# THE DEDIUM NETWORK

Decentralized Computing


## Whitepaper

Version 1.0.0

## Abstract

Dedium is a decentralized network of nodes, offering access to GPU resources for a wide range of computational tasks. By leveraging the untapped potential of idle GPUs, including those of gamers and miners in exchange for Dedi tokens. Dedium aims to democratize access to GPU resources and unlock new possibilities for decentralized computing.


### Introduction

In today's rapidly evolving technological landscape, the global cloud infrastructure market is experiencing exponential growth, projected to reach USD 653.88 billion by 2032 from USD 233.91 billion in 2023 [1]. This growth underscores the increasing demand for computational resources. Dedium emerges as a pioneering solution, offering decentralized GPU resource allocation to address scalability, accessibility, and cost-effectiveness challenges. By harnessing idle GPU resources of retail and commercial users in exchange for rewards, Dedium democratizes access to computational power across industries like AI, machine learning, 3D rendering, and scientific computing. With a focus on innovation and efficiency, Dedium sets a new standard for decentralized GPU computing, eliminating barriers and opening doors to limitless possibilities.

### Mission

At Dedium, our mission is to democratize the GPU market, empowering individuals to utilize their idle GPUs and earn rewards while simultaneously lowering fees for developers, commercial users, and creators in need of GPU resources. We recognize the challenges posed by high fees, limited access to equipment, and the dominance of a few key players in the market. Our commitment to lowering fees ensures that creators in need to render or even commercial users developing their AI models can access GPU power affordably.

### Use cases and examples

Dedium's versatile GPU resources find applications in various sectors, including artificial intelligence (AI) training, machine learning (ML), 3D rendering, scientific computing, and more. An example of Dedium's capabilities is demonstrated by Instacart, which utilized parallel computing capabilities via Ray, the framework that Dedium will employ. The result was up to 100 times more data processed [2], achieving speeds 12 times faster than traditional methods [3], while significantly reducing operational costs. This example highlights Dedium's potential to revolutionize industries by democratizing access to GPU power and driving innovation and efficiency.

### Pricing

Dedium adopts a dynamic pricing model that adjusts based on network usage, ensuring fair and efficient resource allocation. The pricing structure revolves around the concept of Octanebench-hour (OB-hour), which is a unit of measurement

based on the Octanebench GPU Rendering Benchmark. Developed by Otoy, Octanebench serves as a standardized tool for assessing the compute power of GPU configurations.

When utilizing Dedium's GPU resources for rendering tasks, **the rendering cost is calculated as follows:**

$$Duration\ of\ usage\ x\ Octanebench\ used/hour\ price$$

$$factor\ of\ network\ usage$$

The factor of network usage goes between 0.5 - 3 with 1 the system having a normal usage.

The Octanebench used/hour price can be calculated this way:

$$Octanebench\ score\ x\ price\ per\ Octanebench/hour$$

This formula enables users to accurately estimate the cost of rendering tasks based on their specific requirements and system configurations.

The pricing structure encompasses two main scenarios: Full node and Parallel processing. In the Full node scenario, where a single node is dedicated to a task, the pricing is straightforward, based on the node's Octanebench score and the duration of usage multiplied by the factor of network usage.

On the other hand, in Parallel processing scenarios where multiple nodes collaborate to complete a task, the pricing is calculated based on the combined Octanebench scores of all participating nodes and the duration of usage multiplied by the factor of usage.

Dedium operates on a pre-payment model, where users deposit funds into a smart contract before initiating rendering tasks. This approach ensures seamless and secure transactions, minimizing delays and streamlining payment processes.

Upon completion of the rendering job, the corresponding amount is automatically deducted from the pre-paid deposit in the smart contract. The deducted amount is then distributed among the nodes that contributed to the task, compensating them for their GPU resources and processing efforts. Any remaining funds are promptly returned to the client, providing transparency and clarity in financial transactions.

**Task Allocation Mechanisms**

Dedium employs innovative task allocation mechanisms to efficiently distribute computational tasks across its decentralized network of GPU nodes. One such mechanism is the Proof of History protocol, which prioritizes task allocation based on the creator's track record and the Node history. Nodes with a proven history of completing tasks effectively and reliably are given higher priority, ensuring efficient resource utilization and minimizing the risk of abuse or Sybil attacks. Additionally, Dedium offers a second allocation method where clients can opt to take over an entire node, providing a more direct and tailored approach to meet specific hardware requirements. This option allows clients to harness the full power of a dedicated node, albeit at a higher cost compared to traditional task allocation methods.

**Veto Node**

Dedium employs a Veto node to oversee the health and performance of participating nodes, thereby ensuring the delivery of high-quality service to consumers. The Veto node continuously monitors the performance metrics of all nodes within the network, conducting thorough checks to verify compliance with consumer requirements and standards.

One of the primary responsibilities of the Veto node is to detect any instances of inactivity or underperformance among the participating nodes. In the event of node inactivity or failure to meet performance benchmarks, the Veto node has the authority to initiate the replacement process. This process involves identifying and replacing the non-compliant node with a suitable alternative, thereby maintaining the integrity and efficiency of the task execution process.

**No Network Fees**

Dedium is committed to providing a fee-free experience for users. In lieu of charging network fees, the foundation will receive 10% of all new DEDI tokens generated. This ensures the lowest computing prices in the market while covering infrastructure costs for operating and expanding the network, including team employment.

**Delivery Dispute**

In the event of a dispute between a client and a node operator, a neutral third party Veto Node will serve as the arbiter to resolve the issue fairly and impartially. Each node operator is required to deposit a specified amount to become a node within the Dedium network. If the client's claim is deemed valid by the third-party arbiter, the client will be entitled to a refund of their funds from the deposit initially placed by the node operator to become a node. This mechanism ensures accountability and incentivizes node operators to uphold their commitments and provide quality service to clients.

**Structure:**

The network consists of distributed nodes, representing users eager to utilize their idle GPUs to earn DEDI tokens or commercial nodes. Through our software, these nodes are interconnected via peer-to-peer communication protocols, to dictate and exchange information.

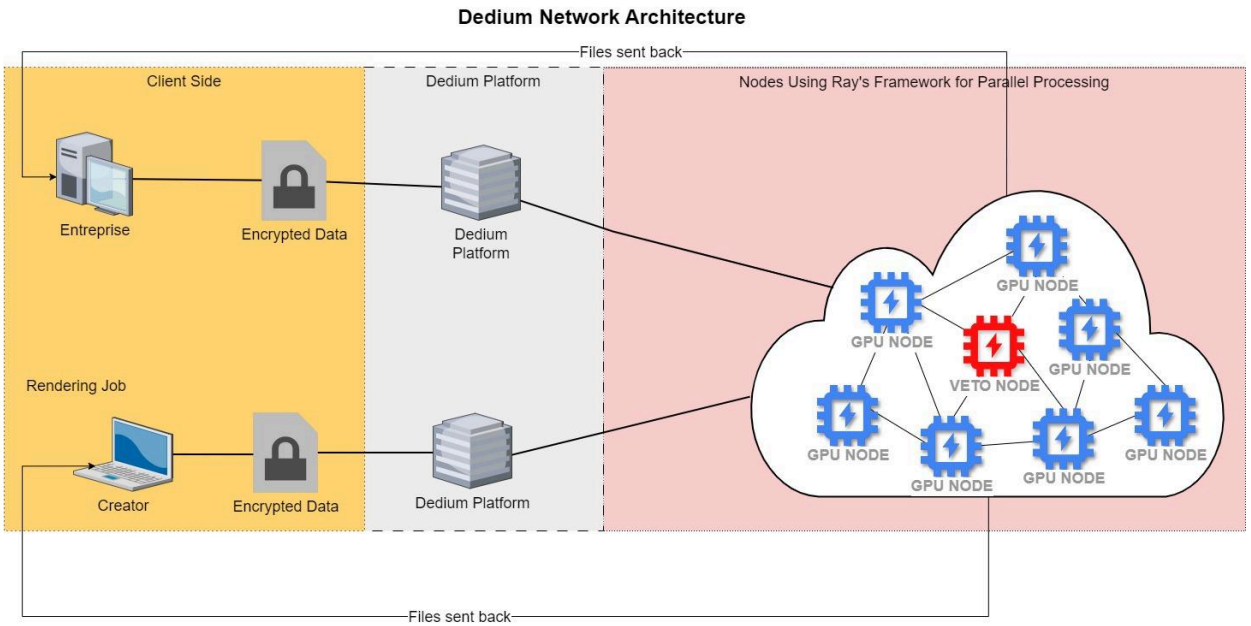
The Dredium platform is responsible for overseeing the client requirements and connecting them with the right nodes. To determine the right node and allocate the task the network looks for the requirements of the client and uses a sophisticated mechanism called proof of history to choose which nodes to allocate the task.

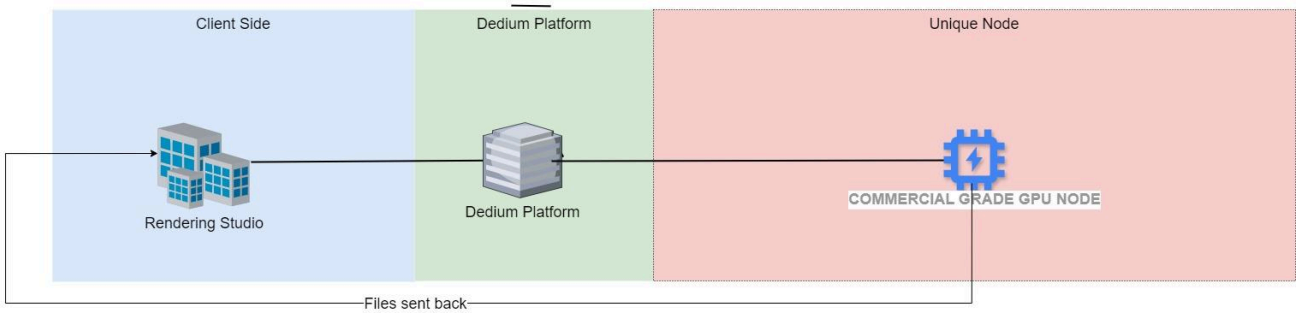
When pricing is requested, the network employs a dynamic pricing model that consults the smart contract and available nodes to provide a quote.

Upon payment confirmation and deposit verification on the smart contract, nodes receive a non-fungible token (NFT) to confirm their allocation. Encrypted files are then distributed, and GPUs commence the assigned tasks.

For parallel computing, Ray is used. All participating nodes receive a non-fungible token (NFT) to confirm their involvement in the task.

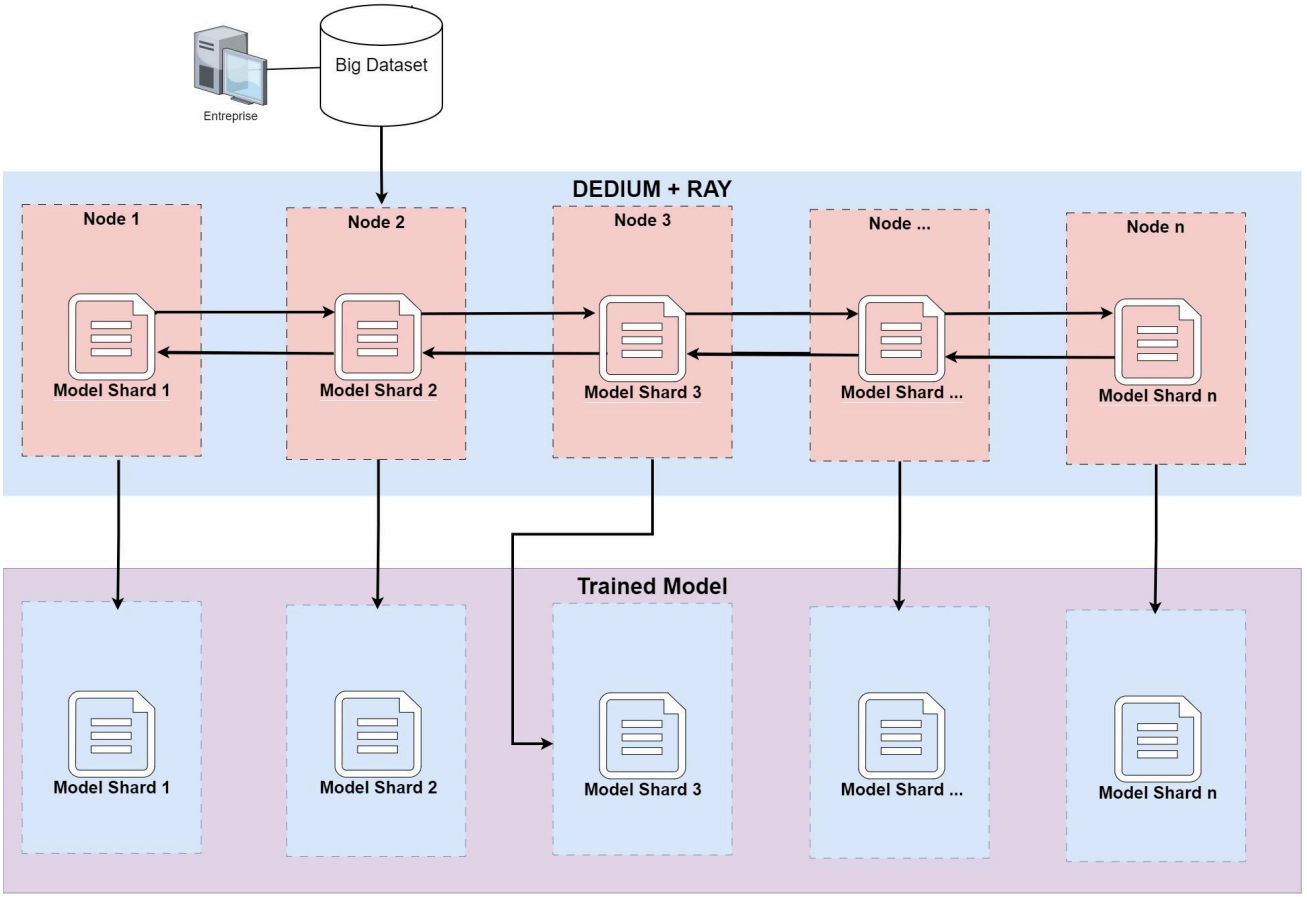
Upon completion, the client receives the processed task and a portion of their initial deposit back, representing the unused fees as network overcharges to ensure fee sufficiency. Nodes return their allocated unique NFTs and receive a portion of the reward commensurate with the power they contributed.



**Ray**

Dedium leverages Ray, an open-source framework renowned for its ability to scale AI and Python workloads through distributed computing. Trusted by industry giants like Netflix, OpenAI, Spotify, LinkedIn, and InstaCart for training and building machine learning (ML) and artificial intelligence (AI) models, Ray serves as a cornerstone of Dedium's infrastructure.
Here's how Ray is integrated into Dedium's ecosystem:

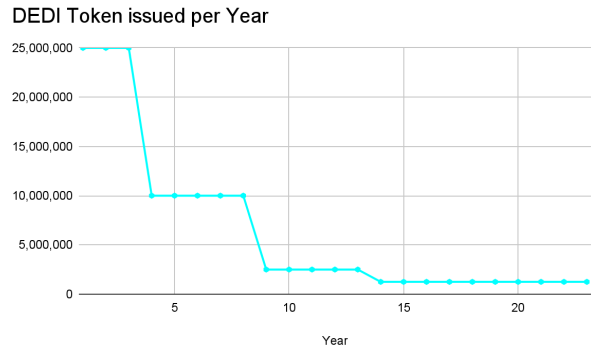


**DEDI TOKEN**

- Maximum token supply: 250,000,000 DEDI tokens.
- Initial Supply: We will launch with an initial supply of 100 million tokens.

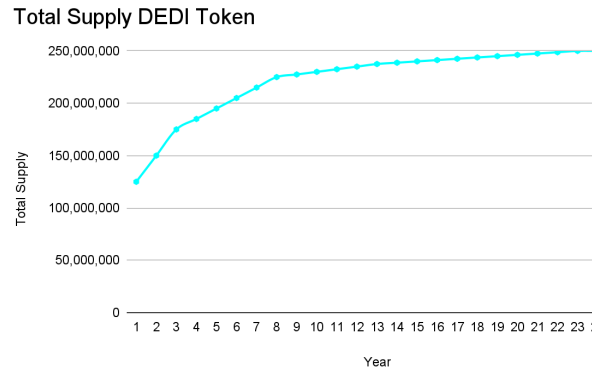
DEDI tokens will be issued as follow:
For Years 1-3: 25 million tokens/year
For Years 4-8: 10 million tokens/year
For Years 9-13: 2.5 million tokens/year
For Years 14-23: 1.25 million tokens/year

Release schedule represented graphically to illustrate token distribution over time:




- Token Distribution: The initial token distribution will be allocated to the treasury, the community and 10% to the team.

Total supply represented graphically to illustrate token distribution over time:




**Uptime Incentive**

Dedium incentivizes node uptime by rewarding operators with DEDI tokens. These incentives encourage node operators to maintain high levels of performance, ultimately enhancing the overall efficiency of Dedium's decentralized network.

**Security**

Each piece of data undergoes secure hashing before transmission, guaranteeing its integrity and safeguarding against unauthorized tampering. Dedium's decentralized architecture mitigates the risk of centralization, ensuring that no single entity or individual possesses complete access to customer files. Through our componentized infrastructure, Dedium distributes data access across the network, preventing any single entity from having sole control over files. This approach effectively reduces the risk of unauthorized access and enhances overall security. Additionally, any files short-term stored are only retained for the duration of the job and automatically deleted afterward, further bolstering privacy and data protection measures.

**Roadmap**

Q2-Q4 2024

Phase 1: Development Of The Core for Sole Nodes

- Develop the core infrastructure for Dedium platform, including smart contracts, node software, and user interface.

- Conduct thorough testing of the platform to ensure stability, security, and scalability.

- Engage with early adopters and gather feedback for further improvements.

Q1 2025

Phase 2: Implementation of Ray

- Implement the Ray framework to enable parallel computing and enhance the platform's performance.

Q2-Q3 2025

Phase 3: Testing and Auditing

- Conduct thorough testing and auditing of the platform to identify and address any potential vulnerabilities or weaknesses.

Q3 2025

Phase 4: Official Launch

- Launch the Dedium platform to the public, enabling users to register, deploy nodes, and access GPU resources.

- Monitor platform performance closely and resolve any issues or bugs encountered during the initial launch phase.

Q4 2025

Phase 5: Optimization and Scaling

- Scale up the platform to accommodate a larger user base and increased demand for GPU resources.

- Introduce new features and functionalities based on user feedback and market trends to enhance the platform's value proposition.

- Optimize platform algorithms and pricing models to improve efficiency and competitiveness in the market.

Q1 2026

Phase 6: SDK and API Development

- Develop robust APIs and SDKs to facilitate seamless integration with third-party applications and services.

- Provide developers with the necessary tools and resources for building custom solutions on top of the Dedium platform.

2026

Phase 7: Implementation of Decentralized Governance Protocol

- Implement a decentralized governance protocol to enable token holders to participate

**Reserved Power**

Dedium introduces a unique Reserved Power feature that allows clients to secure a specific amount of GPU power for future jobs by placing a deposit. This deposit is calculated based on the maximum network overcharge, ensuring that clients reserve the necessary resources.

Upon reserving power, clients are reimbursed for any difference in cost after the job is completed. In the event of cancellation, clients will lose the overcharge fee paid. Moreover, clients have the flexibility to make changes to their reservation by paying a fine equal to one-third of the overcharge cost.

The overcharge fee is determined by multiplying the standard cost by the factor of network usage, providing a transparent and adaptable pricing structure for clients. With the Reserved Power feature, clients can effectively plan and manage their computational tasks while optimizing cost-efficiency and resource utilization within the Dedium ecosystem.

**API & SDK**

Dedium API will be offering developers a wide array of functionalities for seamless integration with third-party applications. From accessing real-time network and node status to retrieving order history and pricing lists, our API will provide comprehensive support for leveraging the capabilities of the Dedium network. Additionally, our SDK will empower developers to build innovative applications on top of the Dedium network.

Reference Page

[1] Precedence Research. (n.d.). Cloud Infrastructure Market. Retrieved from https://www.precedenceresearch.com/cloud-infrastructure-market

[2] Instacart. (2018, May 8). Supercharging ML & AI Foundations at Instacart. Retrieved from https://tech.instacart.com/supercharging-ml-ai-foundations-at-instacart-d48214a2b511

[3] Instacart. (2018, June 26). Distributed Machine Learning at Instacart. Retrieved from https://tech.instacart.com/distributed-machine-learning-at-instacart-4b11d7569423