

PugDAG Whitepaper

Introduction

PugDAG is a fork of the Kaspas blockchain.

The Kaspas blockchain uses an innovative technology that adopts the GhostDAG protocol to create a DAG (Directed Acyclic Graph) infrastructure.

This structural change to the traditional blockchain sequence dramatically increases the capacity and speed of the network, enabling simultaneous block additions and fast transaction throughput.

Kaspas is designed to prioritise fast transactions and high bandwidth while respecting the principles of decentralisation and security, establishing a dynamic foundation for diverse blockchain applications and scenarios.

Issue Identification

Kaspas's original architecture was amenable to ASIC hardware, inadvertently favoring large-scale mining operations and subsequently influencing the network's decentralized nature.

ASIC miners, with their high-powered and purpose-built equipment, can overshadow standard computer setups, which may lead to a disproportionate aggregation of mining influence within a select group of industrial miners.

Such centralization conflicts with the egalitarian ethos of blockchain, a technology envisaged to disseminate authority amongst its users uniformly.

The concentration of mining capabilities not only presents potential risks regarding the governance and security of the network but also introduces significant hurdles for solo miners.

This creates a discord with the open and democratic philosophy intrinsic to blockchain communities.

Solution Synopsis

PugDAG introduces a pivotal change with its GPU-focused divergence, directly challenging the prevalence of ASIC mining conglomerates.

This pivot towards GPU mining democratizes the mining process by capitalizing on the widespread availability of GPU hardware, in contrast to the more specialized and less accessible ASICs.

Diminishing the performance gap between ASICs and GPUs democratizes the mining process, spurring broad-based involvement and fostering a more equitable network.

This not only advances the principle of collective participation and network durability but also fortifies the security framework, remaining true to the decentralized essence of blockchain philosophy.

Contextualizing the Kaspas GhostDAG Paradigm

Kaspas inception in the realm of blockchain signifies a remarkable leap forward, with its pioneering GhostDAG protocol at the forefront.

This novel protocol veers away from the established blockchain blueprint, opting instead for a Directed Acyclic Graph (DAG) configuration.

GhostDAG's framework diverges from the sequential chain model, enabling concurrent inclusion of multiple blocks which substantially bolsters the network's scalability and expedited transaction execution.

This innovative setup advances the network's performance while concurrently safeguarding security and upholding the distributed nature of blockchain, thus mitigating prevalent constraints of traditional blockchain infrastructures.

Crypto Currency Mining Dynamics

The landscape of crypto mining has been evolving, now predominantly under the influence of ASIC operations. These devices, engineered for optimal mining efficiency, have eclipsed the capabilities of GPU and CPU mining solutions.

This trend has culminated in the ascent of industrial-scale mining enterprises capable of deploying the expensive ASIC infrastructure.

Such centralization presents a threat to the network's integrity and stands in opposition to the founding principle of decentralization within blockchain's architecture.

Moreover, it erects financial and competitive barricades for independent or small-scale miners, rendering their engagement in mining increasingly impractical.

The Imperative for Evolution

Pivoting towards GPU-centric mining is critical to preserve the network's vitality and its decentralized character for various reasons:

Mining Democratization: Given their prevalence in standard computing devices, GPUs offer a more attainable entry point for solitary miners and smaller operations, facilitating wider participation in the mining process.

Enhanced Decentralization and Fortified Security: A broader mining constituency, enabled by GPU accessibility, ensures a more dispersed distribution of mining activity, essential for diminishing the risks of concentrated attack vectors and potential network compromises.

Embracing Inclusivity and Enduring Practices: Leaning on GPUs paves the way for a more inclusive mining community, encompassing enthusiasts and modest mining undertakings. It's a stride towards enduring mining practices, often more energy-conserving than ASIC-based mining.

Countering ASIC Hegemony: Transitioning to GPU mining presents a counterbalance to the monopolistic tendencies of significant ASIC mining entities, reinforcing the network's robustness and fidelity to blockchain's decentralized ethos.

PugDAG's proposition to adopt GPU mining epitomizes a deliberate tactic to maintain blockchain networks as decentralized, accessible, and safeguarded ecosystems, directly addressing the tribulations introduced by the prevailing ASIC-centric mining paradigm.

Project Objectives

1/ Smart Contracts Integration

PRC20 protocol

PugDAG is poised to revolutionize the meme coin space by introducing smart contracts using the PRC20 protocol. This integration will bring advanced functionalities and capabilities to the PugDAG ecosystem, enabling a wide array of decentralized applications (dApps) and automated processes. By incorporating smart contracts, PugDAG ensures that its users can engage in more complex transactions and interactions securely and efficiently.

What are Smart Contracts?

Smart contracts are self-executing contracts where the terms of the agreement are directly written into lines of code. They automatically enforce and execute the terms of the contract when predetermined conditions are met, without the need for intermediaries. This automation significantly reduces the risk of errors, fraud, and delays, making transactions more secure and reliable.

Benefits of PRC20 Protocol Integration

1. Enhanced Transaction Intelligence

Smart contracts bring a new level of sophistication to transactions on the PugDAG network. With the PRC20 protocol, users can create and manage tokens that follow a standardized set of rules, ensuring

compatibility and interoperability with various dApps and services within the PugDAG ecosystem.

2. Automated Workflows

Smart contracts enable the automation of complex workflows. For instance, a PugDAG-based crowdfunding campaign can automatically distribute funds to project creators once specific milestones are achieved. This automation not only ensures fairness but also increases efficiency by removing manual intervention.

3. Trust and Transparency

Every smart contract execution is recorded on the blockchain, providing an immutable and transparent audit trail. This transparency builds trust among users, as they can independently verify the terms and execution of contracts without relying on third parties.

4. Cost and Time Efficiency

By eliminating intermediaries and automating processes, smart contracts reduce transaction costs and time. This efficiency is particularly beneficial for small-scale transactions and microservices, where traditional processing fees would otherwise be prohibitively expensive.

5. Security

Smart contracts on the PugDAG network are secured by the robust GhostDAG protocol, which enhances the overall security of the blockchain. The decentralized nature of PugDAG ensures that smart contracts are resistant to tampering and censorship, safeguarding users' assets and data.

Use Cases for Smart Contracts on PugDAG

1. **Tokenization**

Create, manage, and trade custom tokens using the PRC20 standard. These tokens can represent anything from digital assets and in-game items to loyalty points and voting rights.

2. **Gaming and NFTs**

Develop and manage Non-Fungible Tokens (NFTs) for unique digital assets in games and virtual worlds. Smart contracts can ensure the provenance and ownership of in-game items, digital art, and collectibles.

3. **Decentralized Finance (DeFi)**

Implement DeFi applications such as lending platforms, decentralized exchanges, and yield farming. Users can lend their PUG tokens to earn interest, trade tokens without intermediaries, and participate in liquidity pools for rewards.

4. **Automated Escrow Services**

Facilitate secure transactions between parties by using smart contracts as escrow agents. Funds are only released when both parties fulfil the agreed-upon conditions, ensuring trust and reducing the risk of fraud.

5. **Supply Chain Management**

Enhance supply chain transparency and efficiency by tracking goods and verifying transactions through smart contracts. Each step in the supply chain can be recorded on the blockchain, providing real-time visibility and reducing the risk of fraud.

Technical Implementation

1. Integration with Existing Infrastructure

The PRC20 protocol will be seamlessly integrated with the existing PugDAG infrastructure. Developers can utilize familiar tools and libraries to create and deploy smart contracts, ensuring a smooth transition and minimal learning curve.

2. Development Tools and SDKs

PugDAG will provide comprehensive development tools and Software Development Kits (SDKs) to facilitate the creation of smart contracts. These resources will include templates, testing environments, and documentation to support developers at every stage of the process.

3. Security Audits

To ensure the reliability and security of smart contracts, PugDAG will establish a rigorous auditing process. Independent security experts will review and test smart contracts before deployment, identifying and mitigating potential vulnerabilities.

The integration of smart contracts using the PRC20 protocol marks a significant milestone for PugDAG.

By enabling advanced, automated, and secure transactions, PugDAG not only enhances its utility and appeal but also reinforces its commitment to innovation and user empowerment.

2/ Play2Earn Ecosystem Development

PugDAG is committed to transforming the gaming landscape by fostering a vibrant Play2Earn (P2E) ecosystem.

This initiative aims to empower gamers by providing them with opportunities to earn real value while enjoying their favorite pastime.

By developing tools and an ecosystem specifically designed to support the creation of P2E games, PugDAG aims to combine the thrill of gaming with the benefits of decentralized finance.

The Rise of Play2Earn

The P2E model has gained immense popularity in recent years, allowing players to earn cryptocurrency and other rewards through gameplay.

Unlike traditional gaming, where in-game assets and achievements hold value only within the game's ecosystem, P2E games leverage blockchain technology to provide tangible value that can be traded, sold, or used in other contexts.

PugDAG's Play2Earn Vision

PugDAG envisions a world where gaming is not just a source of entertainment but also a viable means of income.

Our P2E ecosystem development focuses on creating a robust infrastructure that supports game developers and players alike, ensuring that everyone can benefit from the opportunities that blockchain gaming offers.

Key Components of PugDAG's P2E Ecosystem

1. Developer Tools and SDKs

PugDAG will provide a comprehensive suite of tools and Software Development Kits (SDKs) to simplify the development of P2E games. These resources will include pre-built smart contract templates, game development frameworks, and detailed documentation to help developers integrate blockchain functionalities seamlessly into their games.

2. In-Game Economies

Our ecosystem will support the creation of dynamic in-game economies where players can earn, trade, and spend PUG tokens. By leveraging the decentralized nature of PugDAG, these in-game economies will be transparent, secure, and fair, ensuring that players are duly rewarded for their efforts and contributions.

3. NFT Integration

Non-Fungible Tokens (NFTs) will play a crucial role in PugDAG's P2E ecosystem. Players can earn and collect unique NFTs representing in-game assets, characters, and achievements. These NFTs can be traded on various marketplaces, allowing players to monetize their gaming prowess and creativity.

4. Marketplaces and Trading Platforms

PugDAG will facilitate the development of decentralized marketplaces where players can buy, sell, and trade in-game assets and NFTs. These platforms will provide a secure and user-friendly

environment for transactions, ensuring that players can easily convert their in-game earnings into real-world value.

5. Community Engagement and Incentives

Building a strong and engaged community is essential for the success of the P2E ecosystem. PugDAG will implement various incentive programs to encourage community participation, such as staking rewards, tournaments, and leaderboards. These initiatives will not only enhance player engagement but also foster a sense of belonging and competition within the community.

Advantages of PugDAG's P2E Ecosystem

1. Financial Empowerment

By participating in P2E games, players can earn a sustainable income, thereby enhancing their financial well-being. This is particularly impactful for individuals in regions where traditional employment opportunities are limited.

2. Enhanced Game Engagement

The prospect of earning real rewards significantly boosts player engagement and retention. P2E games create a more immersive and rewarding experience, encouraging players to invest more time and effort into their gaming activities.

3. Fair and Transparent Systems

Blockchain technology ensures that all transactions and in-game activities are transparent and immutable. Players can trust that the rewards they earn are fairly distributed and that their assets are secure.

4. Global Accessibility

PugDAG's P2E ecosystem is accessible to anyone with an internet connection, breaking down geographical barriers and allowing gamers from around the world to participate and benefit.

5. Encouraging Creativity and Innovation

The tools and resources provided by PugDAG will inspire developers to create innovative and engaging P2E games. This will lead to a diverse range of games and experiences, catering to different tastes and preferences within the gaming community.

Real-World Examples and Use Cases

1. Fantasy Sports and Strategy Games

Players can participate in fantasy sports leagues or strategy-based games, earning PUG tokens based on their performance and strategic decisions. These games combine entertainment with skill-based earnings, providing a rewarding experience for competitive gamers.

2. Virtual Worlds and Metaverses

In virtual worlds, players can own, develop, and monetize virtual land and properties. By engaging in activities such as construction, event hosting, and trading, players can generate income and build their virtual empires.

3. Skill-Based Competitions and Esports

PugDAG will support esports tournaments and skill-based competitions where players can compete for PUG token prizes. This

will create new opportunities for professional gamers and enthusiasts to showcase their skills and earn rewards.

PugDAG's commitment to developing a robust Play2Earn ecosystem is set to revolutionize the gaming industry.

By providing the necessary tools, resources, and infrastructure, PugDAG empowers both developers and players to create and participate in games that offer real financial rewards.

This initiative not only enhances the gaming experience but also aligns with PugDAG's broader mission of promoting decentralization, inclusivity, and financial empowerment.

As PugDAG continues to lead the charge in the P2E revolution, we invite all gamers and developers to join us in this exciting journey towards a more rewarding and engaging gaming future.

3/ On-Chain Loyalty Programs

PugDAG aims to enhance user engagement and retention by introducing innovative on-chain loyalty programs.

Leveraging the power of BlockDAG technology, these loyalty programs are designed to provide transparent, secure, and rewarding experiences for users.

By integrating loyalty programs directly onto the blockchain, PugDAG ensures that all rewards and transactions are immutable and verifiable, aligning with the core principles of decentralization and trust.

What are On-Chain Loyalty Programs?

On-chain loyalty programs utilize blockchain technology to track and manage customer rewards and incentives.

Unlike traditional loyalty schemes, where points and rewards are stored in centralized databases, on-chain loyalty programs record all transactions and rewards on the blockchain.

This approach provides several benefits, including enhanced security, transparency, and user trust.

Benefits of PugDAG's On-Chain Loyalty Programs

1. Transparency and Trust

Every transaction and reward issuance are recorded on the blockchain, ensuring complete transparency. Users can independently verify their rewards and transaction history, fostering trust and confidence in the loyalty program.

2. Security and Immutability

Blockchain technology ensures that all data related to loyalty programs is secure and immutable. Once a transaction is recorded on the blockchain, it cannot be altered or tampered with, protecting users' rewards from fraud and manipulation.

3. Interoperability and Flexibility

PugDAG's loyalty programs are designed to be interoperable with other blockchain-based services and platforms. This flexibility allows users to redeem their rewards across a variety of applications and services, enhancing the utility and value of the loyalty program.

4. Enhanced User Experience

By automating reward issuance and tracking through smart contracts, PugDAG ensures a seamless and efficient user experience. Users receive their rewards instantly upon meeting the specified conditions, without the need for manual verification or processing.

Key Components of PugDAG's On-Chain Loyalty Programs

1. Smart Contract Automation

Smart contracts play a crucial role in automating the issuance and redemption of loyalty rewards. When users meet specific conditions or milestones, the smart contract automatically credits their account with the appropriate rewards, ensuring accuracy and efficiency.

2. Tokenized Rewards

Loyalty points and rewards are tokenized using PUG tokens, which can be easily transferred, traded, or redeemed within the PugDAG ecosystem. Tokenization adds liquidity and versatility to the loyalty program, allowing users to utilize their rewards in various ways.

3. User-Friendly Interface

PugDAG will provide a user-friendly interface for managing loyalty rewards. Users can easily track their rewards, view transaction history, and redeem points through a dedicated dashboard, ensuring a seamless and intuitive experience.

4. Partnerships and Collaborations

PugDAG will establish partnerships with various businesses and service providers to expand the scope and utility of its loyalty programs. These collaborations will allow users to redeem their rewards across a wide range of products and services, enhancing the overall value proposition.

Use Cases for On-Chain Loyalty Programs

1. Retail and E-Commerce

Retailers and e-commerce platforms can leverage PugDAG's loyalty programs to reward customers for their purchases and engagement. By offering tokenized rewards, businesses can enhance customer loyalty and incentivize repeat purchases.

2. Travel and Hospitality

Airlines, hotels, and travel agencies can implement on-chain loyalty programs to reward frequent travelers and loyal customers. Tokenized rewards can be redeemed for flights, hotel stays, and other travel-related services, providing a seamless and rewarding experience for travelers.

3. Entertainment and Gaming

Entertainment platforms and gaming companies can use PugDAG's loyalty programs to reward users for their engagement and participation. Players can earn rewards for achieving in-game milestones, participating in events, and more, which can be redeemed for in-game assets, merchandise, and other perks.

4. Healthcare and Wellness

Healthcare providers and wellness centers can implement loyalty programs to incentivize healthy behaviors and regular check-ups. Patients can earn rewards for participating in wellness programs, attending appointments, and maintaining healthy lifestyles, which can be redeemed for health-related products and services.

Implementation Strategy

1. Development and Testing

PugDAG will develop and rigorously test smart contracts and the overall infrastructure for on-chain loyalty programs. This phase will involve extensive testing to ensure the security, reliability, and scalability of the system.

2. User Onboarding and Education

To ensure widespread adoption, PugDAG will provide educational resources and support to help users understand and navigate the loyalty programs. This will include tutorials, guides, and customer support to assist users in maximizing their rewards.

3. Continuous Improvement

PugDAG is committed to continuously improving its loyalty programs based on user feedback and evolving market trends. Regular updates and enhancements will be implemented to ensure the programs remain relevant, valuable, and user-friendly.

PugDAG's on-chain loyalty programs represent a significant advancement in how rewards are managed and distributed. By leveraging the transparency, security, and efficiency of blockchain technology, PugDAG ensures that users receive fair and valuable rewards for their engagement.

Whether it's in retail, travel, gaming, or healthcare, PugDAG's loyalty programs are designed to enhance user experience and foster long-term loyalty. As we continue to innovate and expand our ecosystem, we invite users and partners to join us in creating a more rewarding and transparent future.

4/ Enhancing Network Distribution

Emphasizing GPU mining has multifaceted impacts on network distribution

1. **Equitable Distribution of Mining Capabilities**

The widespread accessibility of GPUs democratizes mining, allowing a multitude of participants to mine. This counters the monopolization of mining capacity by large-scale ASIC operators and nurtures a more evenly distributed network topology.

2. **Curtailing Centralization Tendencies**

ASIC-dominated mining clusters threaten the equitable nature of blockchain networks by potentially allowing a limited number of entities to wield excessive influence. GPU mining counteracts this, making it more accessible and practical for a diverse cohort to engage in mining activities.

Promoting Miner Inclusivity

1. **Cost-Efficiency**

GPUs, typically more budget-friendly, present a spectrum of economic options in contrast to ASICs. This cost-efficiency empowers individuals or small groups to partake in mining endeavors.

2. **Broad Availability**

Given their common application in personal computing and entertainment systems, GPUs are more attainable for the average user than the niche ASIC equipment.

3. **Multi-Purpose Functionality**

Beyond their designated function, GPUs provide multifunctional utility, including gaming, graphic processing, and mining various digital currencies. Their multi-use capability renders them particularly attractive for novice miners.

Reinforcing Network Security

1. **Mitigating Majority Attacks:** A decentralized mining framework, bolstered by the prevalence of GPU miners, diminishes the probability of majority attacks, where the controlling mining party may attempt to alter the blockchain. A dispersed mining populace impedes the feasibility of such dominance.
2. **Amplifying Stakeholder Diversity:** A network that benefits from an expansive miner base inherently gains a multitude of vested protectors, enhancing the network's overall fortitude and defense mechanisms.
3. **Flexibility and Sturdiness:** Networks underpinned by GPU miners can exhibit greater adaptability and sturdiness. GPUs' algorithm-agnostic nature allows for swift adjustments in response to protocol alterations or hashing changes dictated by security enhancements.

The strategic pivot to GPU mining is instrumental in advocating for a decentralized structure, easing the path for aspiring miners, and bolstering network security.

This strategy resonates with the core tenets of blockchain, ensuring that networks remain expansive, equitable, and resilient.

Technical Characteristics

PugDAG uses the Karlsen hashing algorithm because it's super-efficient and eco-friendly.

Think of it as the green energy of cryptographic hashing—powerful, yet kind to the environment!

Advantages:

1. Energy Efficiency

Karlsen is the most efficient algorithm, consuming the least electricity—just like a pug conserving energy with a good nap.

2. Streamlined Design

Simple and efficient, much like a pug's approach to getting treats.

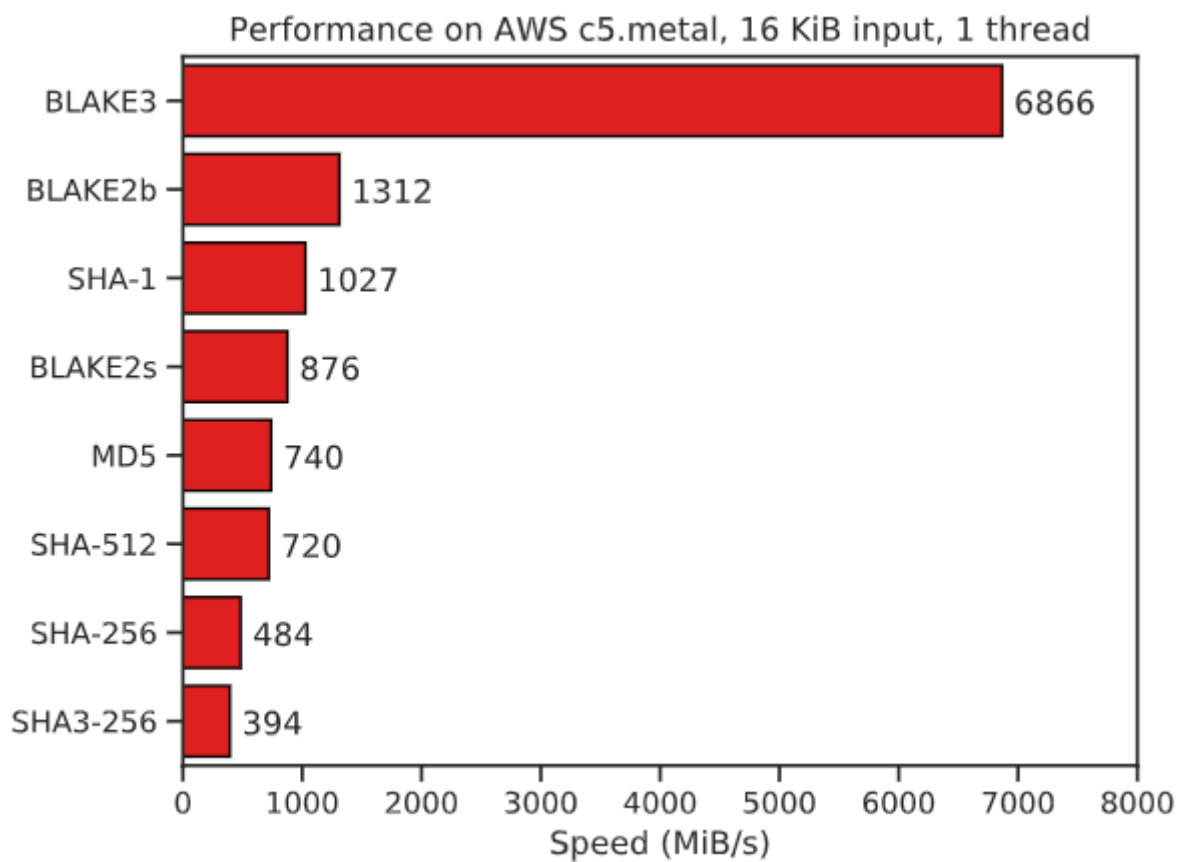
3. Built-in Parallelism

Can handle multiple tasks at once, like a pug managing to be adorable and mischievous at the same time.

4. Implementing Blake3

Blake3 stands as a cutting-edge cryptographic hash function, outstripping predecessors like Blake2 and other hash functions including Keccak from the SHA-3 standard. The attributes leading to Blake3's enhanced speed, and the reason for the lack of specialized ASICs for it.

The chart below is an example benchmark of 16 KiB inputs on a Cascade Lake-SP 8275CL server CPU from 2019



Source : <https://github.com/BLAKE3-team/BLAKE3>

Economic Model

The blockDAG architecture – with rapid block rates – allows more mining decentralization and enables effective solo-mining even at lower hashrates.

The block reward undergoes a halving process annually, but this reduction is gradual rather than abrupt. The initial block reward was 500 PUG. The block reward halves once per year, but smoothly: every month, the block reward is reduced by a factor of $(1/2)^{(1/12)}$.

This will result in a maximum supply of **25,431,205,439 PUG**.

Please note that the policy determines the number of coins created each second, independent of the block rate. Hence, if there's a change in the block rate in the future, the reward for each block will be modified to ensure the emission rate remains constant.

Also, the last block will be mined on **05/18/2059**.

PugDAG emission schedule for the first 2 years

Date	Block Reward
May 2024	500
Jun 2024	440
July 2024	415,3
August 2024	391,99
September 2024	369,94
October 2024	349,22
November 2024	329,62
December 2024	311,62
January 2025	293,66
January 2025	277,18
March 2025	261,62
April 2025	246,94
May 2025	233,08
Jun 2025	220
July 2025	207,65
August 2025	195,99
September 2025	184,99
October 2025	174,61
November 2025	164,81
December 2025	155,56
January 2026	146,82
February 2026	138,59
March 2026	130,81
April 2026	123,47
May 2026	116,54
Jun 2026	110

Conclusion

PugDAG is on a mission to keep blockchain fun, accessible, and eco-friendly. With our focus on GPU mining and the super-efficient Karlsen algorithm, we're making sure everyone can join in the fun while keeping our carbon pawprint small. It's all about building a strong, decentralized community where everyone can mine, trade, and laugh together. PugDAG is ready to lead the pack in the meme coin world—let's fetch those gains!

Beyond mining, PugDAG is set to revolutionize the blockchain space with the integration of smart contracts using the PRC20 protocol. This will enable more sophisticated, automated, and secure transactions, opening the door for a myriad of decentralized applications (dApps) and financial innovations.

Our Play2Earn ecosystem development empowers gamers by allowing them to earn real value through gameplay, combining the thrill of gaming with tangible financial rewards. By providing developers with the tools to create engaging P2E games, PugDAG is fostering a vibrant and rewarding gaming community.

Additionally, our on-chain loyalty programs leverage BlockDAG technology to offer transparent, secure, and rewarding experiences. These programs not only build trust and engagement but also provide users with valuable rewards that can be redeemed across various services and applications within the PugDAG ecosystem.

PugDAG is committed to creating an inclusive, decentralized, and innovative environment where every participant can benefit.