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Problem analysis and future vision for GameFi: A transition from GameFi to DeFi gaming

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Abstract. The increasing popularity of GameFi, a combination of gaming and financial models, has led to the emergence of certain problems with current financial models that can only be overcome through a transition towards de-game, or full-on-chain games. This paper provides an overview of the history and financial models of GameFi, identifies pain points on the path of transition from GameFi to de-game, such as capacity and TPS, and presents a concept for a de-game with achievable performance levels. Both single and double currency models have limitations that prevent them from reaching their full potential, demonstrating the need for a transition to de-game, capable of offering unique gaming experiences and financial rewards. Overcoming pain points such as capacity and TPS will be essential in achieving this transition. Proposed solutions include using sharding technology and optimizing smart contract architecture to enhance system capacity and TPS. Ultimately, this paper highlights both the challenges and opportunities presented by GameFi, proposing the transition to de-game to overcome the limitations of current financial models. Addressing critical pain points such as capacity and TPS, our proposed solutions offer feasible approaches to building reliable on-chain gaming systems. The future vision of GameFi in the form of de-game offers a promising outlook for the gaming industry, where players can engage in immersive games with financial incentives.

Keywords: GameFi, DeFi gaming, transition.

1. Introduction

The adoption of the play-to-earn (P2E) method in blockchain games has been on the rise, with the token mechanism being the mainstay. The two most common P2E models are the single-token and dual-token models. This article conducts an analysis of both models that are currently in use, identifies the inherent issues with the present P2E systems, and presents a vision for a decentralized gaming future. The single-token model uses only one token as the game currency. This token can be obtained by playing the game, and then it can be exchanged for other assets or tokens. However, the value of this token may be too volatile, and this could lead to sudden price changes that could affect the entire game economy, ultimately leading to player losses. Furthermore, the frequent selling of tokens during production or destruction processes can adversely impact the game's sustainability. On the other hand, the dual-token model employs two types of tokens: a governance token and an in-game token. The governance token adds value to the financial system, while the in-game token is used solely within the game environment to prevent frequent sell-offs due to production, destruction, and market price fluctuations. However, this

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model poses challenges in balancing the two tokens' values and maintaining the stability of the game economy.

To address these issues, a multi-token model is proposed, which employs numerous tokens, each with a unique purpose. It envisions a decentralized game ecosystem where players can earn tokens by participating in the game, which can be used for additional in-game purchases or exchanged for other cryptocurrencies. Tokens can be burned to reduce the overall supply, thereby mitigating potential price volatility issues [1]. Additionally, the implementation of governance protocols can enable players to vote on the direction of the game and participate in decision-making processes, resulting in more significant engagement and investment in the game's success. In conclusion, this article has highlighted the current challenges and limitations associated with single and dual-token models. A multi-token model approach is proposed for the future development of decentralized games, through careful design of token models and governance protocols, to establish a more sustainable, engaging, and profitable environment for players and stakeholders within the decentralized gaming space.

2. Relevant theories

2.1. Definition of gamefi

The term GameFi combines the concepts of gaming and finance. GameFi uses gaming as its backdrop but finance as its operating model. GameFi truly entered the public eye with the play-to-earn (P2E) game mode. GameFi allows players to purchase Non-Fungible Token (NFT) tickets to enter the game, which can be seen as buying a way to interact with the game in the decentralized world. In GameFi's closed system, this creates a connection between the value of in-game items and stable real-world currencies. By investing in NFTs early on and playing the game well, players can choose to sell them for a profit when their value rises. The continuous iteration of new and old players and changes in the game ecosystem create a strong supply and demand relationship within the game. It is not difficult to see that GameFi has a close relationship with DeFi, but instead of simply staking or selling to earn profits, GameFi integrates these DeFi behaviors into the gaming model [2].

2.2. Financial model

There are two main currency models in GameFi: the single-currency model and the dual-currency model.

A single-token model refers to a gameFi ecosystem where there is only one native token, and all transactions within the ecosystem are carried out using that token. In this model, the token's value is directly tied to the success and adoption of the ecosystem, and any fluctuations in the token's price can have a significant impact on the ecosystem's health.

A dual-token model refers to a gameFi ecosystem where there are two tokens: one that serves as the primary currency for in-game transactions, and another that serves as a governance token. The primary token is used for transactions within the ecosystem, while the governance token is used for decision-making and voting on proposals related to the ecosystem's development [3].

The single-token model can be divided into four types:

Entering with fiat currency, exiting with cryptocurrencies

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3. System analysis and application research

3.1. Problem on financial models

3.1.1. Single-token mode

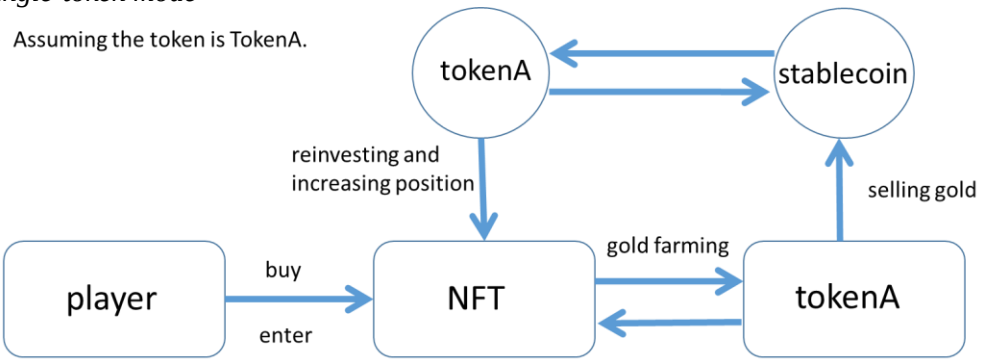

Figure 1. Single-token mode.

As shown in Figure 1, it can be seen that in the single-token model, tokenA serves as the sole currency in the game, fulfilling the needs of in-game transactions in the "game" system and serving as a medium for capital inflows to generate returns in the "finance" system. Depending on whether the currency entering the game through the finance system and the profits earned through the game are the tokens issued by the game project team (tokenA) or recognized value coins (stablecoins or BTC/ETH, etc.), the single-token model is further divided into four types:

Entering with fiat currency, exiting with cryptocurrencies
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Entering with cryptocurrencies, exiting with fiat currency

In the "a" model, if there are many players entering the game and the token price is steadily rising, the payback period will continue to shorten due to the rising price of the token. This was a common model used in early GameFi. However, this model is prone to trigger FOMO emotions, and when the entry fees of new players cannot support the continuous gains of previous players, it will quickly spiral into a death cycle. The "b" model can make the entry threshold and returns relatively stable, but the real-time changes in token price can make the final benefits uncertain. In the "c" model, the entry threshold and returns will fluctuate with the fluctuation of the in-game token (Token A). If early promotion drives FOMO emotions among the public, it will cause the entry threshold to rise sharply with the token price (such as Raca); but if the promotion is insufficient, the token price will be sluggish and the game will not develop. This model is the most intuitive representation of a Ponzi scheme. The "d" model is unfriendly to both the project party and the players, and is generally not used in games.

Table 1. Cryptocurrency exchange types and features table.

	type A	**type B**	**type C**	**type D**
form of expression or manifestation	entering with fiat currency, exiting with cryptocurrencies	entering with fiat currency, exiting with fiat currency	entering with cryptocurrencies, exiting with cryptocurrencies	entering with cryptocurrencies, exiting with fiat currency
lifecycle	short	long	very short(high uncertainty)	/
initial growth	high	moderate	very high	/

In summary of the four models, assuming external variables are the same, as shown in the table 1, it can be seen that all four models are prone to a death spiral. When the heat of the game's issuance subsides and there are no subsequent players to make up for the loss of profits for older players, the value of the

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game's tokens will decline, leading to a massive sell-off of game tokens in exchange for stablecoins, resulting in a rapid devaluation of the game's currency within the ecosystem and ultimately destroying the game's economic system [4].

3.1.2. Dual-token mode

The dual-token model was first proposed by Axie Infinity, which uses two types of tokens, the governance token AXS and the in-game token SLP [5]. The governance token AXS acts as a value-adding token in the finance system, while the in-game token SLP serves the purpose of the game, ensuring that AXS does not face frequent sell-offs due to production, destruction, and market price fluctuations. Initially, the game used a single-token model, but to ensure the long-term sustainability of the ecosystem, the project team introduced the SLP token two years after the game's launch to address the sell-off problem of AXS, as a scapegoat. With the help of mechanisms such as SLP burning, the game became very popular, and the value of AXS steadily increased [6]. As shown in Figure 2 and 3.

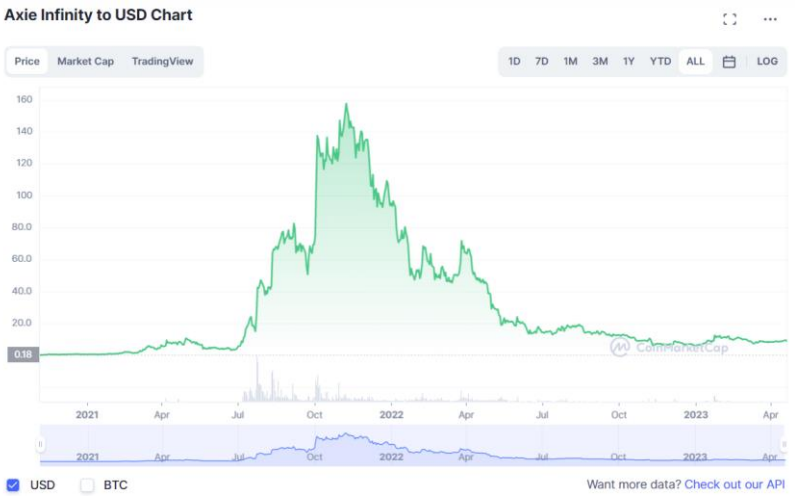

Figure 2. AXS price trends in axie infinity [7].

Figure 3. SLP price trends in axie infinity [8].

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When a game is popular, the dual-token model seems perfect. One token maintains relative stability to supply players' in-game needs, while the other steadily increases in value, providing people with the thrill of speculation. However, when the popularity decreases, a problem arises: the governance token of a game that no longer exists will lose its purpose. At this point, the concepts of dual-token and single-token models become blurred, and eventually return to the irreversible death spiral. Therefore, the dual-token model only delays the single-token model's entry into the death spiral, but it is still inevitable.

3.2. Conclusion on current gamefi

The analysis above indicates that applying the GameFi system of the financial system may be a way for people to enter decentralized games, but it is by no means the ultimate operating model for decentralized games. Existing mainstream currency models in games, including those using single-currency or dual-currency models, inevitably lead to the ecological collapse of the game.

3.3. A transition from gamefi to de-game

The problem with Gamefi is obvious: a financial model like Ponzi scheme added to a game makes it no longer just a game, as people focus more on "how much can I earn" rather than "how is this game". This problem is closely related to the application of the Play-to-Earn (P2E) model. In this type of model, games can attract players' attention through benefits, but it is difficult to sustain development. We need to find a new way to free decentralized games from the constraints of finance, transforming Gamefi into Degame. Fully On-Chain (FOC) games are the trend. We classify games into web2 games, web2.5 games, and web3 games based on their degree of decentralization and on-chain level: asset on-chain games, asset and data on-chain games, and all data and instruction on-chain games. Web2 games refer to traditional internet games, while web3 games are truly decentralized games with all data on-chain, and web2.5 is an intermediate between the two. FOC games refer to web3 games where all instructions and actions are on-chain.

3.4. Pain points on this transition

Due to various limitations and the "impossible triangle" of blockchain technology, game developers today have sacrificed some decentralization to achieve higher performance in their games by only putting transaction and asset attributes on the blockchain, making them more of a web2.5 game. These types of games are currently mainly card games. The bottlenecks for high performance are identified here as two pain points: throughput (TPS) and capacity.

3.4.1. Throughput issue

In a financial scenario, the primary factor that limits the throughput of a blockchain system is the broadcast delay of block data (essentially restricted by internet bandwidth and communication latency). Before the next block is mined, it is necessary to ensure that the previous block has a certain synchronization rate across the network, which restricts the size of each block and the frequency of block mining. This problem tends to be unsolvable.

3.4.2. Capacity issue

Because the bottleneck of throughput has not been solved, the throughput issue has overshadowed the capacity issue, so the industry's current focus on capacity is much less than that on throughput [9]. In the financial system, the calculation power of a single full node is not significant, and memory is the main bottleneck. Once throughput is greatly improved, the capacity issue will immediately arise: in a high-throughput system, if the number of users does not increase, it is likely that high performance will not be fully utilized. The most typical example is EOS. EOS is a smart contract platform based on blockchain technology, designed to provide an efficient, scalable, and easy-to-develop environment for decentralized application (DApp) development. It packages the capacity bottleneck of the ledger as a scarce resource and tokenizes this resource as the EOS RAM virtual currency. At the same time, for the capacity issue of a single full node CPU, EOS also tokenizes it as the EOS CPU virtual currency. This

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seemingly solves the capacity issue, but it is actually achieved at the cost of sacrificing some decentralization.

In summary, consensus algorithms cannot solve the performance and capacity bottlenecks, and cannot significantly improve the performance of blockchain systems from the perspective of consensus algorithms. To solve the two bottlenecks of throughput and capacity, design must be done from the perspective of distributed systems. This is related to consensus algorithms and cryptography, but it is not fundamentally about consensus algorithms and cryptography.

3.5. A conception for a de-game with achievable performance

Assuming a blockchain system with high throughput and high capacity, this paper proposes a future vision for a decentralized game (degame) in which gamefi is transformed into degame by weakening its financial nature and highlighting its gameplay [10].

A. Improving the gameplay of degame: abandoning high threshold ticketing

Based on the wallet address, players can enter for free by minting NFT tickets, and gas fees will be charged for subsequent on-chain activities. Gas fees will be determined based on the level of on-chain behavior. For example, gas fees for common actions such as player movement and interaction will be lower than those for transaction assets. (To achieve free gameplay while charging transaction fees.) As shown in Figure 4.

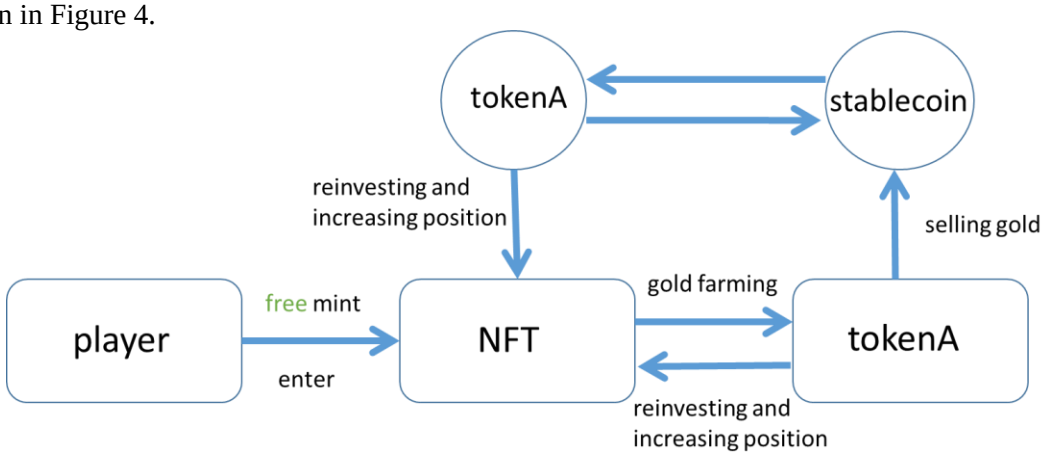

Figure 4. Process structure diagram of NFT.

B. Separating Game and Financial Models: Choosing Participation Modes

A separate designation is set for miner nodes and player nodes. When a wallet address interacts with the game network, it is marked according to its designation as a miner or a player. Players entering the game can choose to participate as either a player or a miner.

Miner Nodes: Perform mining work for the various commands and behaviors of players participating in the game, and set up a funding pool in the smart contract. A percentage of the gas fee paid by players for transactions is put into the funding pool. A portion of the pool is then used as a reward for the miner nodes for each on-chain transaction [11].

Freelance Miner Nodes: Serve as replacements for miners who have left.

Player Nodes: Use the computing power provided by miner nodes to play the game. Gas fees are only paid to the funding pool as rewards for miner nodes when transactions occur during gameplay.

In this way, gameplay and financial incentives are separated. Miners no longer perform both gameplay and proof-of-stake simultaneously, allowing the game to be presented to players in a more maximized form. For miner nodes, since they participate in the game on the entire blockchain and the throughput is sufficient, their profits will be more substantial. Furthermore, their interaction with the game network will be more pure, and more aligned with the decentralized user's self-selection behavior.

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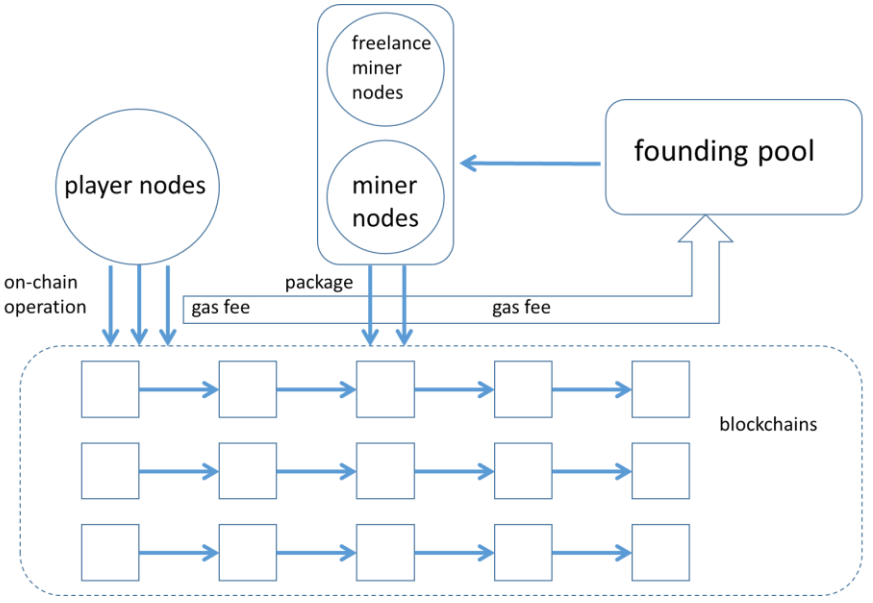

Figure 5. Relationship diagram.

C.Getting around the impossible triangle: Using sharding technology

In a game network with multiple chain interactions, player nodes are abstracted as n-dimensional solid figures composed of multiple layers of undirected graphs. Adjacent nodes form individual shards at certain distances, with the covered portion serving as communication nodes between shards. As shown in Figure 5.

Allocation of miner nodes: A portion of miner nodes are assigned to each shard to provide computing power, with a few miner nodes assigned to handle interaction between shards (similar to a network autonomous system). Miner nodes within a shard are responsible for on-chain instruction behaviors, while communication miner nodes notify adjacent shards of interactions generated between shards. At the same time, waiting miner nodes are set up to avoid insufficient computing power due to miner exits.

Node settings: Player nodes are lightweight nodes, and miner nodes are full nodes within a shard.

In this model, because the player nodes are lightweight, they do not need to download huge data packets to synchronize historical nodes and other node states, but only need to synchronize the surrounding nodes and the states of the chains involved based on the undirected graph. Since the miner nodes are full nodes after sharding, they do not need to download huge data packets in a game network with multiple chain interactions, but only need to synchronize the states within their jurisdictional range of the shard [12]. As shown in Figure 6.

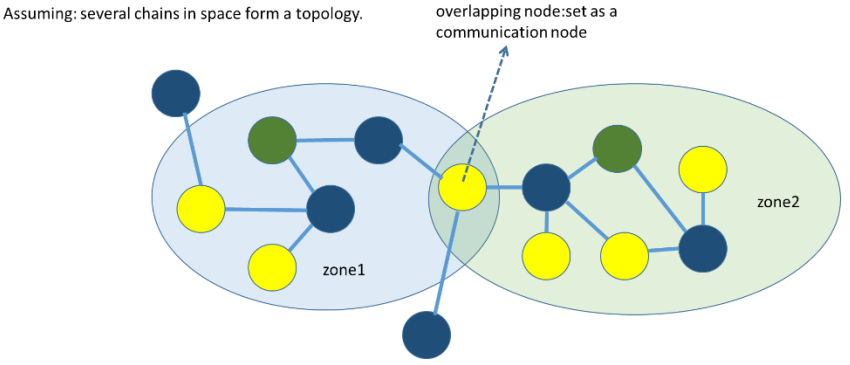

Figure 6. Lightweight player nodes and full miner nodes in a sharded chain game network.

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4. Conclusion

In the future, if the impossible triangle problem of blockchain can be effectively solved, the high-performance achievement will undoubtedly improve the development of the whole chain game. Additionally, GameFi will gradually become a history as the beginning of the Chain Game, and the truly decentralized game "Degame" will emerge in human vision. Currently, academia has proposed techniques such as sharding to attempt to solve the impossible triangle problem, and the idea of Asynchronous Consensus Zones provides a sharding approach. However, this is just the initial stage of research. Based on the future achievements of this technology, a design for a full-chain game is proposed. The dedicated miner and player modes enable miners or players to focus on what they want to do - gain profits or gaming experience - without worrying about the collapse of the game economy and emergency exit when exploring the game. This setting also increases the computing power significantly since miner nodes primarily focus on on-chain work. Furthermore, the use of sharding technology eliminates the need for miner nodes to focus on the entire decentralized network of the game, making physical implementation easier.

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