ARP Protocol

ARP Value Protocol

Based on Zero Arbitration Proof

V1.3

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Abstract

The paper introduces a sharing ARP (App Rendering Power) value protocol based on Zero Arbitration Proof. All smart devices can share their ARP value and complete value transaction. The protocol will provide complete solution during transaction, including the registration, matching and verification of value on blockchain.

We equip protocol users with comprehensive underlying technologies ready to be deployed. All Apps employing ARP value protocol can deploy ARP's cloud application service without secondary development, which facilitates the commercialization of Apps. Therefore, this protocol will help users to develop exciting and disruptive new commercial services.

Table of Contents

1. Background

In 2009, Satoshi Nakamoto published the paper *Bitcoin: A Peer-to-Peer Electronic Cash System*; later in 2014, Vitalik Buterin, inspired by bitcoin, created the Ethereum Virtual Machine (EVM), “a next-generation crypto currency and decentralization platform” for running point-to-point contracts. Since then, more people have come to believe that blockchain, a new value-exchange protocol, will bring about systematic revolution to our society. However, one vital problem remains unsolved: how to apply the blockchain technology to more real-world scenarios? In other words, how do the users on blockchain reach a verifiable and effective consensus on offline information?

Understanding how this consensus of blockchain is achieved will open up new markets, especially in the sharing economy. We believe the services in sharing economy based on the blockchain are the future because blockchain has the inherent attribute of decentralization. For one thing, these services use distributed ledgers to create trust and thus reduce the cost of trust building; for another, when the services are capitalized and the assets tokenized, their global presence and 24/7 access can increase the liquidity of the transactions in sharing economy.

Computing power-sharing based on the blockchain technology is one of the most typical use cases of blockchain in sharing economy at the moment. But there are some prominent issues concerning projects of computing power-sharing:

1. It is hard to provide differentiated computing power-sharing services. Compared with centralized computing, all services provided by computing power-sharing projects are not innovative enough and are often similar to each other, which means that these projects do not offer a unique business model or an innovative product, and some are even poor in performance or stability.

2. It is difficult to verify data outside blockchain. Since computing power-sharing

requires data exchanges outside blockchain, reaching a consensus around these data on blockchain is a common problem facing all computing power-sharing projects.

The ARP value protocol based on Zero Arbitration Proof introduced in this whitepaper aims at solving the problems mentioned above. The ARP value refers to the value of App Rendering Power, which is the smart device's unique ability to run Apps objectively.

The core advantage of ARP value protocol is its ability to combine ARP value with innovative technological services for cloud application, provide original products and services for other participants accessing local agreements and thus transform the whole business model. Using Zero Arbitration Proof to verify the data transferring onto the blockchain, it provides the validity of all transactions in the network and any participant at any point of the blockchain can confirm them.

These advantages promise a bright future for sharing economy with blockchain, and offer brand new solutions for validation of data outside the blockchain.

2. Protocol design

2.1 About the market

As the Internet enters a new developmental stage, all Internet companies are troubled by limited online traffic and high offline cost. Companies have proposed various solutions to win out in this game.

- WeChat: Mini Programs

WeChat, in an attempt to explore new possibilities for mobile applications, officially

launched its Mini Program system in January 2017. It is efficient and ready to use in that users access mini Apps directly from WeChat, without having to install other Apps. As of 2018, there have been 580,000 mini programs online and 170 million daily active users. It is remarkable how much traffic mini programs can harvest.

- Mobile Phone Alliance: Quick Application

Under the pressure of booming WeChat Mini Program, nine Chinese mobile phone companies, including Xiaomi, ZTE, Huawei, Gionee, Lenovo, Meizu, Nubia, OPPO and vivo, jointly initiated a standard called Quick Application on March 19th, 2018. Quick Application aims to facilitate easy and approachable App service, just as what Mini Programs does. It empowers developers to access in a standard way and extends usage in more settings.

- Google: Instant App

Applications that allow instant access to different Apps without downloading are flourishing outside of China, such as mNectar and CrossInstall in the US and Playdigious in France. One striking example is Instant App developed by Google. With just a tap on the phone, players can start online games immediately without downloading.

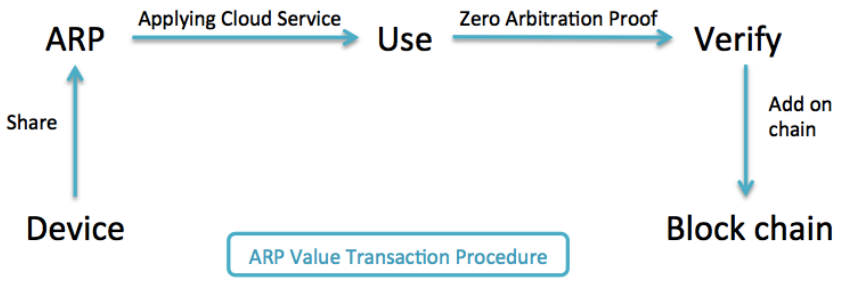
Therefore, it is foreseeable that more companies will break into this field and bring about an enormous industrial revolution. Our team, with years of technological experience in this field, has the technological edge over other mainstream solutions in the market.

	Secondary development	Application	Supported operating system
WeChat: Mini	Needed	Lightweight	iOS & Android

Programs		application only, not suited for big games	
Mobile Phone Alliance: Quick Application	Needed	Lightweight application only, not suited for big games	Android only
Google: Instant App	Needed	Suited to lightweight application and some big games	Android only
ARP	Not needed	Suited for all applications and big games	iOS & Android

Building upon our technological experience and technological innovations in blockchain industry, we have created a new service protocol, ARP value protocol. It is safer, more widely applicable and more incentivizing.

With ARP value protocol, we will create a complete value transaction procedure and provide all-round service to users.



2.2 Procedure for applying ARP Value Protocol

We define three parties in ARP Value Protocol.

- Sharing device suppliers provide ARP value and receive tokens in return.
- Users consume ARP value and pay tokens accordingly.
- Miners match ARP Value users with the most suitable device and record Zero Arbitration Proof on blockchain after transaction.

Procedures involve the participation of three parties.

S0: Sharing device supplier, user and miner deploy ARP smart contract and register with some tokens.

S1: User deploys ARP smart contract via blockchain and creates an order that includes information such as payment to the miner, payment to sharing device suppliers, service time, requirement, miner information, etc.

S2: Miner monitors the order on blockchain.

S3: User connects with miner after creating the order and informs miner of the order number.

S4: Miner validates the order.

S5: Miner selects one sharing device supplier according to requirements and checks the availability of the device.

S6: Miner matches supplier with user.

S7: User demands resource R from supplier before executing the order.

S8: Supplier divides R into several parts: $R = [R_1, R_2, ..., R_n]$.

S9: Supplier offers R_1 and sends out a request P_1 that user would pay V_1 upon receiving R_1.

S10: User receives and verifies P_1, signs P_1 with its private key and sends the new document P_1' to supplier.

S11: Upon receiving P_1, supplier sends the next bit of resource R_2 and repeats S9-S10 until the last piece of resource R_n is sent and the final result P_n' is received.

S12: Supplier broadcasts P_n' to all miners.

S13: Miner responsible for matching user with supplier deploys smart contract and writes P_n' on the blockchain. Transaction is then concluded and data is recorded.

2.3 Registration of ARP value

ARP value protocol calculates in multiple dimensions the ARP value of smart devices, i.e. the potential value of smart devices in a sharing and digitalized environment. This protocol aims at developing an ARP value measurement system in which all smart

devices are registered in multiple dimensions and assessed according to unified criteria.

Each sharing device is evaluated by a testing program in ARP value protocol, and each is assigned with a set of sub-values.

Map：

{
$cpu : value_c$,
$\text{gpu} : \text{value}_g$,
$\text{ram} : \text{value}_r$,
$\text{storage} : \text{value}_s$,
$\text{bandwidth} : \text{value}_b$,
...
}

Sharing device suppliers run ARP App to complete the evaluation. Once the evaluation is complete, suppliers can deploy ARP smart contract on blockchain to complete registration of their device.

2.4 ARP value deployment

In ARP value protocol, miners are important participants. They match orders with devices and add blocks to the chain. When miners finish the matching, ARP value will be officially deployed by users. The protocol provides comprehensive underlying technical services to facilitate that use.

An ARP value deployment can also be seen as a process during which a miner executes the match of orders and a user deploys ARP underlying services.

2.4.1 Miner allocation

- **Miner registration**

Anyone who has devices up to ARP's hardware standard can register to become a member of miners in the ARP value protocol. Registration proceeds according to the following steps:

S1: Install and run ARP miner service-end program.

S2: Submit blockchain account address with the specified details and make sure the value of tokens in the account is no less than S.

S3: Deploy ARP's smart contract on the blockchain and finish miner registration with account address.

- **Miner selection**

ARP value protocol is a decentralized value protocol; therefore, we do not give operational instructions to miners executing orders in any time frame. Instead, selection of miners goes to users through the execution of smart contracts.

The smart contract also works in a way that miner selection achieves "enforced even distribution". That is to say, over time, miners selected by ARP value protocol users are evenly distributed. Any uneven or preferential distribution over certain miners in executing orders is strictly prohibited.

Considering that miner selection is evenly distributed, the following scenarios can be effectively prevented.

- A handful of miners monopolizing orders in the ARP value protocol.

- Malicious competition among miners.

- Ineffective services. A miner's reward is linked to the number of devices he matches, which incentivizes miners to boost matching efficiency and improve the quality of service.

2.4.2 Fees

When creating an order, users must accept two fees: service charge E_1 to the mining machine for the matching service and E_2 to device suppliers, of which E_1 is a flat fee determined by the community and E_2 is a floated fee determined by users.

Suppose a user specifies mining machine M_a to offer the matching service in an order. Mining machine M_a (the number of devices directly connected to it being m) may find the matching device D_{ai}. If the service charge of D_{ai} is E_{ai}, then:

$$E_{ai} \le E_2, i \in (1, m) \& i \in N$$

At this point, the difference between how much the user is willing to pay as a service charge E_2 and the device's required service charge b E_{ai} ($E_2 - E_{ai}$) goes to the mining machine M_a, so:

$$E_{M_a} = E_1 + E_2 - E_{ai}$$

The mining machine M_a may also find a matching device D_{bj} directly linked to mining machine M_b (the number of devices directly connected to it being n) for the user, then：

$$E_{bj} \le E_2, j \in (1, n) \& j \in N$$

Given the fact that device D_{bj} is directly linked to M_b, M_b at this point demands a share of the profit: $\omega_b\%$ (determined by the mining machines): $E_{M_b} = \omega_b\%(E_2 - E_{bj})$. Then the profit of mining machine M_a can be expressed as：

$$E_{M_a} = E_1 + (1\text{-}\omega_b\%)(E_2 - E_{bj})\text{。}$$

To maximize its profit, mining machine M_a will look for devices linked to mining machine a,b,c,… within the specified responding time frame and find a device D_{qk} that is the most optimal (D_{qk} is directly linked to mining machine M_q, the number of direct devices being l , $q \in (1,l)$且$q \in N$). The profit of M_a can be expressed as：

$$E_{M_a} = E_1 + \max\{\max_{i=1}^{m}(E_2 - E_{ai}), \max_{j=1}^{n}(1-\omega_b\%)(E_2 - E_{bj}), \ldots \max_{k=1}^{l}(1-\omega_q\%)(E_2 - E_{qk})\ldots\}$$

The significance of the aforementioned economic model is:

- E_1 serves as a barrier against dust attack instead of a main source of profit.
- Mining machines are effectively rewarded.
- Mining machines are incentivized to boost performance. Machines of increased performance are more likely to find the optimal device that maximizes profit within the specified responding time frame; increased performance also attracts more direct devices.
- Mining machines of high performance can better serve the community and attract more participants, creating a virtuous circle of development.

2.4.3 Cloud application technology service content

Cloud technology offers services of disruptive nature for developers sharing ARP value. These services include：

1. Cloud application deployment

The ARP team's technological strength makes it possible for all the existing smart Apps to be deployed in the cloud without the need of secondary development. This helps to reduce developers' workload in invoking service and makes ARP value protocol more efficient.

2. Smart cloud scenario customization

Sharing devices in the ARP network can be deployed with precision and participate in smarter customization services. Smart cloud scenarios allow developers to locate the content running on Apps，execute scenarios in the Apps and display customized App content automatically.

3. Cloud application operation

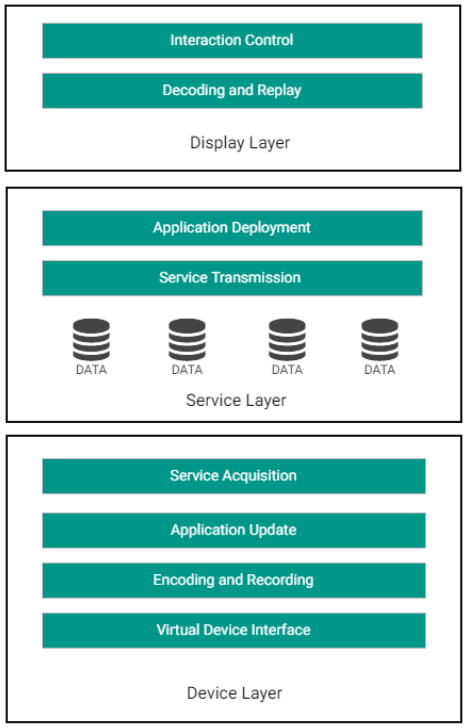
Apps deployed through cloud application technology can be accessed anywhere without the need of download and installation. An URL suffices to access mobile games like Clash Royale.

4. Distributive ARP deployment

Thanks to ARP web support for smart devices, developers can enjoy a range of ARP value deployment services. The service cuts developers' cost in ARP and offers better distributive ARP value support for bigger application service.

2.4.4 Cloud application technology service structure

The ARP value protocol-based service structure has three layers from the bottom up: the device layer, the service layer, and the display layer.



- Device layer

Virtual Device Interface: virtual device interface is responsible for managing and deploying all the resources in this layer, making sure ARP value flows most efficiently at every point.

Encoding and Recording: audio and video encoding and recording

Application Update: Apps will be systematically updated in the device layer. There are two kinds of updates, incremental and full updates. They can be realized by user instructions.

Service Acquisition: service acquisition is responsible for collecting and screening

both media streaming content transmitted from the device layer and instructions transmitted from the display layer. To be more specific, through service acquisition done in the service layer, the device layer detects input and accesses data coming from the display layer; and through the same service, it sends the triggered media streaming content as an output.

- Service layer

Service Transmission: service transmission is responsible for transmitting the transcoded media streaming content from the service layer to the display layer.

Application Deployment: application deployment service helps realize automatic deployment without the need of secondary development.

- Display layer

Decoding and Replay: this service helps to decode the videos and radios encoded in the service layer and render them into a format universal for any device.

Interaction Control: interaction control helps to collect and disseminate user interactions.

2.5 ARP value verification

Current smart contracts are flawed in that they only apply when data is on the blockchain and is verifiable. For data existing beyond the blockchain, or data that is on the blockchain but is not verifiable, smart contracts are rendered inapplicable.

In the ARP value protocol, substantial amount of data beyond the blockchain need to be verified. Hence a new solution, Zero Arbitration Proof is created for data verification outside the blockchain.

2.5.1 The idea behind Zero Arbitration Proof

The idea of Zero Arbitration Proof is inspired by real-life transactions.

Suppose B wants to buy something from A. For two complete strangers living far away from each other and having no history of dealing with each other, the conventional way of making this deal possible is to introduce a third party C who A and B both trust. B gives the money to C, upon which A ships the goods to B. A receives the money from C after B confirms the delivery of goods. A less common practice is for A to ship a unit of goods to B, B pays A, who then ships another unit to B, B pays A again, then gets yet another unit from A…so on and so forth. This back and forth works as a trust-building process. Should A fail to receive money from B after shipping, A would terminate the subsequent transactions, cutting his loss to the final transaction only.

Such is an example of Zero Arbitration Proof: A and B close the deal without introducing a third party or incurring big risk.

The potential problem of the second practice is this: should the cost of multiple transactions far exceeds one single transaction (in shipping or transferring money), the two parties would cease to adopt this practice.

Fortunately, for one thing, goods and services that are digitalized incur less cost in delivery. For another, compared with conventional cross-border money transfer, blockchain technology and crypto currency significantly reduce the cost of money transfer, making deals involving multiple transactions on blockchain possible.

2.5.2 Use cases of Zero Arbitration Proof

The core of Zero Arbitration Proof is Incremental Promise Algorithm. As its name suggests, this algorithm applies to transactions that can be divided into sub-units, i.e.

dividing service life, distances or broadband width into smaller units. Transactions that are not dividable, i.e. real estate deals, are not applicable scenarios of this algorithm.

Suppose a car sharing service provider DUber adopts the Zero Arbitration Proof solution:

Data on drivers (locations, availability) as well as on riders (locations of departure and destinations) will be updated in real time on the blockchain. A smart contract is built to match drivers and riders. Once the matching is done, the rider would receive a constant update of the driver's location. Data will be cross-referred on the rider's end and a P_x (a promised payment amount) will be sent to the driver's end. The promised amount is then locked on the blockchain and the smart contract will carry out the payment.

A centralized system is therefore unnecessary in this transaction.

2.5.3 Zero Arbitration Proof Algorithm

In conventional transactions, buyers may refuse to validate the delivery of goods and thus refuse to pay. A third party acting as an arbitrator may be involved to resolve the dispute, during which process the two parties of transaction should provide verifiable proof of transaction. However, such proof is either difficult to come by or requires substantial investment in resource.

A solution emerges to cut loss even in fraudulent scenarios: transactions are done in smaller units. Failure in any given transaction would end all the subsequent transactions. The dispute is pinpointed to the last transaction. When the unit of transaction is small enough, the loss reduces to a minimum.

But given the existence of cost (commission fees) in real transactions, the number of

units needs to be restricted, especially on blockchains. If transaction units were too small, the total cost would be too high.

Therefore, we introduce a new algorithm as a solution: Incremental Promise Algorithm.

Incremental Promise Algorithm dictates that the two parties of a transaction go through the following steps in any given transaction:

S1: Resource user *A* sends a request to resource provider *B* for resource *R*.

S2: B generates a unique TID (Transaction ID) with addresses of A and B, time stamp (ts) and a random *salt*. B then sends this TID to A.

$$TID = H(addrA, addrB, ts, salt)$$

S3: *B* divides resource *R* into multiple units.

$$R = [R_1, R_2, ..., R_n]$$

S4：*B* provides resource R_x to *A*, and makes a request to *A* for a promise P_x that A has received $\sum_{i=1}^{x} R_i$ and will pay the amount V_x.

$$P_x = \left\{ TID, addrA, addrB, V_x, \sum_{i=1}^{x} R_i \right\}$$

S5: *A* receives P_x, verifies P_x, and then uses its private key to sign P_x to generate $P_x^{'}$. *A* then sends $P_x^{'}$ to *B*.

$$P_x^{'} = Sign(P_x, Key_A)$$

S6: Upon receiving the promise $P_x^{'}$ *signed by A, B* moves on to send the next resource R_{x+1} (back to S4)， or moves to the next step

S7: *B* finishes or terminates the transaction and adds the last $P_x^{'}$ he receives on the blockchain for verification.

S8：The blockchain verifies $P_x^{'}$ and the uniqueness of TID, and executes the smart contract according to the specifics.

In the above transaction, no matter how small the transaction unit is divided into, only one transaction actually takes place and the cost of transaction is low. The whole process is irrevocable, requires no third party intervention and can be verified at any given time.

2.6 Fraud detection and attack prevention

2.6.1 ARP value fraud

ARP value protocol ensures the ARP value offered by every smart device is real, building a solid foundation for a fair and healthy ecosystem. Currently, APR value fraud comes in two forms: forgery of device information and multiple registries by one device.

We offer the following solutions for the first form of fraud:

1. Establishing a data warehouse on all the devices in the market. We collect and build a comprehensive database on smart devices in the market eligible for ARP value protocol. When ARP is conducting value measurement on an App, it matches the core soft and hard ware data of the device with data in the warehouse. Whenever there is a mismatch, the device would be denied access.

2. Marking and identifying simulating devices. ARP value protocol allows PC or servers to access ARP services and is able to distinguish simulated environment from real devices by the use of smart markers.

3. Random rechecks. We conduct random rechecks on smart devices registered in ARP value protocol. We do cross-reference on data including but not limited to hardware, bandwidth, and the system. When there is discrepancy between the two checks on any given device, we return the ARP resource to the device in question and confiscate the deposit token locked in the system.

4. Developing a device blacklist. We generate a unique ID for each device. Devices frequently committing fraud will be blacklisted, any sharing request made by which would be denied thereafter.

We offer the following solution for the second form of fraud:

1. Generating unique IDs in the system. Based on the specifics of devices, we generate a unique ID for each device. When suspicious scenarios of multiple registries emerge, we double-check the device's ownership.

2. Introducing locked deposit token. Every smart device in the sharing system is required to lock a wallet address and make sure the ARP token S in the wallet exceeds or equals YN (S>=YN), N being the number of shared devices, Y being the fixed amount of ARP token of any single device.

2.6.2 Dust order attack

ARP value protocol users could in theory launch a huge number of dust orders (orders that have extreme short service life and low service charge) to attack miners. However, since miners get a fixed profit matching all orders, regardless of the service life and charge of orders, such attacks are rendered futile.

When ARP value protocol users launch dust order to attack the protocol, two scenarios could be possible: the service life is extremely short, so the device would be occupied only for a fraction of a moment. No significant irregularities in the use of devices in the protocol would emerge; the service charge is extremely low, so the shared device would refuse to offer service irrespective of the service life. No substantial attack would occur.

2.6.3 Miners refusing to add blocks to the chain

By default, registered ARP value protocol miners accept all the terms of the protocol and follow a “matchers adders” principle by adding to the blockchain the incremental promises (orders) executed by the device the miner matches. The execution of every incremental promise is added to the blockchain by the miner who matches the order, all the other miners keeping record of such an addition. This means when a bad miner refuses to add the block to the chain, after a given window of Ts to do the addition, any other miner could take the order and whoever makes the addition first gets the reward.

2.6.4 Sharing devices offers inferior services

A healthy ecosystem requires stable, healthy and quality services. According to ARP value protocol, for every execution of an order done on the shared device, we add a block to the chain containing the following entries of information:

- Number of executions of the order N
- Accumulated time of the service T
- Total value (in token terms) of the service S

Any miner on the blockchain can access these data and give effective feedback on devices’ status, using the following function:

$$Q = f(N, T, S)$$

Devices offering inferior services will have its orders' priority lowered by miners.

3 Scenarios where the protocol applies

The Internet has 3 business models proven to be successful: advertising, gaming, and e-commerce. But as the Internet business enters a new era, these models start to show shortcomings such as low conversion rate, insufficient product innovation, and high operation cost.

The new challenges faced by the 3 business models can be addressed by new technical solutions from ARP with innovative business models and higher operation efficiency.

The following examples are just a few cases where ARP can unleash its potential. We believe as the market pursues more efficient applications and optimized user experience, ARP-based scenarios will grow in volume and scope, and bring more benefits to partners.

3.1 Advertising

3.1.1 Interactive advertising

Existing Internet advertisements roughly fall into three categories: texts, pictures and videos. The commonality is that users passively receive advertised information before deciding whether to download and install what is being advertised or not based on limited rich media content.

It will be transformed by ARP-driven interactive advertising. No need to be downloaded nor installed, interactive ads enable “click and play” just like online videos. In terms of user experience, users can actively explore, instead of passively receiving, and experience the application in the shortest time possible before making decisions about downloading.

Passive ads can give overblown and fake information. Users, attracted by beautifully made posters, may find downloaded applications nothing like what the ad says. Thus, applications suffer from low retention and low payment rate. That is where interactive ads come in, which can significantly increase user retention and payment conversion, bringing dynamism to the advertising market.

3.1.2 Decentralized application marketplace

Currently the App marketplace is plagued by two problems：

1. Heavy centralization. Marketplace administrator has total control over distribution of Apps, and thus traffic is not allocated based on merits of games, but on operation and campaign fees paid. As a result, quite a number of boutique applications with small campaign budget get shelved；

2. Poor user experience. Given increasing resource needed, larger installation package, limited poster information and lack of first-hand experience of Apps, users may find out that Apps are not for them only after downloading. That is a huge waste of resources and time.

ARP-based decentralized marketplace can change it. In the future, any mobile App will also be a marketplace that is owned and managed by everyone. In the meantime, cloud technology will transform user experience: no need to download nor install, just click and play.

3.2 Gaming

3.2.1 Sample playing

A game's success largely depends on how good it is at meeting player expectation. Thus increasingly gaming companies invite players to sample games in exchange for user feedback. However, traditional sampling risks leaks and challenges intellectual property rights, especially for small, medium and individual developers, as installation packages need to be sent to users for installation before sample playing.

ARP-based sampling brings a perfect solution. Developers will no longer need to issue installation packages. A move as simple as sending an URL to user on Wechat will allow users to access and experience games, and provide feedback. It will greatly cut time and cost related to collecting feedback, and in the meantime, ensure utmost information security of games.

Besides, sampling can be applied in other scenarios, such as click and play, play first and download after. Users will be given real control and better overall experience.

3.3 E-commerce

3.3.1 Game account trading

When selling mobile gaming accounts, used accounts can sell for 30-40% of the value charged into that account. That is to say, gaming account trading platforms have helped sellers to recoup at least 18 billion of what they have charged into their account in 2016, a total of around 60 billion.

Account transaction injects dynamism into gaming. Sold accounts can get a second life in the hands of their new owners, while its previous owner can use the money for another game. This virtuous cycle helps to extend game life cycle, and supports the

overall development of gaming market. However, due to complicated verification process and risk of fraud, account transaction is not widely used amongst players.

With ARP, developers can effortlessly build smart contract-based account transaction applications. Under existing transaction model, buyer of the used account reset mobile number and passcode on third-party platforms. Sometimes, they are even asked to provide mobile verification code from the seller. In the future, the complicated process can be greatly streamlined by ARP, which will in the meantime buffer fraud risks and contribute to development of used account transaction market.

ARP can be applied in other scenarios, example being account holders paying other players to level up their character.

3.4 Other applications

3.4.1 Alpha tests for applications

In traditional application developing, hardware compatibility test is one of the biggest headaches of developers. Especially for small, medium or individual developers, purchasing terminals for test purposes can cost them a fortune.

Existing cloud testing are all centralized services, with many shortcoming, such as narrow range of available hardware, long waiting list for the most-in-demand devices, and risk of leaking alpha version, among others.

ARP will enable new alpha testing offerings. Its decentralization means more hardware available, and no risk of leaking alpha version. In other words, in the future, ARP-based applications will be able to test on tens of thousands of phones at zero phone purchasing cost.

3.4.2 Scientific research

With more powerful smart devices, and their high penetration, it is possible to involve mobile terminals in scientific researches. A number of researches have already tried shared ARP under centralized management. Examples include mobile phones participating in BONIC of The University of California, and SETI@home, which searches for extraterrestrial civilizations, as well as other scientific researches about Pulsars, Black Holes, Gravitational Waves. However, the number of phones involved is declining due to weak participant incentives and difficulty in centralized management and orchestration.

ARP will offer better incentives and decentralized device management services. All scientific researches will have easy access to ARP and services on a large scale.

3.4.3 Distributed video transcoding

Traditional video transcoding consumes too many developer's resources just to keep it going. ARP allows division and allocation of tasks to multiple nodes for transcoding and consolidating according to ARP value protocol after videos are sliced up with a certain coding technology.

3.4.4 Multi-screen interactive entertainment

Multi-screen interactive entertainment is a novel application scenario completely based on ARP, an experience covering live streaming, simultaneous operation and verification by multiple participants.

Possible scenarios include live streaming of games. During box-opening, lucky draw, lottery and other activities, users can participate as third parties in multi-screen interaction, and get better user experience;

Or in classrooms. Online teaching between one teacher and many students will support simultaneous participation in activities such as 100 persons drawing a picture or making notes.

3.4.5 Video interactive streaming

Traditional streaming has two user experience shortcomings:

1. Different applications are isolated. The cross application update of users' levels and status is impossible; in the meantime, hosts are monopolized by and dependent upon steaming apps. Therefore, to watch their channels users have to download different streaming apps, and only after recharging and consuming can they receive corresponding levels.

2. Users passively watch and cannot participate more.

ARP protocols will help developers conquer the pain points. First, developers can offer streaming protocols based on ARP, allowing user information sharing and recognition among streaming apps. Second, cloud services unique to ARP allow access to all streaming apps without downloading and installation, which boosts user traffic flow. Third, cloud services will empower more imaginative interactions in games. For example, you can allow live streaming hosts to play with your account, without the need to inform him/her of your passcode.

4 ARP Token

4.1 What are ARP tokens?

We will issue digital tokens "ARP" based on the ARP value protocol.

ARP is the digital crypto asset of decentralized blockchain based on the ARP value protocol. It will be used in all scenarios of ARP ecosystems. The total number of ARP is fixed at 1000,000,000.

4.2 Application Scenarios for ARP

ARP token will play the following roles in ARP value protocol:

1. Sharing voucher

ARP will serve as the digital voucher proving that owners of device have shared their devices, and ensuring the distribution of ARP tokens via smart contracts.

2. DApp airdrop voucher

The ARP fund will develop DApp based on ARP value protocol and airdrop a portion of DApp tokens as candies to users. Users only need to lock the tokens in smart contracts as required. Details will be released after we introduce specific rules for different projects.

3. Mining fee

Services based on the ARP value protocol will be allocated by miners, and user will have to pay ARPs to miners in return.

4. Guaranteeing decentralized autonomy

As the ecosystem of ARP value protocol matures, more upgrades and users are needed for further development of the ecosystem. All ARP user will get a vote in the ARP decentralized autonomy by locking onto ARPs. The influence of the vote(V), is the output of a function of the amount(M) and the time(T) of the locked ARPs: V=f(M,T).

In the ARP value protocol system, every decision is made by voting within a

particular period of time. Length of time may differ for different proposals. Proposals will be executed only when enough votes in favour are collected; otherwise they will be rejected. So in this decentralized ARP system, individuals with the biggest votes do not have the power to decide everything. Small votes also have a say, as they can unite and hold the former in check.

In the future, all shared smart devices need to hold a certain amount of ARPs in their accounts as the sharing vouchers, and all registered miners need to have some ARPs in hand to prevent the destruction and abuse of the system by inactive smart devices and miners.

4.3 Allocation of ARP

Prototion	Usage	Amount	Description
20%	ARP Team	200,0 00,000	10% will be locked up for 1 year and released in the next 24 months; Another 10% does not have a certain lock-up period and will be released after reaching a particular target or a group of targets. These targets include but are not limited to the number of idle devices connected to the system, the number of DApp developers involved, the program's influence, etc. The detailed plan for the release will be published within the community.
30%	Operation and marketing	300,000,000	10% for community operation 10% for ecosystem construction 10% for marketing and promotion
25%	Incentive	250,000,000	

25%	Private Equity	250,000,000	Locked up for 5 months and released in the following 5 months, with 20% each time

4.4 ARP Issuance Plan

Exchange rate: 1ETH=7000ARP

Payment method: ETH

5 Roadmap

Time	Events
2017. 8	Completed feasibility study on ARP technology and began research and development
2017. 12	Utilized smart containerization technology to run large-scale commercial App game
2018 Q1	Finalized the details of blockchain-based technological solutions Completed ARP whitepaper
2018 Q2	Designing server control and transport protocol Developing audio and video codec Developing App containers
2018 Q3	Designing Zero Arbitration Proof - Incremental Promise Algorithm Completing the development of Sharing-end App Beta Completing the development of User-end SDK Beta Releasing ARP value protocol Beta

2018 Q4	Designing protocol for cloud computing scenario Developing auxiliary tools for developers Releasing ARP value protocol 1.0 Launching the first project on the ground
2019 Q1	Completing the development of VDI Beta Completing the development of H5 Solution Beta Releasing ARP value protocol 2.0 Launching the second project on the ground
2019 Q2	Releasing VDI stable to the public Launching Plan ROM

6 Risk Warning

6.1 Anti-Money Laundering

Token buyers agree not to use ARP and its derivatives (such as DApp) to engage in any forms of money laundering, illegal foreign currency exchange and other illegal activities. Token buyers are aware that he/she will be prohibited from trading, transaction, exchange or other settlements of his/her ARP, if the settlement is linked with money laundering directly or indirectly.

6.2 Combating the Financing on Terrorism（CFT）

Token buyers agree not to use ARP and its derivatives (such as DApp) to finance terrorism. Token buyers are aware that he/she will be prohibited from trading, transaction, exchange or other settlements of his/her ARP, if the settlement is linked with financing terrorism directly or indirectly.

6.3 Restrictions on Token Buyers

ARP Program does not accept the participation of citizens from Mainland China, Hong Kong, Macau, the United States as well as other countries and regions that have banned ICO. Citizens from theses countries and regions must be cautious, as ARP will not take any legal responsibility for their participation.

6.4 Disclaimer

This document does not constitute any investment advice, offers or solicitations, nor does it constitute an offer to sell and buy shares or securities in any forms. This document does not constitute a contract or a promise of any kind.

ARP Team clearly informs the participants of the potential risks of the program. Once investors and participants join the program voluntarily, they are aware of the terms and conditions in detail, and accept the potential risks as well as the full consequences.