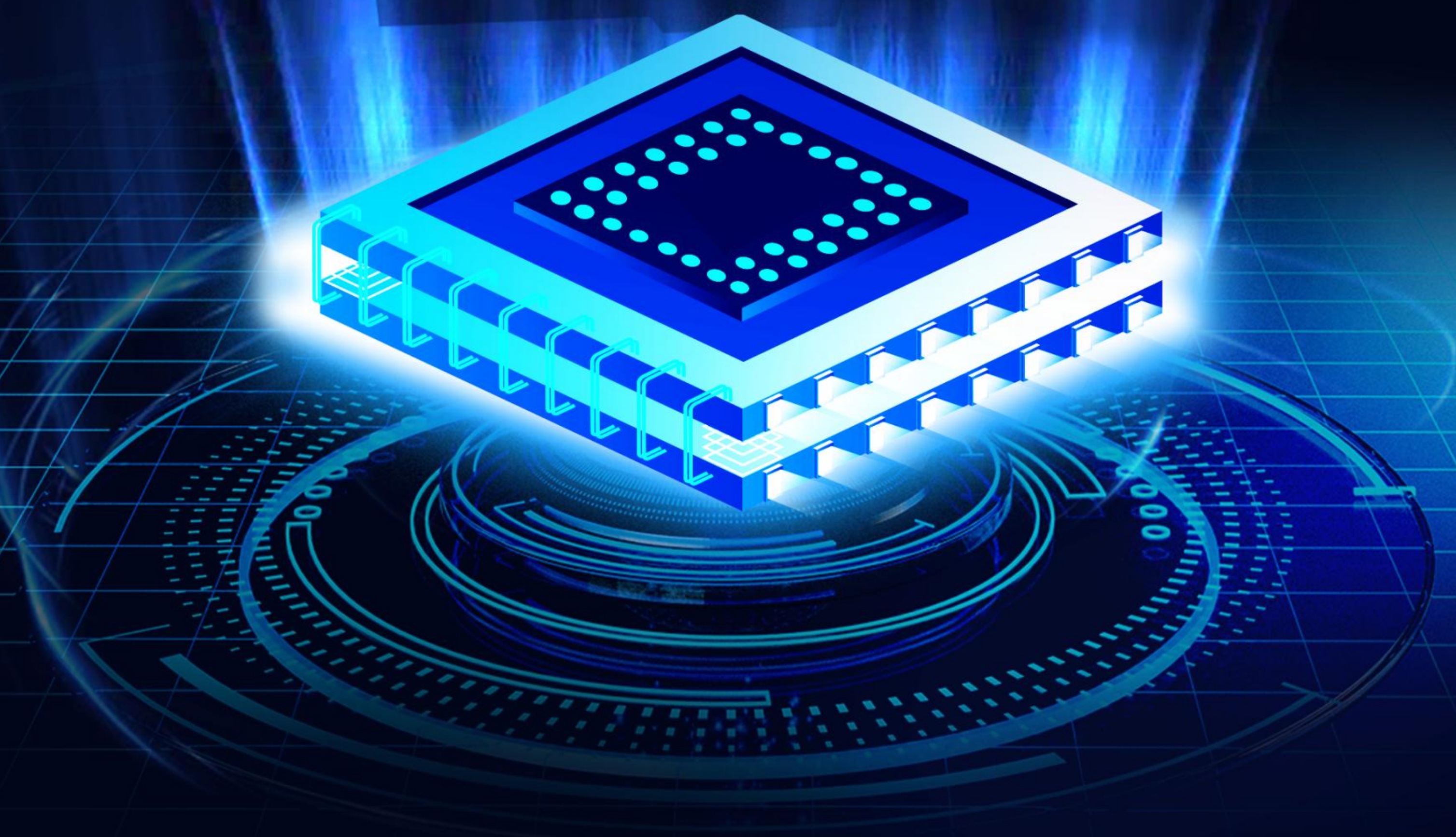
FDW

Based on quantum technology, providing users with secure and efficient data exchange and transmission service applications



WHITE PAPER 2025

Contents

Chapter I Overview of DEPIN Market Development

1.1 What is DePIN?

DePIN, short for Decentralized Physical Infrastructure Networks, is an emerging field dedicated to secure personal digital identity management and privacy protection through blockchain technology and decentralized authentication mechanisms. The development of DePIN will revolutionize personal data security and digital identity verification, breaking free from the limitations of traditional centralized authentication systems while ensuring user data safety and privacy protection.

DePIN utilizes blockchain technology to build a decentralized network framework that incentivizes individuals and organizations to contribute physical resources—including storage space, computing power, network connectivity, and energy—while rewarding them through token-based rewards. This initiative aims to disrupt traditional centralized infrastructure models, enabling broader participation in both the construction of shared infrastructure and the distribution of its benefits.

1） How DePIN works

In brief, DePIN works by combining blockchain technology with physical infrastructure to incentivize individuals and organizations to contribute physical resources, and to share and manage resources through a token reward mechanism.

Proof of Physical Work (PoPW): As the core mechanism in DePIN, PoPW verifies that physical devices have performed specific tasks in the real world. For example, a wireless hotspot generates proof by providing network coverage, while a storage device produces proof through offering storage space. During operation, these devices collect proof data (such as network coverage metrics and storage volume) and transmit this evidence to the DePIN network.

Verification and Storage: DePIN network employs off-chain Oracle services or other authentication mechanisms to validate the validity of Proof of Work (PoPW). The verification process involves device identity authentication and checks on the authenticity and integrity of operational data. The validated data is typically stored in off-chain storage networks to meet large-scale data storage requirements. Meanwhile, data summaries or commitments are recorded on the blockchain to ensure data immutability.

Smart Contracts and Incentive Mechanisms: Smart contracts on blockchain are designed to automate resource allocation and reward distribution. Based on verified Proof of Work (PoW) data, these contracts calculate participants 'contributions and automatically allocate corresponding token rewards. Market-based rewards constitute DePIN's core incentive mechanism. Participants earn tokens by contributing physical resources such as computing power, storage space, and network bandwidth, which can be exchanged for fiat currency or other crypto assets in the market.

Resource Management and Allocation: The DePIN network's physical resources are managed by smart contract systems, which handle device control and data management. Smart contracts coordinate hardware resources, allocate devices based on user demands, and manage data uploaded by devices. Users can purchase services through decentralized applications (DApps), with transactions verified and packaged via the blockchain network. Smart contracts then distribute corresponding hardware resources or data services according to transaction requests.

2) Technology trends

As DePIN continues to evolve, an increasing number of applications are being implemented, with its technology expanding from infrastructure to the application layer. Moving forward, DePIN will not only provide infrastructure resources but also gradually extend to the application layer, driving innovation across various industries. For instance, it supports smart transportation and environmental monitoring in smart cities, while offering reliable physical network infrastructure for decentralized finance (DeFi).

Currently, DePIN tokens are primarily used to cover service fees for payment projects. However, their composability will be further explored in the future, particularly through integration with the DeFi ecosystem. For instance, native integration of virtual machines, tokens, and chains not only ensures the basic functionality of tokens but also enables users to participate in broader ecosystems. Meanwhile, security and privacy protection are being enhanced through measures like adopting multi-layered encryption technologies such as Elliptic Curve Cryptography (ECC), along with Zero-Knowledge Proofs (ZKPs) that verify transactions without disclosing data, thereby ensuring secure and private information.

In essence, the collaboration and efficiency gains between disparate networks are accelerating. The true potential of DePIN will be unlocked as these networks achieve interoperability. For instance, when decentralized wireless networks, sensor networks, and edge computing networks work in concert, they can deliver exponential efficiency improvements. As these networks enhance performance across multiple vertical sectors, their collective benefits will become increasingly significant.

1.2 DePIN core values

DePIN covers a wide range of areas, which can be classified into physical resources (PRN) and digital resources (DRN) according to Messari's classification.

- PRN® Physical Resource Network (PRN): The network encompasses wireless networks, geospatial networks, mobile networks, and energy networks. It incentivizes participants to utilize location-based hardware while providing unique real-world goods and services such as WiFi, 5G connectivity, VPNs, energy information sharing, and geospatial data.

- Digital Resource Network (DRN): Digital resources encompass data storage, computing power, and network bandwidth, with each subcategory containing further subdivisions. This initiative incentivizes participants to utilize real-world physical infrastructure networks that provide digital resources, such as broadband networks, storage networks, and computing power networks.

Unlike traditional construction methods, DePIN builds infrastructure through a decentralized approach, pioneering a novel way to establish and maintain physical-world facilities. To engage individuals and companies worldwide in building infrastructure, DePIN implements token incentives where contributors receive rewards proportional to their resource contributions within the network's ownership structure. The emergence of DePIN is driven by advancements in widespread internet connectivity, blockchain infrastructure, and cryptographic technologies. Furthermore, as a logical framework for the sharing economy, DePIN exhibits distinct core characteristics:

- Web Creators: Start-ups reduce startup costs and capital expenditures.

- Network builder: Has direct ownership and control, and is rewarded with tokens.

- Internet users: access to high quality, expanded, and Web3-spirited service experiences.

DePIN is leading a revolution, not only in the technical integration of blockchain and the Internet of Things, but also in the business level of encouraging the construction of infrastructure. This revolution is completely changing physical infrastructure.

From network builders to service providers and ultimately consumers, DePIN's paradigm empowers individuals and small businesses to deploy and operate infrastructure networks, enabling more efficient, democratic, and cost-effective global deployment of digital-centric infrastructure. From telecommunications to data warehouses and sensors, and the deployment of AI computing power and models, DePIN unleashes limitless potential for technological acceleration.

DePIN is not only a technological innovation, but also a disruptive change to the traditional infrastructure management model:

- Optimizing Resource Utilization: DePIN leverages incentive mechanisms to consolidate fragmented physical resources — including computing power, storage capacity, and network bandwidth — eliminating resource idling and waste common in traditional centralized infrastructure. For example, its decentralized storage network utilizes underutilized storage space to deliver cost-effective solutions for enterprises and developers.

- Enhanced transparency and fairness: DePIN uses blockchain technology to ensure that all transactions and resource contribution records are open, transparent and tamper-proof. This transparency avoids the unfairness of traditional centralized operations and makes resource allocation more fair.

- Cost reduction: By adopting a decentralized model, DePIN has significantly reduced the costs of building and operating traditional infrastructure. For example, distributed networks can replace expensive centralized data centers and communication towers.

- Improving network resilience: The resources of the DePIN network are distributed around the world, reducing the risk of single points of failure and improving the fault tolerance and resilience of the system. This decentralized architecture makes the infrastructure more stable and reliable.

- Encouraging Public Participation: DePIN incentivizes individuals and organizations to participate in infrastructure development and maintenance through a token reward system. This model not only improves resource efficiency but also allows more people to share in the benefits of network infrastructure growth.

- Driving innovation and business model change: DePIN provides a new model for infrastructure construction and operation that can catalyze new business models. For example, decentralized wireless networks provide low-cost, secure connectivity for IoT and mobile devices by incentivizing users to deploy hotspot devices.

- Support for emerging technologies: DePIN provides a strong physical foundation for emerging technologies such as artificial intelligence, Internet of Things, and metaverse. For example, decentralized computing networks can provide more computing power support for AI development.

- Empowering Citizens and Communities: DePIN shifts wealth and power from traditional centralized institutions back to citizens and communities, enabling more people to participate in the construction and management of infrastructure. This model helps address the bureaucratic inefficiencies and inefficiencies often seen in traditional infrastructure development.

- Market Potential and Investment Value: The DePIN market is growing rapidly, with the market size expected to exceed $100 billion by 2025. Smart money in the crypto sector is pouring significant investments into DePIN, with the top 10 projects raising approximately $18 billion in total funding.

- Sustainable development: DePIN contributes to the realization of more sustainable infrastructure development by optimizing resource allocation and reducing operating costs. It also supports the development of renewable energy and distributed energy networks.

Through a decentralized model, DePIN achieves efficient utilization and equitable distribution of physical resources, enhances infrastructure transparency and resilience, reduces costs, and incentivizes public participation. It not only drives technological innovation but also provides robust support for emerging technologies, demonstrating significant market potential and investment value.

1.3 DePIN market size and investment prospects

We believe DePIN represents a perfect fit for the crypto landscape, combining decentralized infrastructure with blockchain technology and token economics. Blockchain can address issues like rights confirmation and verification, while the token economy serves as a catalyst to incentivize more participants and build network effects. From a market potential perspective, DePIN's combined potential exceeds $2.2 trillion and is projected to reach $3.5 trillion by 2028. Therefore, DePIN possesses vast development prospects.

1) Market size

As of 2024, the DePIN sector has reached a market capitalization of $50 billion. Over 1,500 related projects are currently operational globally, with total market value ranging between $30 billion and $50 billion. According to the "2024 DePIN Status Report", the DePIN sector is projected to achieve 100-1000-fold growth in emerging markets by 2025. Another forecast suggests that the DePIN market size will surpass $50 billion by 2025.

The DePIN market is projected to reach $3.5 trillion by 2028, according to forecasts by Messari and other agencies. Moody's predicts the market could reach $3.3 trillion by 2030.

2) Market growth drivers

The integration of blockchain with artificial intelligence, the Internet of Things, the metaverse and other technologies has driven the rapid development of DePIN. DePIN's application scenarios continue to expand, covering distributed storage, wireless networks, sensor networks, energy networks and more.

- Cost advantage: Compared to traditional centralized infrastructure, DePIN significantly reduces construction and operating costs by integrating idle resources.

• Emerging market demand: In developing countries, DePIN can address the lack of traditional infrastructure and meet the needs of remote areas.

• Sustainability: DePIN uses existing hardware, eliminating the need for new facilities and reducing environmental costs.

3) Investment prospects

• Capital Focus: The DePIN project has raised more than $350 million in early-stage funding. By 2025, the DePIN project's venture capital funding reached $583 million, surpassing its 2022 annual level.

• Growth potential: The DePIN market is expected to grow a hundredfold in the next few years, from its current $50 billion market cap to $3.5 trillion by 2028.

• Industry trends: As Web3 technology matures, DePIN, as an important part of it, will benefit from the growth of the entire industry.

Policy support: Governments in some countries are looking for DePIN solutions to address infrastructure challenges, and more supportive policies may be introduced in the future.

Overall, the market size of DePIN is growing rapidly and is expected to achieve significant breakthroughs in the coming years, with vast investment potential. Furthermore, while DePIN provides hardware support for applications, Web3 has opened up an ecosystem application race track for the market. The emerging decentralized artificial intelligence (DEAI) era introduces computational power and hardware support for AI-based DePIN applications and Web3 ecosystems. In the digital age, DEAI is gradually becoming the forefront of technology and innovation.

1.4 DePIN drives market change

In recent years, the field of artificial intelligence (AI) has witnessed remarkable progress, rapidly permeating various sectors including the economy, society, and daily life, sparking a global wave of transformation. IDC reports that with the accelerated development of the AI market, competition in the AI era has evolved into resource-based battles centered on hardware and computing power. This evolution raises three critical questions:

- Whether AI has sufficient resource-side capabilities (computing power, bandwidth, etc.) – particularly stable resources for support. This reliability requires decentralized computing power. In traditional sectors, the chip demand gap, combined with policy-driven and ideological barriers like the "world wall," has naturally placed chip manufacturers in a dominant position, allowing them to significantly inflate prices. For instance, NVIDIA's H100 chip model saw its price surge from $36,000 to $50,000 in April 2023, further exacerbating cost pressures.

- The fulfillment of resource-side conditions enables AI to address hardware requirements, but model training/iteration also requires massive user-generated data (IP) to fuel the training process. Once the model size surpasses a certain threshold, performance across various tasks demonstrates exponential growth.

- Mid-sized and small AI players struggle to overtake competitors. The monopolistic nature of computing power in traditional financial markets has led to similar monopolistic practices in AI model development, with major AI vendors actively building their competitive moats. This environment forces smaller players to seek more differentiated strategies to differentiate themselves.

It is crucial to emphasize that according to the "2022-2023 Global Computing Power Index Assessment Report" released by International Data Corporation (IDC), global digital development is accelerating. The comprehensive transformation of business operations through technology is creating massive demand for computing power. For instance, traditional enterprises are actively integrating business operations with digital technologies, leading to growing computational demands. Meanwhile, emerging technologies powered by computing capabilities—such as the metaverse, AIFDW, and AI4S—are experiencing rapid development. In this data-driven world, computing power has become a foundational resource for societal progress, akin to water and electricity. However, the imbalance in computing resource distribution has resulted in a few major players controlling the majority of these resources.

The uneven distribution of computing resources has become a pressing global challenge. Tech giants, as dominant players in the tech industry, possess massive computing power while leveraging market dominance and technological monopolies to control resource allocation, effectively monopolizing the global computing market. This imbalance not only hinders industry development but also indirectly impacts investment markets and economic security. Furthermore, the uneven distribution drives data centralization. With a few industry leaders controlling most computing resources, their grip on data ownership grows stronger. This creates risks in data security and privacy protection while stifling data diversity and innovation.

Our team believes that product competition in the AI era hinges on resource infrastructure (computing power, data, etc.), particularly stable resource support. Model training/iteration requires massive user-generated data (IP) to fuel model growth, enabling qualitative improvements in efficiency. Integration with Web3 enables small and medium-sized AI startups to overtake traditional tech giants. For the DePIN ecosystem, computing power and bandwidth set the baseline requirements (isolated computing integration lacks competitive moat). The project's potential is determined by four dimensions: AI model application and deep optimization (similar to BitTensor), specialized tools (Render, Hivemaper), and effective utilization of big data.

With the advancement of AI technology and the entry of DePIN and Web3, new blue ocean ——DeAI is emerging at the intersection of AI and DePIN across specialized fields. As a new paradigm of decentralized AI, DeAI is breaking through the limitations of traditional centralized AI. Through distributed networks and open collaboration models, it enhances AI network security and transparency. On one hand, it eliminates computational power monopolies; on the other hand, it expands application scenarios for hardware based on DePIN. Simultaneously, it introduces cryptocurrency incentive systems into AI, aggregates market liquidity, and enables more people to share the dividends of Web3 development.

Based on the above background, FDW Ecological Development Fund created and issued FDW!

Chapter II Overview of the FDW Project

2.1 FDW Introduction

FDW is dedicated to building a globally leading decentralized physical infrastructure network (DePIN) and token economy incentive model (FDW). Through the FDW protocol, it provides comprehensive DePIN infrastructure support for applications including decentralized wireless networks, storage, cloud computing, high-precision positioning, mapping, energy sharing, IoT and edge computing, distributed AI training, supply chain and logistics, energy management, privacy protection and data sovereignty, as well as intelligent transportation.

The core of the FDW protocol is to reward participants through FDW tokens. Users earn these tokens by contributing computing resources, which can be traded on the market or used to purchase computational services within the network. This incentive mechanism not only encourages active participation but also drives sustainable development. By incentivizing individuals and companies worldwide to co-create the ecosystem through FDW tokens, participants receive rewards proportional to their resource contributions within the network's ownership structure, ultimately achieving shared prosperity and mutual benefit.

- FDW purpose: Through a decentralized way, the idle AI computing resources around the world will be aggregated to form a powerful distributed computing network to meet the growing computing needs.

- FDW Vision: To become the world's leading decentralized physical infrastructure network, delivering efficient and cost-effective computing solutions for scientific research, AI training, and complex data analysis. Through the FDW token-based economic incentive model, we aim to encourage broader user participation in network development, achieving optimal resource allocation and sustainable growth.

The FDW protocol integrates core technologies including AI-powered DePIN, L2 and ZKML zero-knowledge machine learning, DAG+DPoS consensus mechanisms, and IBC cross-chain communication. It continuously supports data collection, storage, preprocessing, computational integration, as well as model design/training/adjustment and deployment. Furthermore, FDW connects servers, personal terminals, and other devices to form a DePIN-powered computing network. More importantly, the protocol serves as infrastructure bridging decentralized computing power and dApps, enabling hardware-on-chain solutions for manufacturers. This provides flexible, cost-effective, reliable, and efficient computing resources with accessible interfaces, allowing collaborative data processing through shared computational capabilities.

We believe true freedom in the global digital economy stems from information privacy and security. Only when AI computing power flows according to its own will and remains securely maintained can we achieve genuine computational freedom. DePIN does not represent mere novelty, but signifies a paradigm shift in physical infrastructure deployment and decentralized computing. By leveraging cryptographic protocols and blockchain technology, the DePIN protocol will enable more efficient, decentralized, and equitable infrastructure solutions. This initiative provides decentralized computing services to all, transforming artificial intelligence from a tool for the wealthy to a key that unlocks wealth and freedom for the common people.

The technological innovation, application scenario expansion and ecosystem construction of FDW make it have broad development prospects in the future, and it is expected to become an important force to promote the integration of DePIN and the real economy.

2.2 Development philosophy

FDW will leverage DePIN and blockchain technology to build a fair, transparent, and integrated computing power ecosystem. This initiative aims to address current trust and fairness challenges in the industry, creating a more equitable, open, and efficient competitive environment. In the Web3 era, FDW strives to establish a comprehensive data economy and smart society value ecosystem for global manufacturers and users. By implementing hardware and data on-chain solutions, we drive computing power sharing while building bridges across continents. This enables users to explore the new world of distributed computing powered by DePIN and blockchain from fresh perspectives.

- Computing power sharing: Based on Web3 technology and supported by DePIN, FDW will build a bridge for global centralized physical infrastructure network resource sharing and realize balanced allocation of computing power resources.

- Hardware chain: For the global smart hardware Web3, drive hardware chain and data chain, create convenient channels for hardware manufacturers to connect;

- Technology innovation: AI +DePIN+ORACAL leads the innovation of computing technology and provides global users with excellent network support for centralized physical infrastructure.

- Intelligent evolution: With the help of AI algorithm, intelligent scheduling and optimization of computing power can be realized, so that everyone can mine data and hardware computing power, and finally build a private agent with personal data under AI training;

Open and Win-win: Advocating open cooperation, building a prosperous and win-win network system of centralized physical infrastructure, eliminating the boundaries of technology and resources, and everyone has equal opportunities and achievements.

In the future, FDW will completely transform the operational model of existing centralized physical infrastructure networks. By converting the economic incentive system itself into a self-circulating mechanism, it will create a fully decentralized value transfer ecosystem that transcends geographical and economic boundaries. This system will connect computing resources worldwide through the integration of Web3, DePIN, blockchain technology, and token incentives. Every participant will gain fair access to and utilization of centralized physical infrastructure network resources, ensuring equitable value distribution across all stakeholders.

2.3 Core features

In the current global computing power shortage and GPU supply-demand imbalance, effectively utilizing idle GPU resources has become crucial. The FDW protocol leverages the DePIN+Token operational model to incentivize users or nodes to contribute their idle computing power on a large scale, thereby providing computational support for enterprises in need and meeting their demand for computing resources.

- Innovation without a group network: flexibly allocate and schedule computing resources, storage resources and network resources among cloud, edge and terminal according to service requirements.

- Intelligent resource optimization: Through dynamic scheduling of computing tasks by algorithm, resource utilization rate is optimized, energy consumption is reduced, and overall computing power application efficiency is improved.

- Secure and reliable blockchain infrastructure: Using advanced encryption technology and consensus mechanism to ensure data security and transaction immutability.

- Open innovation ecosystem: Provide rich SDK and API interfaces for developers and enterprises to support hardware chain, data chain and rapid development and deployment of various applications.

FDW fully inherits the characteristics and advantages of existing blockchain technologies, while addressing current technical bottlenecks through the introduction of DePIN technology, thereby truly integrating technological innovation with commercial applications. Furthermore, FDW has made substantial and sustained investments in R&D and innovation of business technologies represented by artificial intelligence and blockchain, applying these advancements to enhance value in traditional industries and accelerate the widespread adoption of computing power across various sectors. With a clear strategic direction, FDW is committed to building a future-oriented super DePIN resource application ecosystem layer that fosters mutual benefits and win-win outcomes.

In the future, a sophisticated FDW ecosystem will integrate top-tier applications including DePIN software, scientific research tools, and higher education platforms, supported by foundational infrastructure such as data processing systems, computing power, algorithms, public blockchain infrastructure, and AI-powered data centers. The innovative incentive model within this ecosystem will establish a complete value chain that drives economic growth. By pioneering the integration of DePIN computing power with digital economy innovations, it will create transformative possibilities for the next-generation value internet.

2.4 Ecological partners

FDW has reached a wide range of strategic partnerships with well-known enterprises in the fields of AI hardware, top applications and the Internet, such as Hewlett Packard Enterprise, OpenAI, Ethereum, Polkadot and others to establish a solid foundation for the implementation of the FDW protocol.

• Hewlett Packard Enterprise (HPE) is a U.S.-based multinational IT company specializing in enterprise-level IT solutions and services. HPE delivers a comprehensive suite of hardware, software, and services including servers, storage, network solutions, cloud computing, data analytics, and enterprise services. The company aims to help clients achieve digital transformation through its technical solutions, enhance efficiency, strengthen security, and create greater business value. HPE serves enterprises of all sizes and types worldwide, ranging from small and medium-sized businesses to large multinational corporations. HPE will provide FDW with comprehensive intelligent analytics solutions for computing power.

• OpenAI is an AI research company headquartered in San Francisco, USA, comprising the for-profit OpenAI LP and its non-profit parent organization OpenAI Inc. Its core mission is to develop safe general artificial intelligence (AGI) that benefits all humanity. By pioneering large-scale models, OpenAI has revolutionized the AI field through innovative paradigms, establishing itself as a leader in general AI development. The company will provide algorithmic models and intelligent interaction support for FDW.

• Ethereum (English: Ethereum) is an open-source public blockchain platform with smart contract capabilities. Through its native cryptocurrency Ether (abbreviated as "ETH"), it provides a decentralized Ethereum Virtual Machine (EVM) to process peer-to-peer contracts. While Ethereum enables digital asset transfers, its applications extend far beyond this core function——allowing users to configure custom code and interact with other applications. The platform's flexibility further supports the creation of complex programs. FDW will leverage Ethereum's L2 blockchain infrastructure to develop its DePIN transaction ecosystem and expand cryptographic applications, thereby providing robust support for the market.

• Polkadot is a next-generation blockchain protocol that connects multiple private blockchains into a unified network. As part of the broader vision to "return control of internet monopolies to individuals," Polkadot builds on the revolutionary promise of previous blockchain networks while offering several fundamental advantages. It provides comprehensive support for cross-chain collaboration, customization, and upgrade iterations for FDW.

Chapter III FDW token model

3.1 FDW token economics

The core of DePIN lies in integrating scattered physical resources (such as computing power, storage space, and network bandwidth) through incentive mechanisms, effectively addressing the common issues of resource idleness and waste in traditional centralized infrastructure. It ensures that all transaction and AI resource contribution records remain transparent, tamper-proof, and publicly accessible. Through token reward systems, this approach motivates more individuals and organizations to participate in DePIN's development and maintenance. Consequently, the value of the token becomes inseparable from DePIN's growth trajectory. The introduction of FDW tokens will further strengthen DePIN's value proposition.

1) The incentive effect of FDW incentive mechanism

Through the FDW incentive mechanism, DePIN will encourage more individuals and organizations to participate in the construction and maintenance of the network. Specifically:

• Encouraging individual contributions: Users can earn FDW rewards by contributing their computing power, storage space, or network bandwidth. These FDWs can be traded on the market or used to purchase services in the network.

• Encouraging enterprise participation: AI enterprises can obtain lower cost computing resources and storage services by participating in the DePIN network, while also gaining additional revenue by contributing resources.

• Community building: The FDW incentive mechanism encourages users to actively participate in the governance and maintenance of the network, forming a self-circulating ecosystem.

2) The close connection between FDW value and DePIN value

• Quantification of resource contribution: FDW tokens accurately record users 'resource contributions through smart contracts and give corresponding rewards. This quantification mechanism ensures that users' contributions are rewarded fairly.

• Market liquidity: FDW tokens can be traded on the cryptocurrency market, providing users with liquidity. Users can earn income by selling tokens or use them to purchase services within the network.

• Community governance: FDW token holders can participate in the governance of the network and vote on the development direction and policies of the network. This governance mechanism ensures the sustainable development of the network and further enhances the value of the token.

• Application scenario expansion: FDW tokens are not only used to reward resource contributions, but also can be used to pay for AI computing services, storage services and other services in the network. This multi-purpose token design gives it a wider application value in the DePIN ecosystem.

The FDW token provides crucial value support for the AI+DePIN ecosystem, ensuring its sustainable growth. As the DePIN network expands and application scenarios multiply, the token's value will increase accordingly, creating a virtuous cycle within the ecosystem.

3.2 Token offering plan

1) Basic token information

- ◎ Token name: FDW

- ◎ Issuance protocol: ERC-20 protocol standard

- ◎ Total distribution: 210 million, destroyed to 21 million, termination of destruction

FDW offers superior liquidity and value growth potential. As the universal token of the FDW protocol network, FDW enables diverse application scenarios and monetization opportunities while delivering substantial investment value. It supports the early-stage development of the FDW protocol network, allowing holders to benefit from the computational power market and capture future value appreciation.

2) Distribution plan

The FDW token allocation scheme is carefully designed to balance long-term development of the project, team incentives, community engagement and market liquidity.

• Team allocation (7.5%): to motivate the core development team and management team, and promote the long-term development of the project.

• Liquidity distribution (5%): to ensure the liquidity of tokens in the market and facilitate user trading.

• Operating distribution (2.5%): to support the daily operation and marketing activities of the project.

• IEO (15%): Issued and sold in cooperation with exchanges to improve the transparency and security of financing.

• Institutional (5%): Priority placement to large financial institutions, fund companies, etc., to improve liquidity.

• Community airdrop distribution (5%): to attract early users and community members and strengthen the community base.

• Mining distribution (60%): As the core incentive mechanism, it is used to reward users for contributing computing resources and promote the construction of distributed computing network.

This allocation not only balances the short-term needs and long-term development of the project, but also establishes a solid foundation for the success of the FDW project by attracting a wide range of users and communities through incentives.

3.3 Value of the Tokens

The economic model of the FDW protocol is built on the FDW token, encouraging collaboration and competition among multiple participants such as computing power providers, demanders, developers, and hardware manufacturers within the network. This forms an open, adaptive, intelligent, and sustainable global DePIN network for computing power sharing and collaboration. FDW has the following functions:

• Transaction fees: Paying FDW tokens as fees for transactions or executing smart contracts.

• Resource purchase: AI computing resources such as storage space and computing time can be purchased using FDW tokens.

• Incentive payments: Nodes that provide AI resources to the network or participate in the consensus process will be rewarded with FDW tokens.

• Media exchange: used to pay for AI computing power and data services, as well as to purchase or redeem DePIN applications and rewards.

• Incentive mechanism: used to reward the contributions of DePIN computing power providers, developers, data providers and other participants, as well as to punish dishonest or malicious behavior.

• Governance rights: used to participate in the construction and governance of the DePIN network, such as voting, proposal, entrustment, etc.

In the future, FDW tokens will be used in the following situations during DePIN application development and service:

• DEPIN manufacturers can obtain computing power through AI computing power sharing, such as laptops and graphics cards, and pay the corresponding FDW token fee.

- Data is obtained through the user's DePIN devices, such as smart cars, industrial equipment, Internet of Things, servers, smart homes, wearable devices, supercomputing hardware, etc., and paid for with FDW tokens.

- Developer testing: Developers will consume some tokens for the training of the AI model during the test. Depending on how many tokens are paid, the training time required for the AI model will be reduced by 50% or 90% respectively.

- Purchase of AI training services: When third-party organizations use AI training services to obtain more refined models, they may be required to pay training fees to retrain the models. FDW tokens are the payment currency.

3.4 Token circulation scenario example

As the token of the FDW protocol, FDW tokens will circulate in the full application scenarios of AI +DePIN, playing a core role in incentive and value exchange. The following are examples of how they circulate and their functions in different application scenarios:

1) Circulation in a decentralized computing network

- Incentivizing Computing Resource Contributions: FDW tokens serve as a key mechanism to motivate users to contribute computing resources (such as CPUs, GPUs, storage space, etc.). By running relevant clients, users can share their computing resources with the network to complete various computational tasks, thereby earning token rewards. This incentive system effectively consolidates idle computing resources worldwide, forming a robust distributed computing network.

- Pay for computing services: When using FDW's network resources, users can obtain services by paying FDW tokens. For example, research institutions can use tokens to access computational power for complex simulations and data analysis, while AI developers can use tokens to acquire GPU resources for model training.

- Optimizing resource allocation: Through token circulation, the FDW network dynamically adjusts resource distribution according to market demand. When computational demands in a specific domain increase, the value of FDW tokens rises accordingly, attracting more users to contribute resources to that domain and achieving optimal resource allocation.

2) Circulation in scientific research

- Support for Scientific Research Projects: FDW tokens can be used to fund various scientific research initiatives, particularly in fields requiring substantial computational resources such as climate modeling, gene sequencing, and particle physics. Research institutions can accelerate their progress by paying tokens to access the global distributed computing network.

- Encouraging research contributions: Researchers can earn FDW tokens as a reward for contributing their computing resources. This incentive mechanism not only reduces the cost of research, but also encourages more individuals and institutions to participate in scientific research.

- Promoting scientific research cooperation: The circulation of FDW tokens facilitates global scientific research cooperation. Scientific research teams from different countries and regions can exchange resources and cooperate through the tokens to jointly promote the development of scientific research.

3) Circulation in AI training

Higher education institutions are now progressively introducing artificial intelligence (AI) courses, a trend that will gain momentum in the coming years. While students typically complete small-scale tasks on personal devices and time-consuming assignments in campus computer labs, these fragmented workloads could be effectively managed through blockchain-powered computing cloud services. Cost-effective AI computing solutions are particularly well-suited for students to practice computational exercises and rapidly refine their models. The FDW token could serve as a payment medium for AI learning initiatives.

- Reduce training cost: The training of AI models requires a large amount of computing resources, especially GPU and TPU. FDW token allows AI developers to obtain idle GPU resources in the distributed computing network by paying tokens, thus greatly reducing the training cost.

- Accelerating model development: Through the FDW network, AI developers can quickly acquire the required computing resources to accelerate model development and optimization. This efficient resource acquisition helps promote the rapid development of artificial intelligence technology.

- Encouraging developers to participate: AI developers can be rewarded with FDW tokens for contributing their computing resources. This incentive mechanism not only reduces development costs, but also encourages more developers to participate in AI projects.

4) Circulation in complex data analysis

- Support enterprise data analysis: Enterprises often need to process large amounts of data and conduct complex data analysis and model building. FDW tokens allow enterprises to obtain computing resources in distributed computing networks by paying tokens, thus efficiently completing data analysis tasks.

- Encouraging data sharing: Enterprises can contribute their computing resources and receive FDW tokens as rewards. This incentive mechanism not only reduces the operating costs of enterprises, but also encourages enterprises to share computing resources and achieve mutual benefit and win-win results.

- Improve decision-making efficiency: Through the FDW network, enterprises can quickly obtain the required computing resources, accelerate data analysis and model construction, so as to improve decision-making efficiency and enhance market competitiveness.

5) Circulation in the Internet of Things and edge computing

- Support for Internet of Things devices: Internet of Things devices often require real-time processing of large amounts of data and high demand for computing resources. FDW tokens can be used to pay for computing resources of edge computing nodes to support the efficient operation of Internet of Things devices.

- Incentive for Device Contributions: Users can earn FDW tokens as rewards by contributing computing resources from their IoT devices (such as smart home devices, smart sensors, etc.). This incentive mechanism not only reduces operational costs for devices but also encourages more users to participate in building the IoT ecosystem.

- Optimize resource allocation: Through the circulation of tokens, FDW network can dynamically adjust the allocation of computing resources according to the needs of Internet of Things devices, so as to realize optimal resource allocation.

In addition, FDW token will also be implemented in a wider range of applications, such as smart cars, AI robots, intelligent manufacturing, smart energy, unlimited home entertainment, connected drones, social networks, AI assistance, etc. In the application ecosystem, FDW token will be circulated as the only value token.

Chapter IV Technical Architecture and Key Technologies

4.1 FDW protocol infrastructure

The FDW protocol architecture is a highly integrated and collaborative system designed to integrate global physical resources through decentralized methods and promote the sustainable development of the network through incentive mechanisms. The FDW protocol architecture consists of the following main levels and modules:

1) Physical resource layer

The physical resource layer serves as the cornerstone of the FDW protocol, integrating globally distributed resources such as computing power (e.g., CPUs and GPUs), storage space (e.g., hard drives and SSDs), and network bandwidth. These resources originate from users worldwide who contribute their idle assets to the network through FDW clients. When consolidated, these resources form a robust distributed computing network capable of handling complex computational tasks. For instance, scientific research projects requiring substantial computing resources can access global idle computing power via the FDW network without relying on expensive supercomputers. This resource consolidation approach not only enhances utilization efficiency but also reduces costs, enabling more projects to obtain the necessary computational support.

2) Blockchain layer

The blockchain layer serves as the "pillar of trust" for the FDW protocol, responsible for recording all transactions and resource contributions while ensuring network transparency and immutability. Through blockchain technology, every transaction and resource contribution is permanently recorded on the chain — accessible to all but unalterable. This transparency strengthens user trust in the network, motivating participants to contribute resources and build its infrastructure. Simultaneously, the blockchain layer provides foundational support for smart contract functionality, ensuring accurate documentation and verification of execution results. For instance, when a user completes a computational task and receives corresponding rewards, every detail of this process is recorded on the blockchain, guaranteeing fair and transparent reward distribution.

3) Smart contract layer

The smart contract layer serves as the "brain" of the FDW protocol, automatically managing resource allocation, task execution, and reward distribution. These self-executing codes operate according to predefined rules without human intervention. When users require computational resources, smart contracts dynamically assign tasks based on network availability and user credibility. Upon completion, they verify results and distribute FDW tokens based on task complexity and resource contribution. This automated approach not only boosts efficiency but also minimizes human errors and fraud risks. For example, an AI developer needing GPU resources for model training can submit a task request through the FDW network. The smart contract automatically identifies suitable GPU resources and disburses rewards upon task completion.

4) Incentive mechanism layer

The incentive mechanism serves as the driving force behind the FDW protocol, incentivizing users to contribute resources through FDW tokens. As the network's native token, FDW rewards users who provide computing power, storage space, or network bandwidth. These tokens are not only tradable on exchanges but also used to pay for computational services within the network. This mechanism not only encourages resource contributions but also drives sustainable development. For example, users can earn FDW by donating idle CPU and GPU resources, which they may then use to pay for additional services or sell on the market for profit. This economic incentive creates a virtuous cycle: users benefit from contributing resources, while the network gains more support through user participation.

5) Application layer

The application layer serves as the "service interface" of the FDW protocol, supporting diverse application scenarios such as scientific research, artificial intelligence training, and IoT. The distributed computing capabilities of FDW networks enable them to handle complex computational tasks across various fields. For instance, in scientific research areas like climate modeling, gene sequencing, and particle physics, which require massive computing resources, FDW networks provide robust support. In AI development where training models demand substantial GPU resources, FDW networks offer cost-effective and efficient computing services. For IoT applications, FDW networks facilitate real-time data processing and edge computing for devices, enhancing their response speed and operational efficiency. This versatility allows the FDW protocol to deliver extensive services to users and enterprises worldwide, driving progress across multiple industries.

6) Governance

The governance layer serves as the "decision-making hub" of the FDW protocol, implementing network governance and policy-making through a decentralized autonomous organization (DAO). As a blockchain-based organizational structure, DAO achieves decentralized governance via smart contracts. FDW's governance layer empowers token holders to participate in network decision-making through voting, enabling them to shape project development directions and policy frameworks. This decentralized governance model ensures transparent and democratic decision-making processes, allowing all participants to organically contribute insights and suggestions for network evolution. For instance, when the network needs to decide whether to introduce new features or adjust incentive mechanisms, token holders can voice their opinions through voting, with final decisions being determined by the voting results. This governance mechanism not only strengthens users' sense of belonging to the network but also ensures adaptive adjustments to user demands and market changes.

Through the coordinated efforts of these six hierarchical layers and modules, the FDW protocol has established an efficient, transparent, and sustainable DePIN. It not only integrates global physical resources but also drives the network's sustainable development through incentive mechanisms and decentralized governance, providing robust support for scientific research, artificial intelligence, IoT, and other fields.

4.2 Oracle Prophecy Machine Technology

An Oracle is fundamentally a technology that integrates real-world data into the blockchain, serving as a tool for obtaining and verifying external information on the blockchain. Acting as a middleware connecting smart contracts with the external world of blockchain, it constitutes a critical infrastructure component. Its primary function is to provide data information for smart contracts within the blockchain ecosystem.

The FDW protocol introduces Oracle Prophecy technology as a bridge between the blockchain and the real world, bringing DePIN's real-time data into distributed systems, enabling smart contracts to access and respond to events occurring in the real world.

Oracle works in three basic steps:

- Computing power data acquisition: Oracle obtains data from real-world data sources such as APIs, sensors, etc. These data can be provided by DePIN related devices. Oracle ensures the accuracy and reliability of the data.

- Computing power data verification: Oracle verifies the collected data to ensure its authenticity and integrity. This can be done by comparing multiple data sources or using data signatures.

- Computing power data transfer: The Oracle sends the verified data to the smart contract, enabling the contract to use the data for logical judgment and execution of operations. The Oracle ensures secure transmission of data to prevent tampering or forgery.

The FDW protocol powered by Oracle's prediction machine technology enables the creation of a decentralized machine learning ecosystem mirroring Polkadot's mainnet and subnet architecture. The operational workflow works as follows: Subnets relay activity data to the FDW API (Oracle), which then transmits actionable insights to the mainnet for Reward distribution.

- Miners: can be understood as the providers of various DePIN algorithms and models around the world. They host DePIN models and provide them to the FDW protocol network; different types of models form different subnets.

- Verifier: An evaluator within the FDW protocol network. Evaluates the quality and effectiveness of the DePIN model, ranks the DePIN model based on the performance of specific tasks, and helps consumers find the best solution.

- User: The end user of the DePIN model provided by the FDW protocol. This can be an individual or a developer seeking to use the DePIN model for applications.

- Nominee: The FDW token is delegated to a specific validator to indicate support, or different validators can be exchanged to delegate.

- Open DePIN supply chain: someone provides different models, someone evaluates different models, and someone uses the results provided by the best model.

The FDW protocol will encapsulate various smart contracts and off-chain services of the subsystem through Oracle to form a protocol layer, providing standardized support for DePIN computing power collection, application and redevelopment, and decentralized application (dAPP) development.

4.3 ZKML Zero-knowledge machine learning

Zero-knowledge proofs, first proposed by S. Goldwasser, S. Micali, and C.Rackoff in the early 1980s, enable verifiers to convince validators of a statement's correctness without disclosing any useful information. As an effective mechanism for implementing privacy-preserving security protocols, we begin by defining interactive proof systems:

Interactive proof system: A pair of interactive machines <P, V> (where P and V are the prover and verifier respectively) is an interactive proof system for the language L if it satisfies:

- Machine V is polynomial time;

- Completeness (Completeness): For every x in L, there exists an honest prover P such that after interacting with V, P outputs "x in L";

- Soundness: For every x in L, for any prover P, the probability that V outputs "x in L" after interacting with P is small.

Zero-knowledge proof system can be considered as an interactive proof system that meets the zero-knowledge requirement, and must meet the following four attributes:

- The verifier cannot obtain any information from the protocol;

- Provers cannot cheat verifiers;

- The verifier cannot cheat the prover;

- The verifier cannot simultaneously pose as a prover in another zero-knowledge proof system.

Zero-Knowledge Machine Learning (ZKML) is an emerging machine learning technology based on zero-knowledge proofs, designed to achieve machine learning tasks while protecting data privacy. Its potential lies in addressing the widespread privacy leakage issues in current machine learning and providing data owners with greater control and autonomy. By utilizing encryption and privacy protection technologies, ZKML allows data owners to train machine learning models without sharing raw data with third parties. This approach ensures data privacy while reducing the risk of data leakage. Additionally, ZKML enables data owners to selectively share model results, thereby balancing data privacy requirements with machine learning objectives. In summary, ZKML offers a viable privacy protection solution for machine learning applications.

ZKML is similar to a method of confidentiality in computing. It mainly involves two parts:

- Use machine learning (ML) to perform tasks;

- Prove that the task was done correctly, but do not reveal all the details.

In simple terms, it works like this:

- Running a task: The user uses an ML model to process some data and get results, like a chef baking a cake according to a recipe but not telling anyone what the ingredients are.

- Proving task: After completing the task, they can present a proof. For example, "I used specific inputs in this particular model to get this result." Essentially, they are demonstrating that they followed the recipe steps correctly.

- Keeping secrets: The magic of ZKML lies in its ability to preserve specific details when validating tasks, such as input data, model mechanisms, or results. Essentially, ZKML allows validators to confidently state "I believe I did the right thing" while maintaining confidentiality of their methodologies and data.

Therefore, the FDW protocol utilizes ZKML zero-knowledge machine learning and offers the following advantages:

- Data privacy protection: Through ZKML zero-knowledge machine learning, FDW protocol can carry out machine learning without data leakage, thus protecting data privacy.

- Data sharing: Through ZKML zero-knowledge machine learning, the FDW protocol data owner can share the data with third parties for machine learning without worrying about the risk of data leakage.

- Efficiency: Through ZKML zero-knowledge machine learning, the FDW protocol can greatly reduce the time of data transmission and processing, thus improving the efficiency of machine learning.

- Security: The FDW protocol uses encryption technology to protect data privacy, thus ensuring the security of machine learning.

- Credibility: Through ZKML zero-knowledge machine learning, the FDW protocol can improve the credibility of machine learning, because the third party cannot access the original data, thus avoiding the risk of data tampering or forgery.

4.4 DAG+DPoS dual consensus mechanism

In order to meet the actual business scenario requirements on transaction speed confirmation, commission fee and scalability, FDW protocol adopts the dual consensus mechanism of

DAG+DPoS, and constructs the DePIN incentive system based on FDW token by taking advantage of DAG+DPoS.

The FDW protocol adopts a DAG architecture, transitioning from single-threaded to multi-threaded concurrent blockchain operations. Designed for IoT and AI devices requiring small-scale, high-frequency transactions, it demonstrates excellent scalability. Building upon IOTA's DAG framework, the protocol integrates DPoS mechanisms through a voting-based transaction validation system. This establishes validator nodes that execute EVM smart contract functionalities. To prevent attacks, FDW implements a fee structure combining DPoS and DAG node verification with dual-verification fees. This dual-verification approach not only enhances security but also supports smart contract functionality while maintaining robust protection.

1） DAG structure

A DAG (Directed Acyclic Graph), commonly translated as a directed acyclic graph or directed non-cyclic graph, is a fundamental data structure in computer science. Its unique topological architecture enables it to be widely used in dynamic programming, shortest path navigation, data compression, and other scenarios where efficient processing is required.

Compared with the chain structure, DAG has the advantages of security and efficiency:

- Security: Compared to chain structures, malicious modifications in Directed Acyclic Graph (DAG) networks are significantly more challenging due to their extensive outdegree and indegree. To alter any node, both its outgoing and incoming edges must be modified simultaneously. When DAG wallets initiate transactions, they don't need to wait for previous transaction confirmation. Instead, they only require local validation, network-wide broadcast, and further local validation – effectively decentralizing transaction confirmation. Each node performs a puzzle-solving task, piecing together its own transactions with those already validated by others.

- Efficiency: The local processing and parallel settlement mechanisms of Directed Acyclic Graph (DAG) technology significantly enhance transaction speeds. Both Bitcoin and Ethereum have long faced criticism regarding their transfer latency, which has become the primary bottleneck in blockchain implementation. Unlike traditional blockchains, DAG's core feature is its blockless architecture – eliminating scheduled block generation. This design not only dramatically accelerates transaction processing but also enables massive concurrent transactions. Moreover, DAG's unique advantage lies in its self-improving nature: the more participants engage in transactions, the faster the confirmation process becomes. This inherent scalability provides a critical competitive edge for DAG's rapid future development.

2） DPoS common view

Delegated Proof of Stake (DPoS) is currently the fastest, most efficient, decentralized, and flexible consensus mechanism among all blockchain protocols. By leveraging stakeholders' voting rights, DPoS resolves consensus issues through a fair and democratic process. All network parameters—from fee estimation to block intervals and transaction capacity—can be adjusted via elected representatives. The deterministic selection of block producers ensures transactions are confirmed on average within just 1 second.

- Quorum of validators: During the genesis phase, a group of trusted nodes will operate as the initial validator set. After the block chain is activated, anyone can compete to join and be elected as a validator. The next validator set will be determined by the node holding the top 21 staking positions, with elections being held every 24 hours.

- For FDW token staking: To maintain compatibility with Ethereum and enable upgrades to future consensus protocols, the FDW protocol utilizes an innovative model for stake management. It features a dedicated staking module that accepts stake deposits from token holders and calculates the maximum stake node set. At each UTC midnight, FDW protocol sends a verifiable `Validator FDW Update` cross-chain message to notify validators of the updated validator set. When new blocks are generated, existing FDW validators periodically check for "Validator FDW Update" messages. If received, they update their validator set after the epoch period (a predefined block-blocking interval). For example, if FDW generates one block every 5 seconds with an epoch of 240 blocks, current validators will complete checks and update their validator set within 1200 seconds (approximately 20 minutes) for the next epoch.

- Security and Determinism: With over ½ *N+1 valid validators, Proof-of-Stake (PoS) networks typically operate securely and reliably. However, a critical vulnerability persists:

Byzantine validators can still execute attacks such as "forking attacks". To ensure safety, DPoS (Delegated Proof-of-Stake) requires validating over ⅔ *N+1 different validators to seal blocks. This mechanism allows DPoS to maintain trust at a lower security threshold, tolerating fewer than ⅓ *N Byzantine validators. For a network with 21 validators, sealing blocks within 5 seconds requires ⅔ *N+1 validators to complete the process (⅔ 21+1) × 5 = 75 seconds. Consequently, any critical DPoS application must wait ⅔ *N+1 validators to achieve relatively secure finality. To address this, the FDW protocol incorporates slashing logic − penalizing Byzantine validators through token burn − as detailed in the subsequent "Slashing and Governance" section. This mechanism rapidly exposes malicious validators, making fork attacks either impractical or highly inefficient. With this enhancement, even ½ *N+1 or fewer valid validators can reliably confirm the majority of transactions.

- Rewards: All validators in the current validator set of FDW protocols receive transaction fees from the FDW network. As FDW is not an inflationary token, it does not generate mining rewards like Bitcoin or Ethereum networks, where gas fees serve as primary incentives. However, since FDW also functions as a utility token with additional use cases, validators and delegates continue to benefit from other advantages of holding FDW tokens. validators earn rewards through transaction fees from each block. validators can determine how much FDW to stake back to their delegates as a reward, attracting more stakers. Each validator receives equal probability of generating block rewards (assuming 100% activity), ensuring all stable validators receive comparable long-term rewards. Paradoxically, validators with higher stake ratios may earn fewer rewards despite greater user trust. Therefore, rational delegates will prefer less-stake validators (as high-risk validators may introduce potential losses). Finally, stake variations among validators remain minimal. A portion of gas fees also rewards relayers for cross-chain communication.

4.5 IBC cross-chain communication

The Inter-Blockchain Communication (IBC) protocol is an open standard designed for cross-chain communication. Its primary purpose is to enable secure and reliable communication and interoperability between different blockchain networks. Through IBC, various blockchains can achieve cross-chain interactions, share data and value, and develop applications that are both more scalable and secure.

The emergence of the IBC protocol addresses a critical challenge in blockchain technology. Currently, interoperability between different blockchains remains challenging as they operate independently with limited cross-chain interaction capabilities. This fragmentation within the blockchain ecosystem prevents seamless data and value sharing between networks, ultimately hindering the development of distributed financial systems.

The wide application and development of chain technology.

The IBC protocol addresses this challenge by introducing a universal cross-chain communication standard. First, it establishes a unified communication mechanism across different blockchain networks, enabling seamless data transfer, event synchronization, and transaction processing between them. Second, the protocol features robust security and high reliability, ensuring tamper-proof communication between blockchain systems. Most importantly, IBC facilitates cross-chain asset transfers and interoperability of applications, unlocking new possibilities for blockchain technology implementation.

In summary, IBC splits the cross-chain into application layer/Application and communication layer/channel, whose simplicity and flexibility can be called the TCP/IP protocol of blockchain.

- The application layer is a cross-chain interoperability interface for end users: it includes multiple independent application protocols such as token transfer, inter-chain account, inter-chain query, etc. These application protocols are composable, and the cross-chain capability can be improved exponentially as the number of application protocols increases.

- The communication layer defines the transmission and reception of data across chains, including transmission, verification, and sorting, with the transmitted data content being invisible. In this process, the light client in the state machine of the source chain is the key to the communication layer and has become the essence of IBC.

For example, Chain A maintains a light client representing Chain B within its state machine, while Chain B also hosts a light client for Chain A. These clients verify cross-chain interactions by validating block headers and Merkle proofs to track consensus data across the blockchain network. A Relay node between the two chains monitors events generated on both sides. Upon receiving an IBC Event, it converts it into an actual IBC message and transmits it to the opposite chain. Essentially, the IBC protocol first establishes a secure channel between the two blockchains, then transfers data packets. Light clients validate consensus information from the opposing chain to ensure transaction consistency and security. Therefore, as long as the communication layer is established, the entire IBC cross-chain process remains secure.

The key to cross-chain technology solutions lies in their interoperability and security. The layered architecture of IBC's cross-chain communication enables the FDW protocol to support feature-rich, trustless cross-chain interoperability.

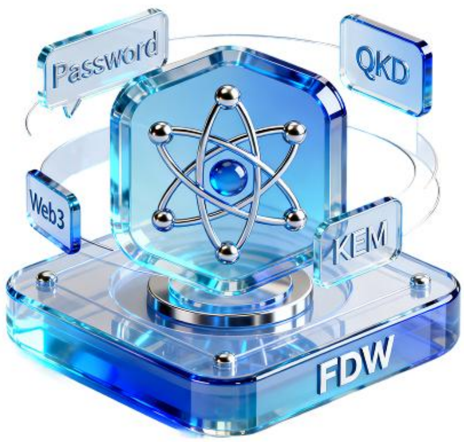
The FDW protocol addresses interoperability challenges between blockchain networks through IBC cross-chain communication. This technology enables secure and reliable data sharing and value transfer across different blockchain ecosystems. By eliminating reliance on centralized exchanges, users can now effortlessly conduct asset transfers and transactions between various blockchain networks.

The FDW protocol addresses cross-chain asset transfers through IBC's cross-chain communication. By enabling users to move assets between blockchain networks via IBC, this solution facilitates secure and efficient asset circulation across different blockchain ecosystems. This advancement not only enhances transactional convenience but also unlocks new possibilities for blockchain technology applications.

The FDW protocol addresses interoperability challenges in cross-chain applications through IBC cross-chain communication. By enabling smart contracts across different blockchain networks to communicate and interact via IBC, it facilitates more sophisticated cross-chain solutions. This capability allows developers to leverage the unique features and resources of various blockchain networks, building more robust distributed applications that further drive innovation and advancement in blockchain technology.

4.6 Quantum-resistant cryptography

With the rapid development of quantum computing, traditional encryption methods may face the risk of being cracked. In order to prevent this potential threat, FDW protocol has developed a quantum-resistant encryption algorithm.



- Development focus: quantum key distribution (QKD) and lattice-based encryption algorithms.

- Graph-based hard problem: Provide security for the quantum era based on a known mathematical problem.

- Key update mechanism: The key is updated regularly to deal with potential quantum attacks.

- Extensive compatibility: Ensure compatibility with existing encryption standards and a smooth transition to quantum security.

1) Quantum key distribution (QKD)

Quantum Key Distribution (QKD) based on quantum mechanics can provide a theoretically secure level unaffected by computational power and technological advancements, including developments in quantum computing. Its core principles—such as superposition, entanglement, and the no-cloning theorem—have paved the way for developing new security protocols like

BB84 and E91.

2) Key encapsulation mechanism

The Key Encryption Mechanism (KEM) comprises three core algorithms: a key pair generation algorithm, a public-key encryption algorithm for computing session keys and ciphertexts, and a decryption algorithm that generates session keys using ciphertext and private keys. The FDW protocol operates on lattice-based principles, leveraging the computational difficulty of the "Learning with Errors" (LWE) problem to enhance security in key exchange. The process begins with generating a pair of keys, where the private key remains confidential while the public key is publicly shared. The key generation process involves lattice operations closely tied to LWE challenges. When establishing secure connections, senders create or encrypt keys using public keys, then decrypt them with private keys to restore session keys, ensuring secure data transmission. Recognized for its efficiency, the FDW protocol minimizes resource and bandwidth consumption while enabling widespread adoption through optimized key sizes and performance-enhanced design.

3) Digitally signed based on Ge

The FDW protocol introduces a lattice-based digital signature method, with the emphasis on ensuring the authenticity and integrity of digital communications

Verifiability and non-repudiation. This approach leverages LWE and its variants, involving the development of a pair of keys: the private key for signing documents and the public key for verifying signatures. The inherent complexity and untraceability of lattice problems enhance the security of the signature process while improving the flexibility of signature verification. Additionally, the implementation of the FDW protocol employs uniformly distributed samples, avoiding the complex and inefficient sampling from Gaussian distributions. Its modular architecture also facilitates polynomial multiplication applications, ensuring consistent execution across different security levels regardless of their respective security tiers, thereby enabling seamless transitions between varying security configurations.

4) Hash-based encryption algorithm

The FDW protocol employs hash-based encryption algorithms that integrate technological innovations with cryptographic techniques to enhance security and efficiency. The algorithm generates a pair of keys, where the private key serves as a random seed to derive other components of the signature scheme through secure hash functions, ensuring resistance to reverse engineering. During signature creation, the private key generates unique signatures including one-time signatures. These are then linked back to the public key via a multi-layered tree structure and intermediate keys, demonstrating the signer's possession of the key while maintaining its confidentiality. To verify signatures, recipients use the public key to confirm the information was indeed signed with the corresponding private key.

Chapter V FDW multi-application ecology

FDW's AI-powered DePIN technology delivers diverse applications spanning IoT, energy management, storage systems, cloud computing, and beyond. Its solutions cover centralized wireless networks, data storage, cloud computing, high-precision positioning, map generation, energy sharing, IoT edge computing, distributed AI training, supply chain logistics, energy management, privacy protection, data sovereignty, and smart transportation. The decentralized architecture and incentive mechanisms enable the integration of globally dispersed physical resources, providing efficient, transparent, and sustainable solutions for multiple sectors.

5.1 Internet of Things and Edge Computing

By integrating global computing resources, FDW delivers robust edge computing support for IoT devices, which is essential for their efficient operation. IoT devices typically require real-time processing of massive data streams, and FDW's distributed computing network can swiftly meet these demands. For instance, smart home systems can access computing resources through the FDW network to achieve more efficient device management and automated control. This support not only enhances device responsiveness but also boosts overall system performance.

Furthermore, FDW enables remote monitoring and data analytics for IoT devices, helping businesses and users optimize equipment performance and operational efficiency. By transmitting data generated by IoT devices to the FDW network, users can leverage distributed computing resources for real-time analysis, generating valuable insights. This capability allows enterprises to better understand device operational status, predict potential failures, and refine maintenance schedules, thereby reducing operational costs and extending equipment lifespan.

Meanwhile, the decentralized nature of FDW significantly enhances security and reliability for IoT devices. Unlike traditional centralized systems where data is stored on single servers or data centers, which make them vulnerable to attacks and data breaches, FDW employs blockchain technology to distribute data across multiple network nodes. This decentralized storage approach ensures data security and tamper-proof integrity. Not only does this distributed storage method strengthen data protection, but it also boosts the system's resistance to cyber threats, enabling IoT devices to operate in a more secure environment.

In practical applications, the edge computing capabilities of FDW can be widely implemented across various IoT scenarios. For instance, in smart factories where numerous sensors and devices require real-time data processing for automated production, FDW networks enable these devices to rapidly access computing resources, facilitating efficient production scheduling and quality control. In smart cities, IoT devices such as traffic signals and environmental monitoring equipment can perform real-time data analysis through FDW networks, thereby optimizing urban operational efficiency and resource allocation.

Furthermore, FDW's incentive mechanism provides financial support for IoT device operations. Users can earn FDW tokens by contributing their computing resources, which can be used to pay for IoT device services, thereby reducing operational costs. This economic incentive not only encourages user participation in the FDW network but also drives the widespread adoption of IoT devices.

5.2 Centralized wireless networks

FDW demonstrates tremendous potential in decentralized wireless network development, offering an innovative solution for network deployment and operation. By installing hotspot devices and connecting their devices to the FDW network, users can provide wireless coverage to surrounding areas. In return, these users receive FDW tokens as rewards. This incentive mechanism not only generates economic benefits but also significantly drives organic growth of the network.

This decentralized wireless network model offers significant cost advantages. Traditional wireless networks require substantial capital investment for construction and operation, including base station deployment, equipment procurement, maintenance, and professional staffing. FDW reduces these costs dramatically by consolidating idle wireless devices from global users. Users can participate in network development simply by purchasing and deploying relatively low-cost hotspot devices, eliminating reliance on large telecom operators' infrastructure.

Furthermore, FDW's incentive mechanism attracts a broader user base to participate in wireless network development. Users not only earn token rewards but also enhance their community's connectivity by providing coverage. This model not only expands network reach but also improves stability and reliability. Since the network is collaboratively maintained by multiple users, any single node failure has minimal impact on the entire system, thereby strengthening the network's resilience against risks.

These decentralized wireless networks are particularly well-suited for remote areas or regions with inadequate traditional network coverage. In such locations, where complex geography, sparse population, or economic constraints often deter telecom operators from investing heavily in infrastructure, FDW's decentralized wireless solutions provide a cost-effective and efficient alternative. They enable residents in these areas to access urban-level connectivity. Through user-driven device deployment and network contributions, communities in remote regions can progressively build their own wireless networks, improving local communication infrastructure while boosting information flow and economic development.

Meanwhile, FDW's wireless network infrastructure provides robust connectivity for IoT devices. With the rapid advancement of IoT technology, an increasing number of devices require network access to enable smart functionality. FDW's decentralized wireless network delivers stable connectivity for these IoT devices, supporting diverse application scenarios such as smart homes, smart agriculture, and intelligent transportation systems. For instance, in remote farms, farmers can deploy wireless hotspot devices to provide network access for IoT sensors and equipment, enabling remote monitoring and automated management that significantly enhances agricultural productivity.

5.3 Decentralized storage

FDW can establish a decentralized storage network similar to Filecoin. Users can contribute their idle storage space to serve data storage needs. The core of this model lies in leveraging globally distributed storage resources instead of relying on traditional centralized data centers. Through this approach, FDW not only effectively utilizes underutilized resources but also provides users with more cost-effective storage solutions.

In decentralized storage networks, data is divided into small chunks and distributed across multiple nodes. These nodes can be any user device willing to contribute storage space, such as personal computers, servers, or cloud storage devices. Through blockchain technology, FDW ensures secure data storage and retrievability. The immutable nature of blockchain ensures that once data is stored on the chain, it cannot be modified or deleted, thereby guaranteeing data integrity and reliability. Additionally, through encryption techniques and distributed storage mechanisms, data maintains high security and privacy throughout its storage and transmission processes.

Smart contracts play a vital role in decentralized storage networks. They automatically manage the allocation of storage services and reward distribution, ensuring transparency and fairness throughout the process. When users need to store data, smart contracts automatically select suitable nodes based on network availability. Once data is successfully stored, smart contracts automatically issue FDW tokens as rewards to users who provide storage services. This automated mechanism not only enhances efficiency but also reduces the likelihood of human intervention and errors.

Compared to traditional centralized storage solutions, FDW's decentralized storage network offers significant advantages. Firstly, it reduces storage costs. By sourcing storage resources from users worldwide rather than relying on expensive data centers, it substantially lowers storage expenses — a major draw for businesses and individuals requiring massive storage capacity. Secondly, decentralized storage enhances data security and privacy. In conventional models, data is concentrated in a few central servers, leaving it vulnerable to cyber attacks and data breaches. FDW's decentralized network distributes data across multiple nodes, ensuring that even if one node gets compromised, the entire network's data security remains intact.

Furthermore, the FDW decentralized storage network demonstrates enhanced reliability and censorship resistance. With data distributed across multiple nodes, even if some nodes fail or face censorship, the data remains securely stored on other nodes. This distributed architecture makes the network more robust, capable of withstanding various risks including natural disasters, human errors, and malicious attacks.

5.4 Decentralized cloud computing

FDW's distributed computing network demonstrates tremendous potential and value in the decentralized cloud computing sector. In traditional cloud models, enterprises and developers typically rely on large cloud service providers that operate centralized data centers, requiring users to pay substantial fees for computing resources. However, FDW offers a more flexible, cost-effective, and efficient alternative by consolidating idle computing resources across the globe.

FDW's network aggregates idle computing resources from personal computers, servers, and other devices into a massive distributed computing cluster. These resources come from users worldwide who contribute their idle computing power (such as CPUs and GPUs) in exchange for FDW tokens as rewards. This model significantly optimizes resource allocation, effectively utilizing what would otherwise be wasted computing capacity while providing support for users and projects that require substantial computational resources but cannot afford the high costs.

For high-performance computing applications such as AI training, complex data analysis, and 3D rendering, FDW's distributed computing network provides robust support. Users can acquire required computing resources by purchasing FDW tokens according to their needs. This payment method is not only simple and convenient but also significantly more cost-effective compared to traditional cloud services, as FDW's resources are sourced from users worldwide. For example, a startup may lack sufficient funds to purchase expensive GPU servers for AI model training. Through FDW's network, it can obtain substantial GPU computing resources with relatively few FDW tokens, thereby accelerating model development and optimization.

Meanwhile, the decentralized nature of FDW significantly enhances cloud computing's security and reliability. In traditional cloud environments, data and computational tasks are typically centralized in a few data centers, making systems vulnerable to risks like single points of failure, cyber attacks, and data breaches. By contrast, FDW's distributed network architecture executes tasks across multiple nodes while encrypting and dispersing data storage. This approach substantially reduces security vulnerabilities, strengthens system resilience against attacks, and ensures robust data confidentiality.

Furthermore, FDW's incentive mechanism has injected new vitality into the cloud computing market. Resource contributors earn FDW tokens by donating their idle computing resources. These tokens are not only tradable on exchanges but also used to purchase other services within the network. This two-way incentive system not only encourages more users to participate in the FDW network but also promotes efficient resource flow and optimal allocation, fostering a healthier and more sustainable cloud computing ecosystem.

5.5 High precision positioning service

FDW delivers high-precision positioning services through the integration of global satellite data and ground sensor information. This integrated approach enables centimeter-level accuracy, offering critical value across multiple sectors. In autonomous driving, precise positioning allows vehicles to accurately perceive their surroundings and make informed decisions. Similarly, intelligent transportation systems leverage these services to optimize traffic flow, reduce congestion, and enhance road efficiency. For precision agriculture, farmers can monitor crop growth with pinpoint accuracy, enabling precise irrigation, fertilization, and pest control – all of which boost agricultural productivity and yields.

FDW's high-precision positioning service demonstrates both technological innovation and unique economic incentives. Users can earn FDW tokens by contributing their data or computing resources, enabling any individual or organization with relevant equipment or data to participate in the network and receive financial rewards through resource sharing. This incentive mechanism not only promotes data and resource sharing but also enhances the FDW network's coverage and improves data quality.

For businesses requiring high-precision positioning services, FDW offers an attractive solution. These enterprises can access the necessary high-precision positioning services by paying FDW tokens, eliminating the need to build and maintain expensive positioning infrastructure themselves. This model not only reduces costs but also enhances service accessibility and flexibility. Companies can purchase positioning services on demand according to their specific requirements, avoiding substantial upfront investments.

In addition, the decentralized nature of FDW also provides higher reliability and security for high-precision positioning services.

Compared to traditional centralized positioning services, FDW's distributed network demonstrates superior resilience against natural disasters, cyber attacks, and other potential disruptions. By distributing data and computing resources across multiple nodes, even if some nodes malfunction, the entire network remains operational. This decentralized architecture not only enhances service stability but also strengthens data privacy protection.

5.6 Energy sharing

FDW enables decentralized energy sharing networks, offering innovative solutions for efficient energy utilization and management. Users can connect their energy devices—such as solar panels and storage batteries—to the FDW network. This allows them to not only use self-generated energy but also contribute surplus power to the network, earning FDW tokens as rewards. This model significantly enhances energy efficiency, prevents waste, while providing users with additional financial benefits and reducing their energy costs.

In traditional energy systems, production and distribution are typically concentrated in the hands of large power plants and grid companies. However, FDW's decentralized energy sharing network breaks this centralized model, enabling direct interaction between energy producers and consumers. This peer-to-peer energy trading model not only enhances market flexibility but also strengthens the resilience of energy systems. Through FDW networks, users can flexibly adjust their energy usage and contributions based on their production and consumption patterns, achieving optimal energy allocation.

Furthermore, FDW can also support the construction of virtual power plants (VPP). A virtual power plant is a concept that integrates decentralized energy resources (such as solar, wind, and energy storage systems) into a virtual power generation facility through software and smart technologies. Through FDW networks, these distributed energy resources can be effectively managed and scheduled, enabling optimized energy allocation and management. Virtual power plants can flexibly adjust energy output according to grid demands, enhancing grid stability and reliability. Additionally, by participating in electricity market transactions, virtual power plants can generate additional income for energy equipment owners.

The development of FDW's decentralized energy-sharing network and virtual power plant not only benefits individual users but also holds significant importance for the energy transition of society as a whole. With the rapid advancement of renewable energy, effectively integrating and managing these distributed energy resources has become a critical challenge. FDW provides a decentralized platform that enhances the efficiency and cost-effectiveness of renewable energy utilization. By incentivizing users to contribute energy, the FDW network can further promote renewable energy development, reduce reliance on traditional fossil fuels, and ultimately drive society toward a cleaner, more sustainable energy system.

5.7 Distributed AI Training

FDW's distributed computing network demonstrates tremendous potential in distributed AI training, offering developers an efficient and cost-effective solution. Training AI models typically requires substantial computational resources, particularly for deep learning and complex machine learning algorithms where such resources are often costly and hard to obtain. FDW

By integrating idle GPU resources around the world, it provides AI developers with a powerful computing platform that enables them to train and optimize models at a lower cost.

In traditional AI training environments, developers typically rely on expensive cloud service providers or purchase high-performance hardware to meet computational demands. However, these approaches are not only costly but also constrained by hardware limitations and maintenance expenses. FDW's distributed computing network integrates idle GPU resources from global users into a massive computing cluster, offering AI developers a more cost-effective alternative. By running FDW clients, users can contribute their GPU resources to the network and earn FDW tokens as rewards. This incentive mechanism not only enhances resource utilization efficiency but also encourages broader participation in the network, significantly expanding the scale of computing resources.

For AI developers, FDW's distributed computing network provides a flexible and efficient platform. By purchasing FDW tokens, developers can access computing resources that are dynamically allocated according to training task requirements. This pay-as-you-go model not only reduces development costs but also enhances efficiency. For example, a startup might lack the funds to purchase expensive GPU servers for model training. Through FDW's network, it can obtain substantial GPU computing resources with relatively few FDW tokens, thereby accelerating model development and optimization.

Furthermore, FDW's distributed computing network enhances the reliability and security of AI training. In traditional centralized computing environments, data and computational tasks are typically stored and processed in a few centralized data centers, making systems vulnerable to risks such as single points of failure, cyber attacks, and data breaches. By contrast, FDW's distributed network executes computational tasks across multiple nodes while encrypting and dispersing data storage. This approach significantly reduces security risks, improves the system's resistance to attacks, and ensures data confidentiality.

FDW's distributed AI training model not only reduces the cost of AI development but also accelerates the advancement of artificial intelligence technology. By integrating global idle computing resources, FDW provides developers with a robust computing platform, enabling more individuals and enterprises to participate in AI research and application. This model not only promotes the popularization and innovation of AI technology but also fosters the development of a global AI ecosystem. As more users and developers join the FDW network, the scale and diversity of its computing resources will continue to expand, offering stronger support for AI training and accelerating breakthroughs and applications in artificial intelligence technology.

5.8 Supply chain and logistics

The application of FDW in supply chain and logistics has demonstrated its powerful decentralized advantages, revolutionizing traditional supply chain management. In today's complex global supply chains, ensuring data authenticity and immutability is paramount. By leveraging blockchain technology, FDW can precisely document every stage of the supply chain—from raw material procurement to final product delivery—each step being transparently and tamper-proof recorded. This transparency not only enhances supply chain traceability but also provides participants with robust trust assurance.

In traditional supply chain management, data is often scattered across different systems and organizations, leading to information silos and data inconsistencies. FDW leverages blockchain technology to centralize all supply chain data on a decentralized ledger, ensuring data consistency and integrity. Whether suppliers, manufacturers, logistics providers, or retailers, all parties can access and verify supply chain data in real time, thereby enhancing overall transparency and operational efficiency.

Furthermore, FDW's smart contract capabilities open up possibilities for automation and efficiency gains in supply chain management. Smart contracts are self-executing agreements encoded on the blockchain that automatically execute predefined operations when specific conditions are met. In supply chains, this means logistics and payment processes can operate autonomously without human intervention. For example, when goods arrive at designated locations and are confirmed for delivery, smart contracts can automatically trigger payment procedures, ensuring suppliers receive payments promptly. This automated workflow not only reduces human errors but also enhances the efficiency and reliability of supply chain operations.

FDW's decentralized supply chain management provides equal competitive opportunities for SMEs and emerging markets. In traditional supply chains, large enterprises often dominate, while SMEs struggle to participate in complex supply chain management due to limited resources. By lowering participation barriers, FDW enables SMEs to join global supply chains at lower costs, thereby promoting diversity and innovation within the supply chain ecosystem.

Furthermore, FDW's supply chain management solutions demonstrate exceptional resilience. Unlike traditional supply chains where a single failure could disrupt the entire network, FDW's decentralized architecture mitigates risks through distributed control. Even if a node fails, it won't compromise the system's overall functionality. This robustness proves particularly vital when confronting external shocks such as natural disasters, political instability, or economic crises.

5.9 Privacy protection and data sovereignty

In the realm of privacy protection and data sovereignty, FDW has demonstrated remarkable technical potential and innovative value. As data becomes increasingly vital in modern society, the critical challenge of protecting personal and organizational privacy while leveraging data, along with ensuring data ownership and control, has emerged as a pressing issue. By integrating blockchain technology with advanced privacy-preserving solutions such as multi-party secure computation (MPC) and homomorphic encryption, FDW provides an effective solution to this problem.

Blockchain technology, with its immutable, decentralized, and transparent features, provides a robust foundation for secure data storage and management. In FDW's network, data ownership and control remain firmly in users' hands. Users can selectively share their data while clearly understanding its usage and scope. This transparency and control empower users to participate in data sharing and computational processes with greater confidence.

Privacy-preserving technologies significantly enhance data protection during usage. Multi-party secure computation enables collaborative processing among multiple parties without disclosing individual data, achieving "usable yet invisible" data. Homomorphic encryption allows direct computation on encrypted data without decryption, effectively preventing information leakage during processing. Through these mechanisms, FDW ensures privacy integrity throughout computational workflows. Even when handling large-scale data processing and analysis across distributed networks, sensitive information remains securely protected.

Users can participate in FDW's privacy computing network by contributing their computational resources. This engagement not only helps build a more robust privacy protection ecosystem but also rewards participants with FDW tokens. This incentive mechanism encourages more users and organizations to join the privacy computing network, thereby expanding its scale and influence. Simultaneously, it provides a reliable and efficient platform for enterprises and developers requiring privacy-preserving computations.

This model not only safeguards user privacy but also ensures data ownership and control remain firmly in users 'hands. In traditional data processing models, users often have to hand over their data to third parties for processing—a practice that not only increases the risk of data leaks but may also lead to misuse. FDW's privacy protection and data sovereignty solutions enable users to perform computations without disclosing data content, thereby protecting privacy while fully leveraging the value of data.

By integrating blockchain technology with privacy-preserving computation, FDW delivers an innovative solution for data sovereignty and privacy protection. Users can participate in the privacy computing network by contributing computational resources, earning FDW tokens while maintaining data privacy during computations and retaining ownership control. This model not only enhances data security and privacy protection but also unlocks new possibilities for effective data utilization and value extraction.

Chapter VI Teamwork and collaborative development

6.1 Global Team

The core team of FDW is composed of experts and scholars from blockchain, DePIN, AI, Internet of Things, Web protocol, computing power and other fields. They have rich technical experience and innovation ability, which provide a solid foundation and guarantee for the technical architecture and functions of FDW protocol.

Chief Executive Officer (CEO) ——Michael Lee

He holds a PhD in quantum computing and artificial intelligence from Massachusetts Institute of Technology (MIT), and has served as senior researcher and technical director at Google, IBM, Microsoft and other well-known enterprises. He is a leading figure and authoritative expert in the fields of blockchain, artificial intelligence and quantum computing.

Chief Technology Officer (CTO) ——David Wong

He holds a PhD in blockchain and cryptography from Stanford University, and has served as a core developer and technical consultant for well-known blockchain projects such as Ethereum, Polkadot and EOS. He is an outstanding talent and innovator in the field of blockchain and cryptography.

Chief Artificial Intelligence Officer (CAIO) ——Emily Roberts

With extensive research experience in blockchain, cryptography, and data mining, Emily Roberts will provide in-depth algorithmic support for the project at the level of core mathematical models for blockchain, core AI algorithms, and big data parallel computing.

Chief Operating Officer (COO) ——Jessica Tanaka

He holds a master's degree in business management and marketing from the University of Tokyo, Japan. He has served as senior manager and Marketing Director in well-known companies such as SoftBank and NTT in Japan. He is a professional and leader in the field of business management and marketing.

6.2 Financial support

FDW has gained recognition from international capital and secured funding from top-tier global investors including TechConnect Partners, Digital Assets Capital, and Innovation Ventures.

• TechConnect Partners: A leading technology innovation investment and consulting firm focused on providing funding support and professional consulting for cutting-edge technology projects. It has successfully invested in and supported a number of leading blockchain projects.

TechConnect Partners has invested in FDW, which will provide a full range of technical consulting and marketing support to facilitate the smooth implementation and promotion of the project.

• Digital Assets Capital: A dedicated investment firm focused on digital assets, this institution identifies innovative and promising projects in the blockchain sector. With extensive experience in investments, it demonstrates acute insight into technological innovation and market demands. TechConnect Partners has recognized the potential of the FDW protocol's exploration in the DePIN field, thus investing in and driving its implementation to jointly explore innovative opportunities in AI + DePIN.

• Innovation Ventures: A venture capital firm specializing in blockchain projects, dedicated to identifying innovative solutions with unique value propositions across various sectors. Its investment philosophy focuses on unlocking potential value, having backed multiple groundbreaking blockchain initiatives. TechConnect Partners invested in the FDW protocol following their consensus on advancing DePIN and AI computing systems, supporting innovation through strategic funding and resource allocation to achieve mutual success.

6.3 Resource integration

Thanks to the advantages of sustainable and innovative technology, extensive commercial applications and refined governance, FDW is competitive in the following aspects:

• Technical Team: FDW boasts a highly sophisticated and robust technical foundation. With extensive industry expertise and technical experience in blockchain, artificial intelligence, quantum mechanics, machine learning, DePIN, Web3 protocols, and community self-governance, the team has achieved groundbreaking advancements in underlying blockchain technology development and practical applications. FDW's leadership team combines cross-industry professionals with years of hands-on operational experience and deep industry insights.

• Industry Resources: FDW has established strategic partnerships with leading projects in target industries, providing robust support for its integration into specific application scenarios to effectively drive real-world implementation. Key industry partners include Amazon, IBM, Adobe, Google, Verizon, NVIDIA, and Qualcomm.

• Liquidity Support: FDW leverages extensive industry resources and partnerships with multiple international mining farms, active communities, investment funds, and professional institutions to ensure robust liquidity. Our dedicated computing power team collaborates with global market leaders to deliver integrated fragmented liquidity solutions, supports computing power trading, and provides APIs compatible with fast-paced algorithmic trading systems.

• Business Governance: Unlike conventional projects, FDW maintains a clear and well-defined strategic blueprint for its target industry. Operating through an autonomous community model, it continuously drives the growth of a free, fair, and high-value ecosystem. Leveraging blockchain's distributed decentralization, tamper-proof security, and peer-to-peer value transfer capabilities, FDW is strategically focused on penetrating the DePIN sector and rapidly capturing market share.

• Fund Management: FDW's fund management, under the guidance of the Investor Protection Fund, strictly adheres to the principles of fairness, justice, and transparency, with project development as its primary objective. The Investor Protection Fund specifically safeguards and ensures the safety and availability of funds.

Sustainability. All fund usage will be disclosed to all investors on a regular basis to ensure openness of fund usage.

• Development Scope: FDW targets the trillion-dollar AI+DePIN market. The development team has established a robust governance framework to effectively manage routine operations, including decision-making processes, code management, financial oversight, compensation systems, and privileged access controls, ensuring sustainable growth.

Supported by the core competitiveness, FDW has a clear commercialization logic, and each technical link and organization have a strong target and logical gene, and on this basis, a number of modular and modified technical solutions or mechanisms are proposed.

6.4 Development planning

Initial Plan (2025):

- Development of FDW protocol;
- Hardware chain test network;
- AI +DePIN to open up a diversified ecological layout;
- Issuing FDW tokens;
- Attract early users and build a community.

Medium-term Plan (2026):

- A large number of AI manufacturer hardware access protocols;
- FDW main network online;
- Large-scale sales of AI +DePIN supporting hardware;
- Expand the value of FDW tokens and realize smart hardware mining.

Later planning (2027 and beyond):

- Develop a public chain based on FDW, and test and launch it;
- Start the global offline AI +DePIN smart hardware concept store layout;
- Explore more possibilities of AI +DeFIN, and FDW protocol becomes an industry benchmark;
- Realize the true decentralization of computing power resources, so that everyone can participate in and benefit from the construction of DeFIN;
- Continue to expand the AI +DeFIN ecological application, FDW token to achieve high value-added, open a new future!

Chapter VII Disclaimer

This document is provided solely for informational purposes and does not constitute any investment advice, solicitation, or offer to sell shares or securities in FDW or its affiliates. Any such offer must be made in the form of a confidential memorandum and shall comply with applicable securities laws and other applicable laws.

The content of this document shall not be construed as an invitation to participate in the Token Public Offering. Any actions related to this white paper shall not be considered participation in the offering, including requesting copies of this white paper or sharing it with others. Participation in the offering indicates that participants have reached the required age threshold, possess full legal capacity, and that the contract signed with FDW Team is valid and authentic. All participants voluntarily entered into the contract and provided FDW with clear and necessary information prior to signing.

The value appreciation of cryptocurrencies is determined by market dynamics and post-launch demand. The team does not guarantee value appreciation and assumes no liability for consequences arising from fluctuations in value. To the maximum extent permitted by applicable laws, we disclaim responsibility for damages and risks arising from participation in Token public offerings, including but not limited to direct or indirect personal losses, loss of business profits, leakage of commercial information, or any other economic damages. We expressly disclaim and refuse to assume the following liabilities:

- No person shall violate the anti-money laundering, anti-terrorist financing or other regulatory requirements of any country when exchanging assets;

- No person shall, by purchasing an FDW, violate any representation, warranty, obligation, undertaking or other requirement set forth in this White Paper, and thereby cause the digital currency to be unavailable or unextractable;

- The delay or postponement of the FDW upgrade and consequently the failure to meet the previously disclosed schedule;

- Errors, defects, flaws or other problems in the source code of FDW;

- Failures, crashes, paralyses, rollbacks or hard forks of FDW;

- Failure to achieve any specific function or not suitable for any specific purpose;

Failure to disclose information about FDW development in a timely and complete manner;

- Any participant has leaked, lost or damaged the wallet private key;

- Breach, violation, infringement, collapse, paralysis, termination or suspension of services, fraud, misoperation, misconduct, error, negligence, bankruptcy, liquidation, dissolution or closure of the third-party distribution platform;

- Any agreement with a third-party distribution platform is different, conflicting or contradictory to the contents of this White Paper;

- The listing, suspension or delisting of any speculation by any person in FDW on any trading platform;

- FDW is classified by any government, quasi-governmental agency, competent authority or public body as or as a currency, security, commercial paper, negotiable instrument, investment product or other thing that is prohibited, regulated or subject to legal restrictions;

- Any risk factors disclosed in this white paper, as well as damages, losses, claims, liabilities, penalties, costs or other negative effects associated with and therefore caused or incidental to such risk factors.

We comply with all regulatory requirements that promote the healthy development of the industry, including self-regulatory declarations. By participating, participants expressly agree to fully accept and comply with such inspections. All information disclosed by participants for these inspections must be complete and accurate. The FDW technical team has clearly communicated potential risks to participants. By participating in the token public offering, participants confirm their understanding and acceptance of all terms and conditions outlined in the regulations.