc
moderc.gasper@gmail.com
University of Primorska, UP FAMNIT
Koper, Slovenia

Aleksandar Tošić
aleksandar.tosic@upr.si
University of Primorska, UP FAMNIT
Koper, Slovenia
Innorenew
Koper, Slovenia

Jernej Vičič
jernej.vicic@upr.si
University of Primorska, UP FAMNIT
Koper, Slovenia
ZRC-SAZU
Koper, Slovenia

ABSTRACT

In this paper we review the potential of using blockchain technology to tokenize in-game assets such as items and currency. We review existing projects developing technology to support this and through various available metrics and argue their potential for success. We provide insight into the potential formation of a global decentralized virtual marketplace where players can leverage the free market to seamlessly migrate between supported games taking the value with them. We also argue, that blockchain would infuse the much needed trust in virtual economies and make them more secure, less prone to manipulation, and easier to regulate and police.

CCS CONCEPTS

• **Applied computing** → **Electronic commerce**; • **Human-centered computing** → *Human computer interaction (HCI)*; • **Software and its engineering** → Software notations and tools.

KEYWORDS

in-game transaction, blockchain, coin, game engine, comparison

ACM Reference Format:
Gašper Moderc, Aleksandar Tošić, and Jernej Vičič. 2019. In-Game Economy Based on Blockchain. In *Proceedings of (HCI-IS '19).* ACM, New York, NY, USA, 4 pages. https://doi.org/10.1145/1122445.1122456

HCI-IS '19, October, 2019, Ljubljana

ACM ISBN 978-x-xxxx-xxxx-x/YY/MM…$15.00
https://doi.org/10.1145/1122445.1122456

1 INTRODUCTION

Games designers have steadily explored different models of monetization. A recent and emerging monetization model usually referred to as free-to-play is becoming more popular. The idea of this freemium business model is to monetize the content in the game instead of the game itself. More specifically, games frequently introduce an in-game virtual currency that users can buy with real currency and use in the game to buy items. With the growing support of fiat gateway, a service that allows you to convert fiat currency (a national currency, say US Dollars) in to cryptocurrency, and in-game purchase services in game platforms, such as Google Play and Apple's App Store, there is much less friction in buying in-game items. Such models have been a great success, with games like Clash Royale by Supercell creating 1 billion USD in revenue less then a year after launch [14]. There are many elements contributing to this success. In most cases, players must acquire virtual in-game currency by playing or acquiring it with real money in order to progress, speed up game processes that require waiting, upgrading items to lower the difficulty, etc. However, the virtual currencies are spendable only in the game and there is rarely a bi-directional value transfer of money. This prevents players from migrating their in-game valuables to other games, consequently forcing them to spend additional money should they choose to play a different game.

To overcome this limitation, independent marketplaces were created by players where items and accounts can be traded for currency or exchanged for other items and accounts. Due to the unregulated nature of these markets, trading is very risky. Additionally, the use of third party marketplace services creates a lot of unnecessary friction for users, requiring them to constantly switch between the game screen and different web-based marketplace services. A blockchain-based inter-operable protocol would revolutionize the gaming industry by enabling global virtual markets with no unnecessary friction and thereby increase market participation. Owning, transferring and trading digital assets could become as easy as playing a game.

2 GAME ENGINES AND BLOCKCHAIN

This section describes various game engines and possible options for blockchain payment integration, i.e. how different gaming platforms have begun to enable integration with their platform.

When the first games were introduced, the term "game engine" did not exist at all, since what we now understand as a game engine evolved with the computer game. Namely, each game had its own game drive, which made it possible to quickly debug, add new functionality and encapsulate logic, graphics and other components.

In the 1990s [6], however, the first broad-spectrum game engines began to develop, allowing the construction of similar games. For example, if a programmer wanted to make a racing game with a car, he made a game engine for such games and used a template to change the game to get from one version to another version. Examples of such gaming engines are Hydro thunder Engine [9], Quake [12], Doom [9], etc.

Subsequently, fully self-contained game engines began to develop, allowing the development of a wide range of different games, some of which have survived to this day. Examples of such engines that are still in the top spot in popularity today are Unity 3D [3] and Unreal Engine [6]. Among other things, these gaming engines are available free of charge, so that any future developer can get them for free and can immediately start making their own computer game.

Same parts of this paper are based on just one game engine technology. For these purposes, we have chosen Unity 3D [3]. The decision was mostly pragmatic as we had more experience in using the selected engine.

Games and blockchain

The widespread model of micro-payments in games resulted in a heterogeneous ecosystem of virtual currencies that are not inter-operable and often prone to manipulation. One of the key concerns are the so called "game of luck" elements of random chance to obtain virtual items, which have met some regulatory issues and are often compared to gambling. Another issue for costumers is the constantly changing chance for loot boxes in order to achieve more balance and in-game economic stability. Hence, the in-game economy can not be considered free and open market. Instead, it is heavily regulated and manipulated, with a goal to set the best ratio between player engagement and revenue. Virtual markets can become quite large, and often though basic principles of supply and demand should drive the market [15], virtual markets behave very differently [2]. Additionally, game designers can manipulate the supply of goods without player's awareness should they choose to conceal it due to the centralized nature of the virtual currency and luck ratios in loot boxes. These issues can be addressed by using a trust-less system (that does not depend upon the intentions of its participants, who may be honorable or malicious), which is one of the key properties blockchain technology has.

Tokenization of real and virtual assets is one of the use-cases for blockchain-based tokens. At the time of writing (May 2019), Ethereum [1] was home to more then 200,000 ERC20 token contracts alone, making it the largest blockchain network for tokenized assets and utility tokens. Ethereum has many token standards, among which the ERC-721 token standard for non-fungible tokens allows games to represent a specific virtual item as a unique token, while the ERC20 standard can serve as fungible in-game currency. There are many benefits to tokenizing in-game assets such as:

- Transparency of supply and demand: The smart contract can keep record of all tokens (in-game items) and their owners. Due to the immutable and transparent nature of blockchain, these contract states can be queries by anyone.
- Transparency for trades, transfers and value at any given time: Decentralized protocols supporting an ERC standard can inherently support all tokens in compliance with the standard. An illustrative example would be the 0x Protocol [16] that enables most popular ERC standards including ERC-721 to be traded between two parties in a completely decentralized and trusted way. This would enable players to trade their tokenized assets between games.
- Transparency of loot box chances and inability to manipulate: Loot box chances can also be written in smart contracts to prevent manipulation. Additionally, with the help of oracles providing safe random, the randomness .
- Easier regulation: The blockchain can provide a historical and immutable record that can be used by regulators to monitor and police the virtual markets.
- Interoperability between games, merging virtual economies: With interoperability standards for trading, landing, borrowing, etc., currently separated virtual markets can be a bridge through trade. This could create a global in-game virtual economy where players are free to migrate their value from game to game through trade.

Due to the high potential of blockchain technology in revolutionizing gaming, many start-ups were funded through initial coin offerings to try and build the technology needed for integration.

3 PRESENTATION OF THE AVAILABLE TECHNOLOGIES

This section presents the blockchain technologies that were found by the authors and tested on a proof of case implementation with mostly default settings. The observed technologies are:

- Enjin [4],
- WAX [8],
- Decentraland [5],
- Loom Network [11],
- Funfair [10].

Each blockchain technology is presented and a comparison of the comparable properties is presented in Section 3.

Enjin

The oldest blockchain technology aimed at in-game transactions is Enjin [4] that was presented to the public in 2009, but the blockchain-based crypto coin with the same name was presented in 2017. The vision of this technology is to allow developers to develop their games as easily as possible, with as little background as possible, so anyone with some programming knowledge can integrate their technology and easily connect to blockchain. The focus of Enjin technology is on the Unity 3D game engine.

From a practical point of view, the use of Enjin looks like this: first, the user (in this context, the developer) must provide the Unity 3D game engine and prepare the foundations of the game. Once this is set up, it has to download the Enjin SDK from the Internet, which ensures proper communication of Unity 3D and the Enjin platform. The integration of these two technologies is automatic.

WAX

WAX technology [8] has not yet come fully into use but is already extremely popular and highly anticipated. WAX technology is praised for its full compatibility with the very popular and well-known EOS [7] technology (at the time of writing [1] this is the third most popular Blockchain technology). WAX promises developers an easy integration of their technology into existing systems, regardless of the game drive or the game program where current technology is in use.

The user will either play a game or see something related to the game online (say, some good) and decide to buy it. All he/she has to do is to click on a button to purchase this item, which may be a direct purchase, or request a replacement for another user. Clicking on the button will introduce the WAX authorization to complete the entire process for the user.

[1] Coincodex, May 2019: https://coincodex.com/crypto/eos/?period=YTD

Decentraland

This is a technology that allows the user to buy a virtual estate on the Ethereum network [1], modify, edit and monetize them. As the name implies, the point is that all these virtual estates are decentralized. Which means that there is no central institution that controls who owns any of the possessions and that can also be used (or that the institution would collapse and all users would lose all the possessions). Thus, the whole system is decentralized, which enables, among other things, direct purchase, sale and control of the user's part of the property. The process of using this technology is very different from all the others presented in this paper, namely, the whole system is divided into two goods: Mana and Land. If we want to have our digital property inside Decentraland, we can buy it through their "Mana" store. This is essentially the cryptocurrency behind Decentraland. So the developer first has to buy the right amount of "Mana" through an online exchange, then go to the Decentraland store and buy any property there.

Loom Network

The technology is based on the very popular Ethereum [1] technology, allowing the user to build their own Ethereum private chain. As Ethereum is considered the most popular blockchain technology (besides Bitcoin, which cannot be used for this purpose), Loom Network has become very popular as well.

The entire communication with Loom Network goes through Loom SDK (software development kit). The interface of the SDK takes care of converting user function calls into their Loom network equivalents. Loom SDK is independent of the gaming engine.

Funfair

The company's focus is on online casino games, but, in general, their technology can be used in other games, even in gaming engines. The technology allows players to look into the code, which means they can see if the game is really fair. Among other things, they can see its operation on the blockchain itself, so fair play can prove its "honesty" immediately.

Comparison

These projects are still in early deployment phases; currently, there are only a few small games testing out the potential of tokenizing in-game assets. There are also issues with scalability of the Ethereum's base layer, which has a relatively low transaction throughput. Ethereum has a plan to address this issue in the following years by upgrading to Ethereum 2.0. Meanwhile, some projects decided to implement plasma [13] chains to speed up and batch transactions to achieve higher

Table 1: Comparison of monetised values of presented technologies.

Technology	ERC-721	Plasma	Engine integration	Market cap ($)	Place
Enjin	Yes	Yes	Yes (Unity)	120	top 60
WAX	Probably	No	No	72	top 90
Decentraland	No	Yes	No	64	top 100
Loom network	Yes	Yes	No	62	top 100
Funfair	No	Yes	No	41	130

throughput. In Table 3, we compare selected projects by market cap that could be a measure of market confidence in the project, support for plasma chain (which indicate innovation and scalability), support for non-fungible token standard ERC-721 and game development engine integration.

As it is shown in the Table 3 both Enjin and Loom Network support ERC-721 standard (while WAX will most likely support it at its release). Interesting point is that both technologies offer even better token standards (Enjin supports ERC-1155 and Loom Network supports ERC-1187). The Ethereum Plasma support metric did not prove to be helpful in this study, since every technology supports it (aside from WAX, which is on EOS, therefore it cannot support it). A real breakthrough of the study was the Engine integration metric, which showed why the Enjin dominates the ladder - it is the only top 100 technology which supports an engine integration. We observe that Enjin has the most potential regarding support, which is further validated by market confidence – the last two metrics.

4 PILOT IMPLEMENTATION

The implemented game possesses a fully functional decentralised system for trading cards between players. The game is made in Unity 3D game engine with Enjin SDK integration for supporting decentralised trading. The system detects tokens from player's digital wallet and recognize every token as an in-game virtual item. The trading system is generic, so a token can represent any virtual item, for example a card, sword, skill, pet, car, house, etc.

5 CONCLUSION

Blockchain technology has the potential to revolutionize the in-game virtual markets. The standards for tokenizing assets enable easy support by decentralized protocols. Clearly, there is a a growing interest within the gaming industry to adopt this technology, with an ever-growing number of protocols with some already integrated in-game development engines. The potential to bridge virtual markets into a global economy is very ambitious and requires further analysis to address question such as:

- How these markets would behave?
- Would they need to be regulated?
- Will more profitable games be played more?
- Can game designers attract players by increasing demand for their in-game items instead of investing in marketing?

However, there is currently very little data available to analyze, simulate or predict potential market behaviour.

REFERENCES

[1] Vitalik Buterin and Others. 2013. Ethereum white paper. *GitHub repository* (2013), 22–23.

[2] Edward Castronova. 2002. On virtual economies. (2002).

[3] Ryan Henson Creighton. 2010. *Unity 3D game development by example: A Seat-of-your-pants manual for building fun, groovy little games quickly.* Packt Publishing Ltd.

[4] Enjin. 2017. *Enjin white paper.* Technical Report. Enjin® PTE LTD. 34 pages. https://enjincoin.io/enjincoin{_}whitepaper.pdf{%}0A

[5] Ordano Esteban, Meilich Ariel, Jardi Yemel, and Araoz Manuel. 2017. *Decentraland white paper.* Technical Report. Decentraland. 15 pages.

[6] Jason Gregory. 2017. *Game engine architecture.* AK Peters/CRC Press.

[7] E O S IO. 2017. EOS. IO technical white paper. *EOS. IO (accessed 18 December 2017) https://github. com/EOSIO/Documentation* (2017).

[8] William Quigley Jonathan Yantis and Malcolm CasSelle. 2018. *Worldwide Asset eXchange white paper.* Technical Report. WAX. 44 pages. chrome-extension://oemmndcbldboiebfnladdacbdfmadadm/https://wax.io/uploads/WAX{_}White{_}Paper.pdf

[9] Michael Lewis and Jeffrey Jacobson. 2002. Game engines. *Commun. ACM* 45, 1 (2002), 27.

[10] Jeremy Longley and Oliver Hopton. 2017. *FunFair Technology Roadmap and Discussion.* Technical Report. Funfair. 6 pages. chrome-extension://oemmndcbldboiebfnladdacbdfmadadm/https://funfair.io/wp-content/uploads/FunFair-Technical-White-Paper.pdf

[11] Loom. 2019. *Loom API.* Technical Report. https://loomx.io/developers/en/intro-to-loom.html

[12] Alexander Ploss, Stefan Wichmann, Frank Glinka, and Sergei Gorlatch. 2008. From a single-to multi-server online game: a Quake 3 case study using RTF. In *Proceedings of the 2008 International Conference on Advances in Computer Entertainment Technology.* ACM, 83–90.

[13] Joseph Poon and Vitalik Buterin. 2017. Plasma: Scalable autonomous smart contracts. *White paper* (2017), 1–47.

[14] The Tech Portal. 2017. *Supercell's Clash Royale generates over $1 billion revenue in less than a year.* Technical Report. 2 pages. https://thetechportal.com/2017/02/16/clash-royale-revenue-first-year/

[15] Qiu-Hong Wang, Viktor Mayer-Schönberger, and Xue Yang. 2013. The determinants of monetary value of virtual goods: An empirical study for a cross-section of MMORPGs. *Information Systems Frontiers* 15, 3 (2013), 481–495.

[16] Will Warren and Amir Bandeali. 2017. 0x: An open protocol for decentralized exchange on the Ethereum blockchain. (2017). url:https://github.com/0xProject/whitepaper