# MIP.AI

## Digital Distributed Manufacturing Chain
## (Blockchain 3D printing)

# White Paper

# Content

# Executive Summary

MIP.AI, a digital manufacturing eco-protocol based on blockchain technology, which committed to linking digital manufacturing equipment such as 3D printers and CNC machine tools worldwide to establish a distributed manufacturing ecosystem, making every manufacturing equipment as a node of the global manufacturing network. It accesses the 3D printer according to the development plan and resource deployment for the first time. MIP.AI was earlier known as "blockchain 3D printing".

The vision of the MIP.AI is to build a new global digital distributed manufacturing ecosystem that will link designers, engineers, demanders, and equipment owners, and will restructure the manufacturing industry model in a more revolutionary and innovational way.

# 1. Background

## 1.1 Blockchain

Blockchain is essentially a decentralized distributed ledger database. Its features are,

- Constructing a Self-organizing network
- Using a string of data blocks generated by cryptographic correlation algorithms,
- Recording time-ordered events
- Everything unchangeable
- Containing valid confirmation information for multiple transactions in each data block

Thereby, the blockchain establishes a distributed consensus mechanism to realize a decentralized trust system.In addition, the blockchain uses encryption techniques, distributed consensus protocols, peer-to-peer network communications, and smart contracts so that the participants in the blockchain ledger system build a trust base for multi-party transactions without the need of additional third-party guarantee agencies. This brings low cost and low latency of information exchange and transaction processing which enables the efficient distribution of digital value.

## 1.2 Smart Contract

The term "Smart Contract" dates back to at least 1995 and was proposed by Nick Szabo, a cross-disciplinary legal scholar.He gave the concept of "smart contracts" and defined it as follows, “a set of promises agreed to in a meeting of the minds [which] is the traditional way to formalize a relationship.” published on magazine *Extropy*in 1996.

"The basic idea of smart contracts is that many contract terms can be embedded in hardware and software." Saab believed that the initial applications of smart contracts were vending machines, point-of-sale terminals, electronic data exchanging among large companies and

interbank transfer such as SWIFT, ACH, FedWire. In the future, smart contracts can also be embedded in digital manufacturing terminals such as 3D printing.

## 1.3 Industry 4.0 and Digital Manufacturing

Industry 4.0 refers to the use of the Cyber-Physical System (CPS) to digitalize the information of supplying, manufacturing, and marketing in order to achieve a fast, effective, and customized production.

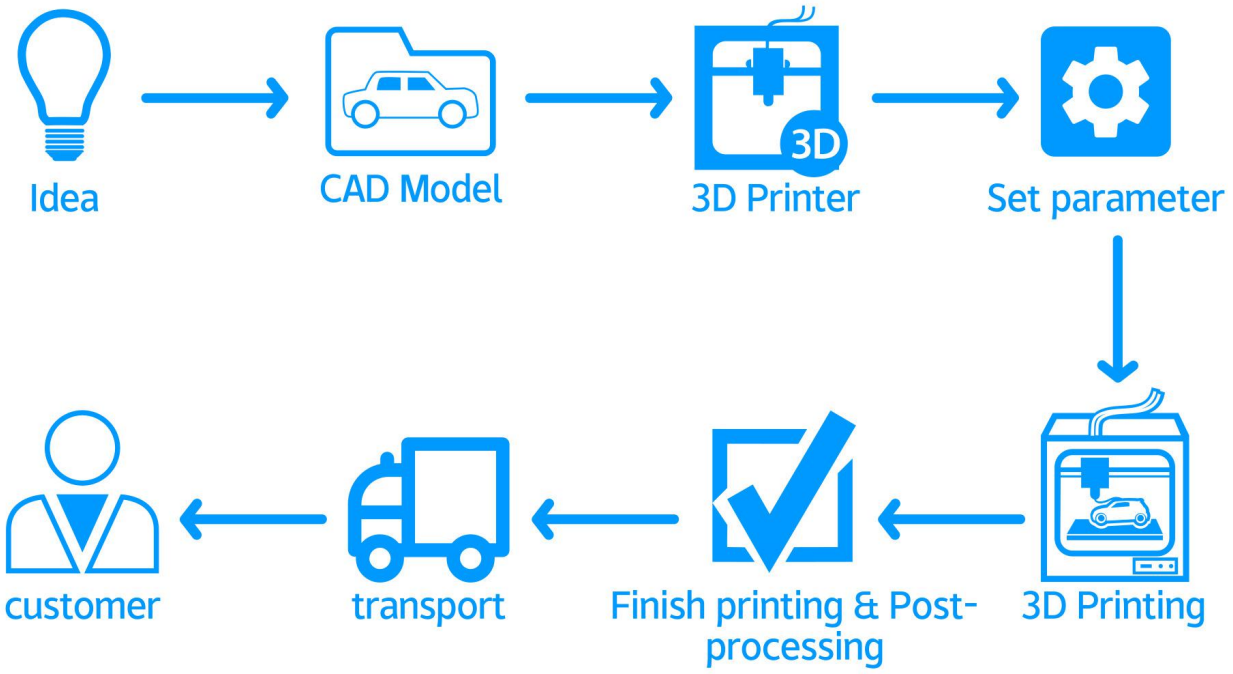
Digital manufacturing, especially for the 3D printing, digitalize the design of manufacturing which forms a certain instruction that can be input into the equipment to automatically produce the parts. It is more widely defined as the bridge between the design and the manufacturing. Digital manufacturing contains production planning, process design, process simulation and process management. It can provide the visual solutions for production by using the process design and management tools.

Digital manufacturing based on 3D printing technology has many advantages in product innovation, inventory management, and sustainability.

In August 2017, Dion Weisler (Hewlett Packardpresident & CEO) refers to the digital manufacturing, "The fourth industrial revolution is about the digitization of manufacturing. The global $12 trillion manufacturing market is undergoing a drastic transformation."
There are many limitations in the traditional factories for customized and flexible production. However, digital manufacturing technologies such as 3D printing, which were included in the National Key Strategic Plan of the United States in 2011, can perfectly meet the increasing personalized production demands of individuals and enterprises.

## 1.4 3D Printing

3D Printing (3DP) is one of the most important technologies for digital manufacturing. It is based on the digital model files (such as STL, OBJ, AMF, 3MF, etc.) and uses metal powder or plastic granular materials to build parts by layer-by-layer printing.




**The general process of 3D printing is,**

Creative ideas → CAD software modeling (or reverse modeling by 3D scanners) → Transfer model files to 3D printers → Printing setup (materials, print parameters, etc.) → 3D printing Manufacturing, post processing, quality inspection → logistics → delivering to customers.

In the early days of 3D printing, it was often used in manufacturing molds, industrial designs, and other fields to fabricate prototypes. Now, they are also used in the direct production of some parts. 3D printing, known as the advanced manufacturing technology, is the data-driven manufacturing technologies.

# 2. Project Introduction

## 2.1 Project Introduction

Each digital manufacturing equipment will become a node in the digital distributed manufacturing chain, providing customized production services to customers around the world.In order to achieve this goal, we build the MIP.AI platform ("*Make It Product. Artificial*

*Intelligence*", which aims to combine artificial intelligence and blockchain technology to turn design into a product).. It can be explained as follows,

- In mathematics, the $f(x) = x^{\alpha}$ where the x ishe xmatic mat $\alpha$ issvariable. In general, the $\alpha$ can be positive or negative integers. But here it is the positive integers.

MIP.AI is committed to connect manufacturing terminals worldwide, digitize manufacturing, build distributed manufacturing networks, and intelligently drive human production activities. Digital distributed manufacturing chain will use the decentralized idea of blockchain to achieve this transformation.For example, if you want to customize a car model, the only thing you need to do is uploading your design requirements on the MIP.AI platform. Then MIP.AI will manage the resources such as global collaborative design and distributed manufacturing to build the components. Then, these parts will be delivered to your home and can be assembled into a complete car model.

With the development of Industry 4.0, Internet of things(IOT), and artificial intelligence(AI), traditional manufacturing processes and systems are no longer to work efficiently . We try to use the First-Principles to reconstruct manufacturing and discover the basic principles of manufacturing processes. We take advantage of blockchain, IOT, AI and other technologies to reconstruct the manufacturing chain. The future of manufacturing should have the basic principles as follows

①**Distributed**

From the view of space and time efficiency, the closer the manufacturing node is to the consumer, the more time and cost it will save. In the old days of industrialization, highly centralized factories were adopted to achieve high production efficiency, but the material transportation and storage added a lot of costs. With the increasing level of intelligence in production equipment and the increasing ability to autonomy, the future distributed manufacturing model will become a more efficient and powerful by combining the artificial intelligence and big data technology.

②**Networking**

Networking contributes the development of big data and artificial intelligence technologies. We can use the Internet to achieve people-to-people communication, Internet of Things (IOT) to achieve M2M (equipment Unicom) and blockchain to achieve the value link between the information and physical world.

**③Flexible Manufacturing System**

Nowadays, personalized and customized production becomes the mainstream. This requires the manufacturing industry to have more flexible production capabilities, be able to respond quickly to changes in production requirements and could adjust production resource allocation more intelligently. By combining the edge computing and sensing capabilities provided by IOT technologies and blockchains, flexibility will become the basic feature of smart manufacturing.

**④Transparency**

Manufacturing industry is a typical multi-role, multi-process, and long-period complex industry. The cooperation efficiency between roles and the improvement of the operational efficiency of internal and external processes, are highly dependent on the highly transparent and trustworthy information. The transparency in manufacturing needs to meet several requirements including data trust, controllability, and real-time.

**⑤Intelligent**

Big data and artificial intelligence (AI) will empower the design, simulation, and manufacturing processes. The future manufacturing chain will fully use the big data collected by trillion-level sensors from Internet of things (IOT) and world-wide-web to achieve several goals, such as demand forecasting, smart pricing, resource matching, manufacturing execution and smart logistics. The future of manufacturing will be a smart manufacturing network for sustainable evolution and iterative evolution.

# 3. Industry Analysis

## 3.1 Current Situations

3D printing technology has achieved accelerated development of technology from Fused Deposition Modeling (FDM), Stereo lithography Apparatus (SLA), Selective laser sintering (SLS) to selective laser melting (SLM). The materials also have been upgraded from civilian-grade plastic resins to industrial-grade high-strength metals and military-grade high precision alloy. At present, the processing speed and precision of 3D printing can gradually compete with traditional production technologies. Meanwhile, 3D printing has a uniquely large-scale custom production capability, natural digital design and manufacturing attributes, which makes 3D printing has great potential of leading a new generation of digital manufacturing revolution.

Hewlett Packard （HP）believes that the strong growth of the 3D printing market and its application potential in the future will subvert the $12 trillion market-sized manufacturing industry. HP, GE (General Electric), Siemens, BASF and other global industrial giants have already invested capital in the field of 3D printing.

## 3.2 Industry Pain Points

With the rapid development of digital manufacturing technologies such as 3D printing, the industry has grown strongly. It unlocks more business opportunities. However, the new problems appear.

- **Poor trust mechanism**

3D design model data (digital manufacturing information files) can be easily copied, transferred, and transmitted. When customers look for 3D printing services, they require confidentiality agreements. Customers cannot fully trust that their data isn't to be copied even if they sign confidentiality agreements.

- **Intellectual property protection**

The core information of digital manufacturing is saved in the form of digital files and is easily pirated and copied.

- **Data tampering**

It is easy to use CAD software to modify a 3D model to avoid copyright.

- **Insufficient design database**

Because of concerns about data security, designers are not willing to share design data, resulting in a lot of repetitive design and stifle creation.

- **Poor customer experience**

It is difficult for customers to find the most suitable suppliers. Due to the poor communication, poor manufacturing processes, logistics issues, etc., consumers have a hard time getting a good service experience.

- **Idle and waste resources**

There are a large number of 3D printers on the market being idle resources; at the same time, there are a large number of designs requirements in the society that need to be manufactured in small batches or personalized.

- **Others issues**

Today's 3D printing industry also has problems such as uneven distribution of manufacturing resources, long production processes, high communication costs, opaque material price information, and poor production capacity.

Blockchain can integrate multiple value chains of digital manufacturing processes and create connected data clues in the value chain and is expected to solve above problems. It can improve the overall operational efficiency and reduce resource waste through blockchain distributed bookkeeping, smart contracts, encryption technologies and relevant technologies. Also, the various participants in the digital advanced manufacturing process are fully protected.

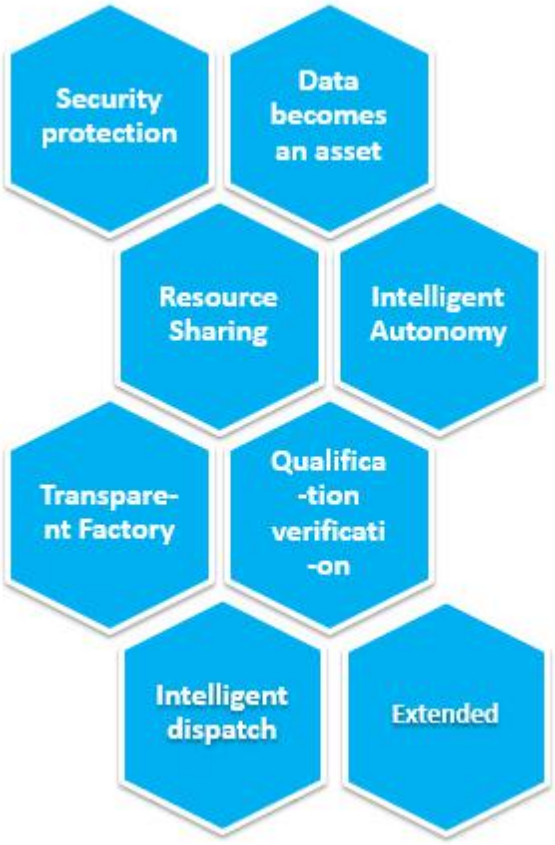
# 4. MIP.AI, New Era of Global Digital Distributed Manufacturing

## 4.1 What is MIP.AI

MIP.AI (Make It Product. Artificial Intelligence)，Chinese name “幂派” ( Exponential growth), is a digital manufacturing ecosystem protocol based on blockchain technology. It connects global 3D printers, CNC machine tools and other digital manufacturing equipment, and establishes a distributed manufacturing ecological chain. Regardless of individuals or organizations, as long as you have a 3D printer, you will become a node in the global manufacturing network.

Parts or finished products can be produced locally no matter they are from individual’s needs or business requirements. MIP.AI is going to link manufacturing equipment all over the world, especially for individuals ‘equipment as manufacturing nodes. We all know that Foxconn is a world-class factory. However, MIP.AI will create tens of thousands of “small Foxconn”.

## 4.2 Features of MIP.AI




### 4.2.1 High security of production data

By using blockchain and other related technologies, production data can be protected during the entire process of design, dissemination, and manufacturing.

For example, if user A wants to fabricate a part, he only needs to send the production data (such as STL model) directly to the service provider's 3D printer to produce the part through the smart contract, which means service providers can conduct production without obtaining complete production data to avoid data leakage and ensure safety. Therefore, the problem of easy piracy, copying, and falsification of files was solved at the source.

### 4.2.2Capitalizing production data; Equipment resources become nodes

Designer's works and other production data (such as 3D models) become a status of digital asset, which have commercial value.

Once equipment resources become manufacturing nodes, the owners will be rewarded for MIP.AI tokens. Designers upload their own works and obtain tokens after verifying by votes. They also can use the platform to sell their works by charging tokens. Manufacturers also receive tokens when they produce the works.

### 4.2.3 Distributed manufacturing; Mining 3DP tokens while processing 3D printing

**G**lobal distributed manufacturing can be achieved by MIP.AI. The MIP.AI collects the global digital manufacturing resources, adjusts them to connect the MIP.AI by Internet and assigns the orders to the matched equipment.

Also, 3DP tokens are mined during the 3D printing process. Compared with the normal mining which needs to solve the complicated mathematical problems, 3DP token mining is based on printing the physical and valuable objects.

### 4.2.4 Intelligent Production; Equipment Autonomy

By using artificial intelligence technology, MIP.AI can accurately analyze the requirements submitted by users, evaluate the production and match the appropriate manufacturers or equipment. MIP.AI also uses optimized parameter settings, and avoid production risks.

Using the latest IOT technology, real-time monitoring of equipment, remote control, and predictive equipment maintenance can be applied. In addition, intelligent self-governance of

devices can be achieved by edge computing and edge control, not only protect the network security but also enhance the productivity.

### 4.2.5 Transparent factory; full-process real-time viewing; production traceability

Data during processing are all recorded that cannot be tampered. For instance, the user's information, nodes' information and printing settings for a 3D model is all recorded on the chain.

The IOT technology is used to make device access to the Internet. Under authorized conditions, the status of node production equipment can be viewed on the platform in real time, such as vacancy, maintenance, and full-load production.

### 4.2.6 Service qualification verification

Verifying the vendor through the blockchain, MIP.AI will record the suppliers' information such as 3D printers, materials, printing accuracy and dimensions so that the customers can check the information before placing orders. The certification or verification of suppliers can be audited by third-party network coordinators or organizations. In addition, suppliers can also provide their own certificates, proof of the machine ownership or materials on MIP.AI to be audited by other users.

### 4.2.7Intelligent order assignment; Efficient matching resources

The biggest challenge in manufacturing is how the appropriate manufactures are matched in the quickest way. This requires an in-depth analysis of customer needs and manufacturer's capabilities in different dimensions.

Using big data and artificial intelligence, the requirements on the manufacturing chain can be automatically categorized according to several criteria such as regions, production factors, priorities, and design requirements. Orders can be split or merged in order to generate bills of materials (BOM).

The manufacturing resources can be categorized according to factors such as equipment types, material types, regions, service level evaluated by historical data, availability, and prices. The platform allocates the BOM bills to the most suitable manufacturing resources to achieve high customer satisfaction as well as the high utilization of resources.

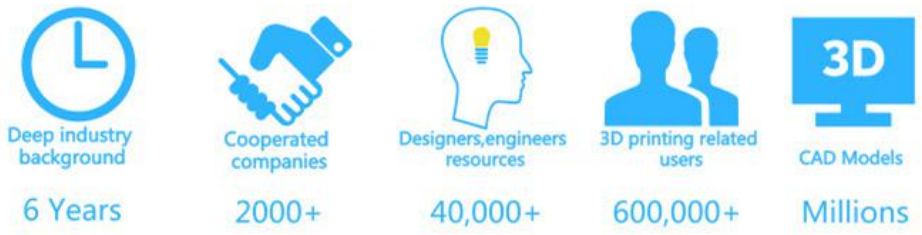
### 4.2.8 Strong extending ability

MIP.AI will join the open smart contract system in the future, which can easily adopt more equipment types and transaction types.

MIP.AI supports a wide range of equipment types, such as 3D printers. It supports a wide range of transaction types, including production data transactions, copyright transactions, manufacturing service leases, manufacturing equipment rental, and materials transaction. It can also be adjusted to various business needs.

## 4.3 MIP.AI’s resources and capabilities

The digital distributed manufacturing chain MIP.AI has a team with rich experience in Internet, artificial intelligence, big data storage, internet of things (IOT), data encryption, 3D model retrieval, digital design, smart manufacturing, and blockchain technology.

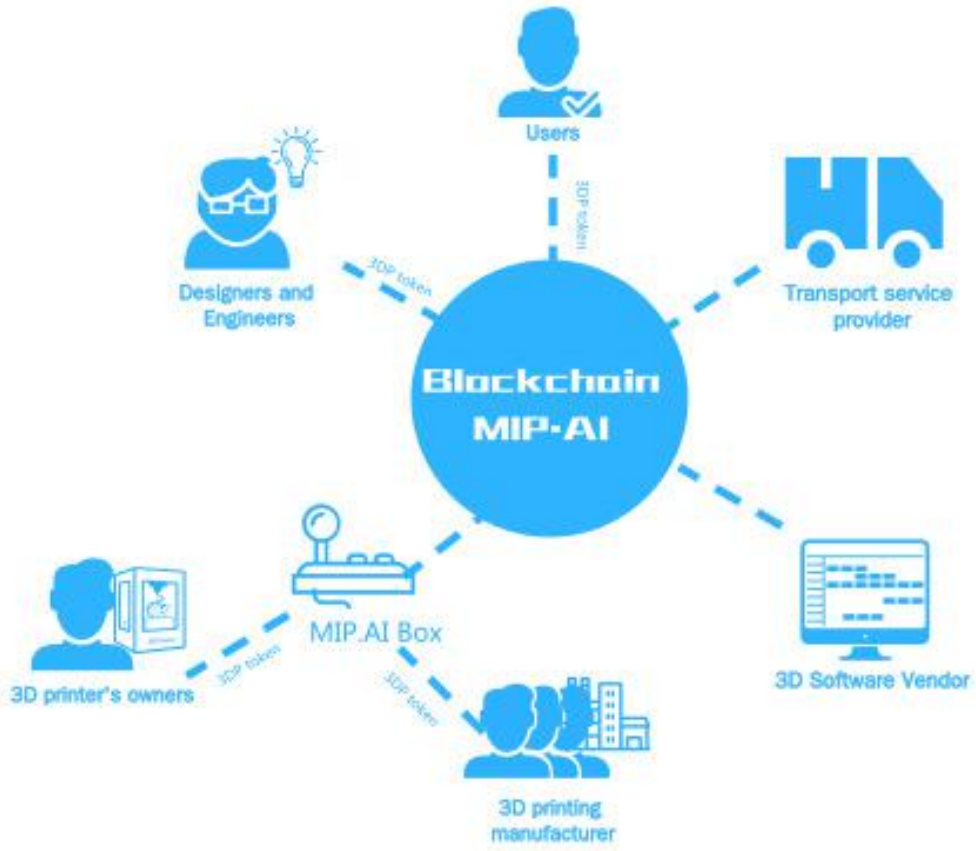



The MIP.AI team has been involved in the 3D printing industry since 2012 and has accumulated more than 2,000 advanced manufacturing company resources worldwide. It has cooperated with 40,000 designers and attracted 600,000 users with potential needs, accumulating more than one million 3d model data.

With the development of the platform, MIP.AI will receive more supports from industrial design agencies, 3D digital technology providers, 3D printers and consumables providers, 3D printing equipment distributors, 3D printing service providers, third-party testing and verification institutions, and financial Institutions. MIP.AI also gets supports in areas such as intellectual property protection and will have access to industrial big data in order to create more values by using the data.

## 4.4 Roles in MIP.AI ecosystem

There are 5 main roles in the MIP.AI ecosystem (Shown in Figure 2), which are designers, demanders, equipment owners, equipment manufacturers (e.g.3D printer provider) and CAD modeling software providers. 3DP tokens act as the medium of value circulating which links the ecosystem and the blockchain. The roles are described as follows,




**(1) Designer**

It can be individuals or enterprises who provide digital manufacturing information files (such as 3D design models). At the same time, designers and engineers themselves can be demanders and need to make their own designs into physical objects.

**(2) Demander**

It can be individuals or enterprises who need the finished parts or products. They post their requests using tokens.

**(3) Digital manufacturing equipment owner**

It can be individuals or enterprises who have manufacturing equipment such as 3D printers and CNC machine tools. They become the owners of manufacturing nodes on the chain to receive orders from global customers, complete the manufacturing process and provide the final product to the customer.

**(4) Digital manufacturing equipment manufacturer**

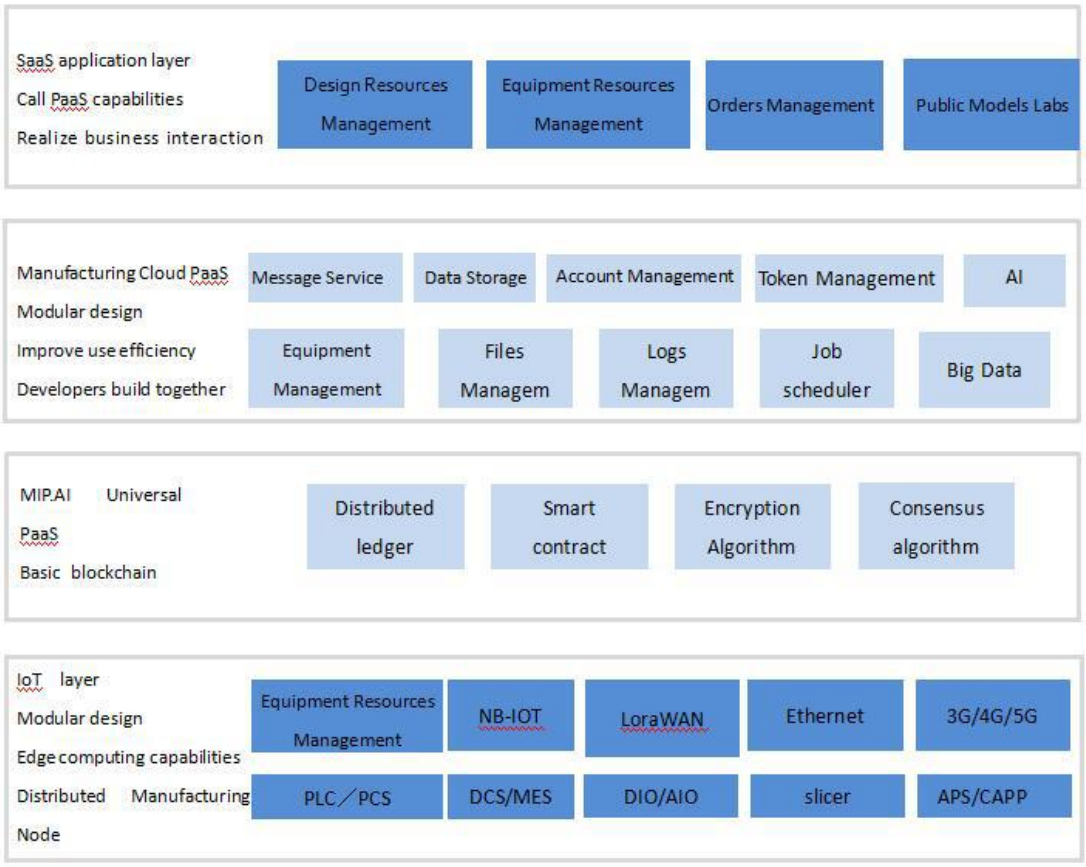
The digital manufacturing equipment manufacturer will enable the equipment (e.g. 3D printers, CNC machine tools) to access MIP.AI platform. Now manufacturers are trying to provide equipment rental services and production services, but are lack of customer resources and production resources. MIP.AI will help manufacturers to gain more resources to improve their business.

**(5) CAD modeling software provider**

The software provides the source and management support for manufacturing data.

# 5 MIP.AI’s Platform Architecture

## 5.1 MIP.AI Platform Architecture




The MIP.AI blockchain digital manufacturing platform is divided into 4 layers which are, SaaS application layer, PaaS service layer, blockchain middle layer, and connection layer. Each layer offers different functions to ensure the application of blockchain technology in manufacturing. The blockchain provides the cross-layer functions to ensure perfect connection between the layers.

**Key points of platform architecture**

- The blockchain records file information real-time and unchangeable. It can verify the production data files (3D models), vendors, equipment, and designers.
- Using information-hiding technology to embed valid copyright concealment information for each 3D model as a“ fingerprint”to protect the designer’s work Using Hash index to corresponding to the model file.
- Using M2M technology to realize the networking of 3D printers and using IOT technology to achieve data acquisition for 3D printers.
- The blockchain system provides automated audit trails to enable users to track the asset status, which also helps prevent design theft. Smart contract will maintain all 3D printingusage logs.
- When it comes to the production of distributed components worldwide, it must be ensured that only authorized personnel can access the data and only the original data is printed. Also, the data will not be misused to make pirated copies after being authorized for use.
- Adopting end-to-end security solutions throughout the manufacturing process, from creating 3D print data (models) to exchanging data with 3D printing service providers.
- The user can choose the manufacturing node or use default-optimized nodes to produce after uploading or selecting the design files.
- Each node must show its own manufacturing capabilities, such as the technology they use (e.g. 3D printing), color, material properties, size, accuracy, and processing speed.

## 5.2 Blockchain in digital manufacturing (3D printing)

**① CAD design software, 3D printing model file**

Blockchain technology can be used to track the origin and evolution of each design file such as file iteration and copyright.

**② Production data transmission**

Device matching is easy to achieved. Parameters and information of 3D printers are stored on the blockchain andverify orders.

**③ Production Preparation**

Blockchain can help validate the file in order to ensure that the print command data is executable.

**④ Machine production**

Blockchain can monitor the 3D printers and the printer's log cannot be tampered. Also, the data can be viewed and tracked if the finished products have any flaws.

**⑤ Product delivery**

Blockchain can provide supply chain and logistics tracking. The product will be delivered to the right customers safe and fast.

**⑥ Payment**

Smart contract ensures the safety of payment.

## 5.3 Technology realization

- **Data analysis**

MIP.AI have the abilities to analyze the data from various channels, including the design data, production data and logistics data.

- **File uploading**

Users can log in to the account to upload the 3D model file. The platform records the data volume of the uploaded model and the user’s contribution value to give rewards.

- **Model classification**

By means of network extraction and user uploading, we have acquired massive 3D model data, to fill our database. For the 3D model classification, we use deep learning method to recognize the commonalities between the same classes of 3D models and the characteristics of different classes.

- **Data encryption**

3D ID code can be marked in 3D printing model and the creator's information including time, are encrypted into the model's internal password, and the abbreviated digital information is formed and recorded in the blockchain to prove the model's originality. When the model is transferredand printed through the platform, the platform can recognize and give the reward.

- **Distributed storage**

With the continuous development of the Internet, data has grown exponentially.The system that stores all the data in one or several large servers has been increasingly unable to meet the development of big data. Data are savedin multiple storage servers.Using a distributed storage architecture to store 3D big data can not only improve storage capacity and read/write efficiency, but also increase the transfer speed and read/write speed when using a block SAN architecture. It can also increase the transmission speed and read/write rate, accelerate the data transmission process and reduce the waiting time.

- **Online Drawing**

In addition to uploading the model, users can also design on the client or web page to create a new 3D model. At the same time, you can also search for some similar 3D models in the database, insert the designed model into your own design to save a lot of time and cost.

- **3D Model Retrieval**

Users can search existing models in the database by drawing a simple 3D model. After searching for the required model, users can insert it into their own design scenes, or download the model for subsequent operations such as printing.

- **Blockchain transactions**

Transactions are performed using blockchain architecture. The blockchain has irrevocable, secure and reliable distributed accounting features. It is based on techniques such as cryptography, distributed consensus protocols, peer-to-peer network communications, and smart contracts. No other third-party guarantee agencies are needed for multiple participants in the blockchain ledger system to form the trust base for multi-party transactions. This enables

low-cost, low-latency information exchange and transaction processing for efficient digital value distribution.

- **MIP.AI box**

Using a hardware or software to control 3D printers and other manufacturing equipment, link cloud platform, calculate coin value, and identify originals. Through the box, other users can automatically invoke 3D printer resources and print parts.

- **Anti-cheating**

Cooperation with major 3D printer manufacturers, firmware adaptation, and cannot be tampered.

- **Technologies enabled**

Available manufacturing technologies include selective laser sintering (SLS), selective laser melting (SLM), fused deposition modeling (FDM), Poly Jet 3D printing, direct metal laser sintering (DMLS), metal EDM 3D printing, CNC and spindle lathe manufacturing. As long as the user uploads a 3D CAD file, he can inquire any of the above technologies. The platform supports different file types, such as obj, stl, step, stp, iges, igs, x_t, x_b, and sldprt. When a 3D file is uploaded, the system software automatically generates several service options based on the component's application, time requirements, cost limitations, and specific material requirements.

- **Model storage**

Since the model is large and takes up a lot of storage space, it will be stored in the IPFS blockchain. MIP.AI only saves the file's Hash value. IPFS can directly index to the corresponding file through the Hash value, and because of its distributed storage feature, it allows users to get model files nearby.

- **Data repair**

The user uploads the designed model data to the platform, and the platform can automatically detect and prompt the model design defect, automatically repair after being authorized by the user, and then save it as data.

- **Quotation generated**

After uploading the model, the users can select the type, accuracy, post-processing parameters of the material. The platform automatically calculates the production price based on the different devices (such as 3d printers) parameters set by the manufacturer. After the user pays the corresponding token, the manufacturer will create the physical product and give it to the user.

# 6 MIP.AI Blockchain Technology Application

## 6.1 Distributed structure

The blockchain of MIP.AI constructs a distributed structure system according to the open source and decentralized protocols determined by the system, so that the value exchange information is sent to the entire network through distributed transmission. Determine the content of the information data through distributed billing, generate the block data after covering the time stamp, and then send it to each node through distributed transmission to achieve distributed storage. Specifically, distributed architecture is embodied in three aspects,

- **Distributed billing**

MIP.AI has established a distributed accounting system. Everyone can voluntarily participate in information records and share the records of all participants across the entire network，thereby decentralizing the accounting responsibilities.

- **Distributed propagation**

The dissemination of each new transaction in the blockchain adopts a distributed structure. According to the P2P network layer protocol, messages are sent directly from a single node to all other nodes in the entire network.

- **Distributed storage**

Let all data in the database be stored in all computer nodes in the system and updated in real time. The completely decentralized structure settings enables data to be recorded in real time and updated in every network node participated in data storage, which greatly improves the security of the database.

Through distributed accounting, distributed dissemination, and distributed storage, called “three-distribution”, the data storage, transaction verification, and information transmission processes in the system are all decentralized. In the absence of the center, the data stored in the blockchain nodes are authorized and shared, intelligent transactions, and collaborative sharing; and It also access to judicial identification, data notarization, on-line arbitration service agencies, on-line completion of information docking, and issue various reports.

## 6.2 Data block structure

A blockchain is a combination of blocks in a chained manner. A blockchain is a transaction database shared by all nodes in the system. These nodes participate in the blockchain network based on a value exchange protocol. The header of each block contains the transaction information compression value of the previous block, forming a long chain from the creation block (first block) to the current block. Since there is no way to generate the current block if the Hash function value of the previous block is unknown, each block must follow the previous block in chronological order. This structure of all blocks containing the previous block reference makes the existing block set form a long chain of data. "Block + Chain" data storage structure as shown below.

## 6.3 Consensus mechanism

The allocation of equity after the production of blocks can be achieved without consuming additional computing power. It can also dynamically determine whether letting the agent or the entire node to verify the execution result of the smart contract according to the transaction status of the network. The agent node is selected by the equity holder. The first 99 agents with the highest number of votes in turn authenticate the transactions in turn, the order is determined by all the agent nodes, and cannot be tampered.

In MIP.AI, the uploaded model, 3D printer's printing work will be evaluated as a specific workload, and then reward corresponding tokens; At the same time the authority is given to download the model. Using the 3D pr

## 6.4 Security encryption algorithm

**The security encryption algorithms involved in MIP.AI and related definitions are as follows,**

- **Symmetric encryption**

Symmetric encryption is the fastest and easiest encryption method. Encryption and decryption use the same secret key. Symmetric encryption usually uses a relatively small key, typically less than 256 bits. The size of the key should not only take care of security, but also take care of efficiency, It is a trade-off.

- **Asymmetric encryption**

Asymmetric encryption provides a very secure method for encrypting and decrypting data. It uses a pair of keys, a public key and a private key. The private key can only be safely kept by one party and cannot be compromised, while the public key can be sent to anyone who requests it. Asymmetric encryption uses one of the keys to encrypt, while decryption requires another key.

- **Private key**

Private, a 256-bit random number that is kept by the user and is not open to the public. The private key is usually randomly generated by the system and is the only proof of the right to access the user's account and the ownership of the asset in the account. The effective bit length is large enough so it cannot be compromised and there is no potential safety hazard.

- **Public key**

Publicly available. Each private key has a public key that matches it. The ECC public key can be generated by the private key through a one-way, deterministic algorithm. Currently used schemes include: secp256r1 (International Standard), secp256k1 and SM2 (China National Standard).

In the blockchain network, the account address is designed for secure exchange. The account, public key, and private key generation process has the following relationship: private key -> public key -> account address, and all of them are used the Secure Hash Algorithm (SHA) to ensure sufficient security. Hashing is the refinement of information, usually its output is much smaller than the input, and is a fixed length. With current technological means, a strong, encrypted hash must be irreversible. That is, the user's private key information cannot be derived from the user's account address.

## 6.5 Smart contract agreement

Smart contracts are the foundation of the blockchain platform. With smart contracts, rules can be applied securely when dealing with transactions. You can use them to automate the verification steps， and code the conditions that were previously included in the signed physical contract.

Smart contracts mean that blockchain trading goes far beyond trading in currencies, and there will be more extensive instructions embedded in the blockchain. Traditional contract means that two or more parties agree to do or not to do something in order to exchange for something, and each party must trust each other to fulfill their obligations. Smart contracts do not need to trust each other, because smart contracts are not only defined by the code but also mandatory enforced by the code. They are completely automatic and cannot be intervened.

## 6.6 Decentralized autonomy

In a decentralized autonomous system, any decision must be completed within a fixed period of time. This time varies according to the content of the proposal. The proposal will beimplemented only if a sufficiently high interests voting is collected, otherwise the proposal will be closed. In a decentralized autonomous system, people with high interests are not dominant, and those with low equity can unite together to fight against those people with high equity.

## 6.7 Traceability

The blockchain allows all nodes of the entire network to keep a time stamp on each block, indicating that this information is written at this time, then, an irreproducible and unforgeable database is formed. A time stamp can prove that someone actually did something on some day and can prove who was the first creator of an event. The proof of "existence" of anything becomes very simple, and every transaction data in the blockchain can be traced back to the source through a chain structure. Therefore, every transaction on the blockchain is traceable.

## 6.8 Unmodified

Once the information is verified and added to the blockchain, it is stored forever and have extreme high data stability and reliability. In the MIP.AI blockchain, all transaction information isunmodifiable.

## 6.9 Proof of workload

MIP.AI uses the mining method of 3D printing workload proof, that is, the owner of 3D printer will get the corresponding token reward according to the printing workload that connected to the blockchain.

According to different production requirements, using additive manufacturing technology processes (FDM, SLA, DLP, SLM, SLS, etc.), Reduced material manufacturing (CNC machine tools, etc.), Equal material manufacturing process (injection molding, MIM, etc.), selecting different materials types, processing accuracy, and component structure to produce different parts, then reward the corresponding tokens.

# 7 Analysis of MIP.AI Application Value

## 7.1 Main Application Scenarios of MIP.AI

**MIP.AI will continue to improve its functions to adapt to more application scenarios,**

- **Digital distributed manufacturing**

Users in any corner of the world who need to fabricate products can use MIP.AI to find suitable manufacturing terminal equipment.

- **Manufacturing equipment sharing**

Users who own manufacturing equipment such as 3D printers can display information andobtain orders through MIP.AI to realize higher value of resources.

- **Realization of design value**

Designers or engineers can easily sell their own design data and will not be pirated.

- **Cooperation with industrial manufacturers, such as GE, BMW, Mercedes-Benz, etc.**

With the help of blockchain technology, we will build spare parts database for the aviation industry and the automotive industry. When there is a problem with the aircraft or auto parts

that need to be replaced, the parts database can be directly invoked to select the nearby industrial-grade 3D printer for manufacturing. As a result to reduce the cost of spare parts inventory by manufacturers, and the time customers waiting for parts;

- **Cooperation with footwear manufacturers, such as Adidas, Nike, Peak, and Li Ning**

Individualized 3D printed shoe technology solutions have become more mature and popular. Adidas began mass sales of 3D printed sneakers Futurecraft 4D in 2018, priced at several thousand dollars, and is expected to produce hundreds of thousands of pairs. The brand-new design and wearing experience were enthusiastically sought after by the users. Some people even bought it and then sold it on Taobao for 5 times the price. A digital distributed manufacturing chain is launched to give a comprehensive solution for the customized needs of shoes, headphones, etc.

- **Cooperation withAnimation Comic Game (ACG) companies**

Cooperate with ACG companies to obtain corresponding IP rights, uploading 3D data models such as movie characters, game characters, animation characters, and props to the platform, allowing users to pay for printing and production.

- **3D scanning portrait applicatio**n

Develop mobile 3D scanning function, let users scan people, get 3D model data of the human body, search and select the surrounding 3D printer from MIP.AI, and then print the mini version of the 3D portrait.

- **Medical application cooperation**

Establishing a cooperation platform with medical orthopedics, surgery, and other departments to provide model customization, guide plate customization, and even professional 3D printing titanium alloy implants customization services, etc.

- **Cooperation with well-known design software**

For example, SOLIDWORKS, CAD/CAM, Maya, Zbrush, etc., allowing designers to place orders directly in the design system and invoke manufacturing nodes worldwide.

- **CNC, injection molding and other process areas in the later stage**

After the operation based on 3D printing technology become mature and complete, the technology will extend to traditional digital industrial applications such as CNC and injection molding, and face a broader market.

## 7.2 Grand vision of MIP.AI project

MIP.AI is committed to building a new global digital distributed manufacturing ecosystem that will have a profound impact of manufacturing in the future,

- **Realize the digitization and distribution of the manufacturing industry**

The Internet has realized the digital dissemination of information, and the blockchain has brought about the transfer of value. Advanced manufacturing technologies such as 3D printing have actualized design and manufacturing， and reuse of globally distributed manufacturing networks to match nearest manufacturing terminals for users. MIP.AI will combine the four into a digital distributed manufacturing chain, deliver the customized products to the customers as quickly as possible, and achieve the digital transmission of commodity objects and the transfer of use value.

- **Zero inventory, global design and manufacturing**

Through the MI.PAI platform, the C2B2C model is created. When you need a product or part, you can choose the right design and digital manufacturing node globally and deliver it to the node for production. For the seller, zero inventory is achieved, financial pressure is released.

- **Give ordinary people independent innovation and manufacturing capabilities**

The MIP.AI platform will assign manufacturing capabilities to every customer in need, empowering ordinary people (manufacturing capabilities). It becomes very easy for anyone to make a product, and it will greatly stimulate the universal innovation ability of human beings. Ideas can be realized immediately and no longer confined to manufacturing process.

- **Reshaping the Future of the Supply Chain**

MI.PAI is created according to the customer's individual needs and responds to the final customer's needs in real time. Customers directly delivery requirements to manufacturing nodes, without having to go through sales and intermediate links, truly realizing network transmission, local manufacturing, distribution, short delivery time, low transportation cost features, and the cost is greatly reduced due to localized manufacturing and close-range transportation.

# 8 Development plan of MIP.AI

## 8.1 Project dynamics and development planning

**Develop digital distributed manufacturing platform chain MIP.AI, upgrade in different versions.**

| Time | Activates |
|---|---|
| 2017. Feb | MIP.AI is established and began to sort out users, technologies, markets, and applications. |
| 2018. Mar | MIP.AI token was released, codenamed 3DP, and the Chinese name is 3D printing token. |
| 2018. May | White paper on MIP.AI was released. |
| 2018 Q1 | MIP.AI 1.0 : Online trading platform for 3D model data based on blockchain technology will be launched |

| | |
|---|---|
| 2019 Q2 | MIP.AI 2.0 : The whole process of model transfer, purchase and 3D printing based on distributed manufacturing chain will be got through. Link the model data of the platform to the printer under encryption condition, directly print after decryption. |
| 2019 Q3 | Online platform and release the SDK. Support the access of major 3D printing service providers, enable other companies and individuals to invoke global manufacturing capabilities through API. |
| 2020 Q1 | Provide segmentation domain sidechains for different application industry domains and scenarios. |
| 2020 Q3 | MIP.AI 5.0 : Platform globalization |

## 8.2 Business plan

### 8.2.1 Operating community members

Invite 3D Printer Owners, 3D Designers, 3D Printer Equipment Manufacturers, and Digital manufacturing customers worldwide to join MIP.AI to create a digital distributed manufacturing community

Cooperate with professional designers and use MIP.AI chain to optimize and transform their existing design business processes.

Design incentive mechanisms to allow community members to obtain tokens by participating in platform construction, thereby enhancing community activity.

### 8.2.2 Connect with the devices

Cooperating with desktop-level 3D printer manufacturers such as Flashforge, Makerbot, Ulitimater, Formlabs to access its 3D printers, allowing its customers all over the world to

become manufacturing nodes and to manufacture simple lifestyle products, artwork, and simple industrial products, etc.;

Collaborate with industrial equipment manufacturers such as HP, EOS, SLM Solutions, 3D systems, Stratasys, Platinum Special Material Technology, Farsoon Technology, UnionTech and ZRapid Tech. Adapt their 3D printers and make their customers all over the world become manufacturing nodes. And can manufacture high-performance, end-use parts or products.

### 8.2.3 Join the Microsoft 3MF and other manufacturing alliances

3MF will use a file format that can contain more information to link CAD software, 3D printing hardware and software, and is committed to supporting the current 3D printing technology throughout the printing process.
Join the manufacturing alliance and become the recognized digital manufacturing platform in the manufacturing industry.

### 8.2.4 Industry promotion and replication

Work with leading brands in the automotive, sports, gaming, medical, and software industries, promote MIP.AI tovarious industries worldwide, and build a complete new ecosystem of 3D printing services.

# 9. revenue model of MIP.AI

## 9.1 Eco-type income

MIP.AI will gain major revenue through eco-business,

- When a user trades on the platform and uses MIP.AI tokens for payment, such as purchasing digital models and purchasing manufacturing services, the platform will charge a certain service fee.

- MIP.AI platform will charge corresponding fees for token transactions, withdrawals, etc.。
- Rely on the promotion for service providers, equipment vendors and designers to obtain advertising revenue.
- Big data mining, resulting in application value.
- Enterprise-level production data encryption transmission costs.
- Other business models.

# 10. Operation team introduction

## 10.1 Foundation of MIP.AI

MIP.AI Foundation, founded in Singapore in 2018, composed of decision-making bodies, regulatory agencies and executing agencies. It is responsible for managing the MIP.AI protocol and R&D, releasing and distributing Token (3D Printing, 3DP), promoting MIP.AI products and culture, and operating the MIP.AI community.
Decision-making body would be a council including CEOs, CTOs, COOs, investors, consultants, community activists, and experts and scholars, which is responsible for daily management, operations and strategic planning under the director.

Regulatory body would compose of legal advisors and financial advisors and is responsible for legal affairs, financial risks, and supervision and management of the foundation's daily operations.

Executive body would consist of a technical R&D team, a financial audit team, an integrated administrative team, and a market operations team and is responsible for MIP.AI R&D, project landing, global operations and promotion.

## 10.2 Project Team

The project team was founded by teams of experts from the world of blockchain, artificial intelligence, 3D printing, and smart manufacturing. With the wave of smart manufacturing upgrades, we hope to build a global distributed manufacturing ecosystem with blockchain technology, IOT, and artificial intelligence to integrate 3D printing and digital manufacturing industry chains and bring the personalized and intelligent manufacturing.

## 10.3 Core team

**Ben Li**

The founder of China's 3D printing leading media platform (founded in 2012), a blockchain technology observer, who has been involved with blockchain and Bitcoin since 2013. Ben Li is responsible for overall operations.

**Dr. Adam Liu**

Doctor of National University of Singapore, proficient in 3D big data search and mining, 3D data encryption algorithm development.

**Dr. Json Nie**

The principal of the Multimedia Information Processing Center of Tianjin University, a visiting scholar of the National University of Singapore, and a visiting researcher of Visenze, a famous Internet company in Singapore. He has engaged in artificial intelligence, multimedia analysis and related frontier research and has published many papers in the top journals and conferences in the field as the corresponding author and applied for more than 20 patents.

**Peter Pan**

Master of Tsinghua University, co-founder of China's first 3D printing media platform, responsible for MIP.AI platform business cooperation, resource connection and community operations.

**Gen Yang**

Graduated from the Department of Mathematics of Nanjing University, worked as a Huawei software engineerbefore and later established a leading 3D printing cloud manufacturing platform in China as a co-founder. The platform accumulated tens of millions of financing, and won the first place in the “Internet+ Top 10 Innovation Cases” hosted by the Ministry of Industry and Information Technology. As the only representative of intelligent manufacturing, he went to the State Council to report to the Prime Minister. He has a deep understanding and practical experience in the digital IOT technology architecture of the manufacturing industry and the blockchain industrial cloud technology architecture.

**Fly Wang**

Master of computer science from Shenzhen University, a blockchain technical engineer. Mainly focuses on artificial intelligence and blockchain technology, early gamers of bitcoin and dog-dog coins. He once founded China's hottest dog community forum. In 2018, his artificial intelligence book "TensorFlow Scratch" was published.

**Torry Shao**

Master of Mechanical Engineering from Tsinghua University, he has deeply cultivated in the 3D field for many years, formulated relevant educational solutions and successfully applied it to China's top primary and secondary schools. He led the development of 3D printing software and hardware based on the IOT and has a deep understanding of the combination of 3D printing and blockchain.

**Hanju Bao**

Semiconductor integrated circuit experts, embedded software development engineers of the ZTE Research Department, technical backbones of the Huawei Symantec driver group, and application developers based on the ARM A7 A9 series chips.He has developed more than 40 technology application solutions.

# 11.MIP.AI token system

## 11.1 Application scope

**MIP.AI tokens mainly have the following uses,**

- Blockchain operation consumption

In the MIP.AI common chain, when writing information into the blockchain, a certain token must be paid as the cost of consumption.

- Payment for sharing platform fee

Token can be used to pay for the service fee in the MIP.AI common chain.

- Purchase production data (3D design model)
- Purchase manufacturing Services (3D Printing Service)
- Post demand contracts
- Evaluating and voting of 3D model data, equipment operation quality, service vendor quality and design level in the ecological platform.
- Deduction of MIP.AI platform processing fee
- MIP.AI platform advertising spot display auction

## 11.2 Circulation

The protocol token itself follows the relevant standards of the blockchain technology and has strong liquidity based on the MIP.AI smart contract.

## 11.3 Economic model

The MIP.AI platform uses incentives to ensure perfect operation of the entire system. All reward transactions and strategic information are recorded in the blockchain, which is open, transparent and traceable. The incentive model ensures that each participant in the system can find its own needs.

### 11.4 Decentralization

In MIP.AI, as the transaction data accumulates, the rules need to be continuously upgraded, so decentralized autonomous mechanisms must be introduced. In a decentralized autonomous system, any decision must be completed within a fixed period of time. This time varies according to the content of the proposal. The proposal will be implemented only if a sufficiently high interests voting is collected, otherwise the proposal will be closed. In a decentralized autonomous system, people with high interests are not dominant, and those with low equity can unite together to fight against those people with high equity.

Decentralized autonomous content includes, but is not limited to, MIP.AI registrations, statistical functions, and range of mortgage values. These upgrades can be determined through the participation of autonomous system participants in voting.

# 12. Token plan

### 12.1 Issuing plan

（1）Name of MlP.AI token：3Dprinting token，3D_Printing，Code number :3DP.

（2）3DP total numbers: 3333333333。

## 12.2 Issuing details

For more information, please visithttps://wj.qq.com/s/2095974/ffc3

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# Warnings

Blockchain technology and digital manufacturing technology are still in an early stage of development. Technical factors, market factors, policy factors, and human factors may cause the project failure. This document is for issuing information only. The information or analysis above does not constitute investment decisions or specific recommendations. We expressly declare that this document does not constitute a reference for participating in the exchange of relevant tokens.

It is not advisable to participate in token related activities unless you personally understand the risks associated with the blockchain, 3D printing, and digital manufacturing industries, and know about the development of MIP.AI,

This document is not a contract document of investment behavior and cannot be used as a contractual basis for investment behavior.

The team does not assume any direct or indirect losses caused by anyone participating in the project.