DATx

Blockchain Empowered Revolutionary Digital Advertising Terminal

Decentralized Ad Decisioning with User Participation

DATx WHITEPAPER

DATx WHITEPAPER

(V1.0)

PREFIX - The Revolution of Digital Advertising Market

October 27th 1994: The World's First Banner Ads

The world of advertising was forever transformed, when Wired Magazine flipped the switch on its first website, hotwired.com, with a small kitschy rainbow graphic bearing the presumptive words "Have you ever clicked your mouse right".

The age of banner ads had officially begun, starting a revolution in web content and advertising that still reverberates today.

1996 - 2006 : Search Engine, Paid Search and Pay per Click

As the number of sites on the Web increased, search engines started appearing to help people find information quickly. And new business models were developed to enable search engines to finance their services, including pay per click programs offered by Open Text in 1996 and then Goto.com in 1998. Google also began to offer advertisements on search result pages in 2000 through the Google AdWords program. By 2007, pay-per-click programs proved to be primary moneymakers for search engines.

2006: Social publisher and Targeted Advertising

The success of search engine relies on matching user's searching query and a relevant advertisement, which would turn into a successful ad click action. Extended to display advertising on publisher

sites, search engines' content networks semantically process the content of the page and retrieve ads that are relevant.

However, this complicated matching mechanism is no longer a problem for social publisher platform, a new growing force of the Internet, such as Facebook and Twitter. They know their users way better than search engines could understand, by collecting detailed user information. Users willingly provide their personal information in a structured and detailed manner to create complete social profile and enable better social network exposure and growth.

This lays the foundation for targeted advertising, where advertisers can use the information through Social publisher Advertising Platform to better understand and target their audience.

2010 - Present: The Booming of Native Ads

Instead of relying on ads that disrupt the target audience's online experience, native advertising allows marketers to create "in-feed" and inherently non-disruptive promotional content that supplements a user's online experience, such as promoted tweets on Twitter, suggested posts on Facebook, sponsored content on Buzzfeed or Mashable.

Content marketers are increasingly turning to native advertising as it is understood to be better at building trust and engagement with prospective customers than traditional display ads.

The Future?

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DAT^X

A Blockchain Empowered Revolutionary Digital Advertising Terminal

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Decentralized Ad Decisioning with User Participation.

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Catalog

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DATx MISSION

CHALLENGES AND OPPORTUNITIES IN DIGITAL ADVERTISING

1. DATx MISSION - CHALLENGES AND OPPORTUNITIES IN DIGITAL ADVERTISING

DATx is a renovation against current advertising industry, aimed to build a brand new intelligent advertising ecosystem, with decentralization as the foundation and artificial intelligence as the power engine.

According to the forecast of ZenithOptimedia, since 2011, global advertising market has steadily developed, with an overall growth rate between 4% and 5%. In 2018, global advertising expenses would increase 4.4%, and till the end of year it would increase to $592 billion. Among them, the market share of programmatic media buy and advertising would be above 50%.

The era of Mobile and Big Data has provided advantages for development of programmatic advertising. Mobile devices connect with users more closely, convenient for programmatic ads to identify and locate users. Meanwhile, abundant mobile-based marketing approaches combine with programmatic advertising, boost marketing value of digital advertising on both accuracy and innovative capabilities.

Programmatic media buy purchases ad placement traffic through automatic procedures with AI and RTB. When targeted audiences appear, the ads are delivered to the right group in real time, with appropriate ad content, thus realizing precise marketing aimed at individual consumers.

On this background of programmatic marketing, the advertisers are no longer restricted to the few existing approaches to deliver and plan ads, they have much greater flexibility. However alongside, this would also bring “the Walled Garden” that everyone plays her own game, thus posing larger challenges to advertisers, media channels and platforms on their ability of planning, coordination, optimization and data protection.

1.1 DATA PRIVACY AND SECURITY

In the Big Data era of advertising, once advertisers or media initiate marketing campaigns, they would collect user behavioral and private data from diverse channels. All data generated by users would be stored on data platforms built by each of the advertisers and media, but none of the proprietary or tenured rights belong to users at all. No matter what campaigns are carried out, users have no idea about their data being utilized for benefit exchanges.

However arguably, users’ data proprietorship should be their own. On this matter, it should be

optional for users to choose individualized advertising services given their interests and preferences, or hide their own data, or provide part of data authorized to advertisers or media.

Besides, due to enormous user privacy data storage, the enterprises and institutions having the data are exposed to risks of user information leaking caused by existing security vulnerability. This issue not only imperils the company business health, branding and reputation, but also causes to bear severe legal punishment.

1.2 DATA ISOLATION

Data is essential for precision advertising. The technical innovation utterly altered the traditional methods to use data in advertising. Nowadays, advertising platforms are to improve their products and services through data machine learning effects. For instance, Youtube could track each user's click behavior, to amend and complete the algorithm, thus to attract more users. Based on Big Data personas, companies can also provide customized products, and set individual prices adjusted to consumers' affordability and price-sensitivity. Moreover, companies can reuse the data, and develop new business opportunities.

At the same time, each major media and advertising platforms just build respective advertisement exchange market and delivery systems, along with major public advertisement exchange markets, forming the situation of fragmented world, and data isolation.

Data isolation exists among all systems that require for data sharing and exchange. As the application of Big Data technique involves, different advertising platforms and media cannot share or manage data information, nor communicate on production data. When data comes apart, there is data isolation, and brings difficulties like information redundancy, spam lump, and inability to ensure consistency of information exchange.

Media and advertising platforms utilize user information in their own data center, provide advertisers "audience targeting" services, whereas the advertisers would process the user data to deliver retargeted advertising. In this case, the collected user data that stored on various servers of each advertiser and media, forming data isolation, leading to failure of portraying user personas and extremely low efficiency of advertising delivery.

1.3 ADVERTISING - UNIFORM, OR VARIETY?

Advertisements on traditional media such as TV and newspaper are always uniform, barely taking advertising audience into consideration. All audiences view the same advertisement, and are not

entitled to choose. Though online media have started to push advertising that users may have interest in, the users can still only passively accept. Even the ad content is unappealing, the users are left nowhere to express their opinion, and would have awful experience.

For advertisers, massive advertising content cannot reach targeted audiences, thus is not precisely delivered. These ads cause advertisers plenty of marketing expenses, actually perform ill on ROI.

Up to now, advertising has come to an era of personalized recommendations. It should generate user personas according to their various preferences, provide varied customized push content, and help advertisers effectively increase CTR, conversion and user viscosity, consequently improve clients' operating performance tremendously.

1.4 MISSING USERS ON ADVERTISING VALUE CHAIN

On the advertising value chain, advertisers deliver ads through media and acquire customers, while media would make profits from the advertisers with their user traffic. What's odd here is, though ad audience is a significant part on the value chain of advertising industry, they cannot participate in the advertising profit sharing.

In addition, if the ad content is not appealing at all, the audiences will blame the pushed ads for occupying them to view other content, and easily feel resistant to the ads.

We believe, only by involving ad audiences in the value chain entirely, ensuring user data privacy and security, can we maximize the economic benefits of the whole ad ecosystem, can we develop the ad ecosystem in a benign direction.

DATx is dedicated to develop favorable unified protocols for the entire advertising ecosystem, to build a complete set of ad ecosystem's operating mechanism, and to form an effective, secure, benign and benefit-maximized advertising ecosystem.

DATx is committed to base on blockchain techniques combining artificial intelligence and big data techniques, to build revolutionary innovative intelligent advertising ecosystem.

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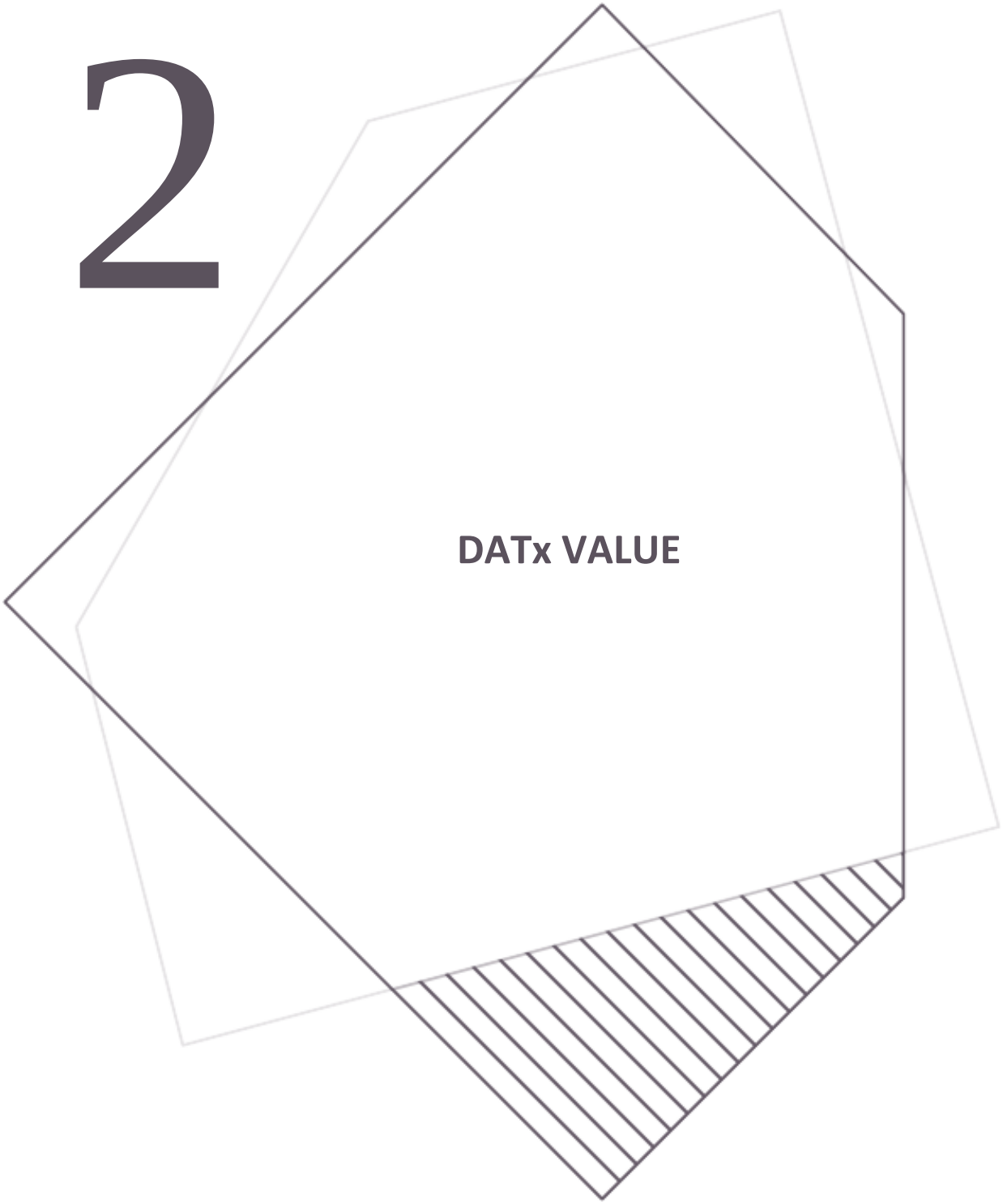


DATx VALUE

2. DATx VALUE

Aristotle defined justice as following, “if any action is well performed, it is performed in accordance with the appropriate principle; if this is the case, human good turns out to be activity of the soul in accordance with virtue.” In his opinion, the disciplines derived from justice can be accounted for the judge of right and wrong, and justice is exactly the foundation of forming social orders.

Under the guarantee of “irreversibility”, “justice”, “transparency”, and “auditability”, DATx ecosystem transmits impeccable “truth of information”. We acknowledge that, the “true” is the “good”. Through this pattern of value transmission formed of machine trust, DATx will definitely bring a brand new “goodwise” interaction between one and another. Media, ad platforms and advertisers make data collection transparent to users, and users are willing to share their data. It becomes easier to create positive incentives between individuals, and human culture certainly will develop to a further level towards harmony and goodness.

DATx strives to build a just, transparent and open advertising ecosystem, and will bring innovation on following:

Complementary advantages of AI and blockchain
Precision advertising and high ROI
Decentralized trustworthy system, lowered operating costs
Openness and Scalability
Stronger reliability, anonymity, independence and compliance
Optimized incentive mechanism
Fairer benefit distribution, higher intra-system matching efficiency
Connection between digital world and real world

3

MARKET STATUS

3. MARKET STATUS

Since May 2017, a number of ICO projects have been implemented to incise in advertising industry.

The founder of JavaScript initiated the BAT project. The project primarily built Brave - a fast, open and privacy-oriented browser able to screen the third-party ads and tracking. It also constructed a record system able to award user and ad publisher according users' attention measurement, which is merely against web ad system and restricted to audience in Brave browser, therefore the user base is limited.

AdEx is another blockchain-based P2P ad exchange platform, aimed at renovating current advertising pattern and resolving important matters such as ad fraud, privacy issue and malicious sponsorship ad exposure. Advertisers can bid against ad assets like impressions, clicks and conversions, and set ADX price for the assets. Once a publisher accept a bid, the token used for this transaction will be frozen until the publisher certifies that the goal has been achieved. When this is proven, the token will be transferred to the publisher's account. A core characteristic of AdEx is AdEx Profile. This is a customized page, to help each of end users understand and control the ads delivered to them. For advertisers, allowing users to have more control rights would be more beneficial, as the users are actually proactively informing their consumption preferences, behaviors, habits and will, etc. This means that AdEx Profile can help advertisers realize ad targeting of "surgical precision", to acquire higher ad ROI. The project's problem is that P2P is too costly for the platform and too difficult to support massive ad impressions, hence the expandability of the project turns to be a great trouble.

Similar to AdEx, other P2P ad exchange platforms AdChain and AdShares are also confronted with same issue, also, the most recent developments are still vastly restricted to too small participation user base of the platforms.

In a nutshell, all above solutions may have set wrong starting points, plus the trivial user base, it would be a tremendous difficulty to implement.

4

DATx MULTI-WIN DECENTRALIZED ADVERTISING ECOSYSTEM

4. DATx - MULTI-WIN DECENTRALIZED ADVERTISING ECOSYSTEM

DATx' mission is to build a multi-win revolutionary decentralized advertising ecosystem, so that all users can actively participate in the ecosystem we build.

Users can know that their actions will help the advertising platforms better deliver suitable ads, and they can also get the corresponding rewards under this mechanism.

Similarly, the advertising platforms in this ecosystem can better utilize the data to improve their user targeting algorithm, and deliver ads that are more acceptable to users.

Advertisers can spend less to target more accurate users and avoid some ineffective ad deliveries.

Publishers can reduce the inconvenience and discomfort caused to users, providing higher quality advertising. At the same time, publishers are willing to provide better traffic and ad placements due to the corresponding incentive mechanism.

Furthermore, DATx blockchain technology can solve the transparency issue of profit distribution in advertising industry. Based on the decentralization protocol, a transparent and multi-stakeholder advertising ecosystem is built through blockchain technology and distributed storage. The incentive mechanism encourages users to participate, thus promoting spontaneous interactions among users, publishers and advertisers in the ecosystem. Finally, the feature of blockchain decentralization and data transparency is used to balance advertising user experience and commercialization, thus forming reliable data flow closed-loop.

All data snapshots can be kept on the blockchain so that the data can never be tampered with, users will also be able to view data based on their corresponding permission level. We will introduce a DATx protocol to involve all participants in the ecosystem. It can also bring in more convenient payment system (DATx Token can be distributed quickly via smart contracts, which can be used to purchase services in the ad ecosystem).

Developers can integrate DATx Ad SDK, which will not only enable them to generate digital advertising revenue, but also receive DATx Token as a reward from the ecosystem based on developer's capability to generate quality traffic and user acquisition. We will incentivize advertisers to use tokens when placing advertisements on our advertising platforms, and will offer extra reward at early stage of the ecosystem development.

We expect such kind of incentive mechanism can bring in a positive loop of traffic growth (because developers can gain extra benefits in the ecosystem), with more and more developers joining the ecosystem, the increased traffic volume can attract more advertisers to place their ads here, and empower the platform to achieve more accurate recommendation algorithm. Metcalfe's law points out, the value of a telecommunication network is proportional to the square of online user number in the system (n2). The more participants in the network, the greater the value of the platform will be, which will directly reflect in the long-term value appreciation of the DATx Token.

4.1 THE ROLES IN DATx ECOSYSTEM

DATx Ecosystem is composed of four important roles.

4.1.1 THE END USER

The end user is the audience that views the advertisement. In DATx ecosystem, users no longer passively receive ads, but will be more involved in the process to optimize advertising service through feedback mechanisms, such as click on "like" or "not interested", and other key measures such as viewing time, click through actions, conversion etc. As long as the behavior and interactions contribute to the construction of the whole ecosystem, they should be rewarded.

In addition, the advertising SDK will be integrated into various D-APPs. DATx will design proper and effective user acquisition system to balance user growth and advertising effectiveness. Potential DATx users will be identified, acquired and required to fill out their profile information to enable DATx to identify them in the system and provide better targeting advertisement. Active users also need to provide timely feedback on the advertisements content from the DATx advertising platform: including likes, dislikes, etc.

Acquisition of active users can be achieved through but not limited to:

1) The DATx' advertisement platform
2) Promote through D-APP developers. Users and D-APPs will both receive rewards for the contribution to the ecosystem
3) DATx native advertising

4.1.2 ADVERTISERS

Advertisers purchase tokens as advertising budgets, create different ad requests, and raise the advertising rankings by bidding to get more users. Advertisers deliver the matching ads to the target users through the personalized recommendation algorithm, and the user's feedback to the advertisement will affect the ordering of the advertisement. Ultimately, the Ad ranks among the users who are interested in it, and is ranked low or even hidden among the users who are not interested in it, so that the advertising budget can be spent effectively and the ROI is enhanced.

Advertisers will get more detailed user data and more efficient access to the real users they want, after placing ads on the DATx platform. In addition, the CPM ads on the DATx platform are billed based on the effectiveness, excluding ad interactions from users who are not interested in the advertisement, which can reasonably save advertising budget.

4.1.3 PUBLISHER

Publishers integrate our SDK to participate in the whole ecosystem. Publishers will automatically get a wallet to receive payment and rewards in the ecosystem (DATx Token), which will enhance the user's stickiness and loyalty. Users can even reward publisher for providing quality content, and the publisher can gain additional rewards by providing better targeted advertisement services.

4.1.4 ADVERTISING PLATFORM

The DATx advertising platform is used to manage ad delivery and advertising data.

Ad delivery is based on user data. On the premise that the user agrees, blockchain records the real user data profile in a encrypted matter, so it better utilizes big data to continuously optimize the ad targeting algorithm. The advertisers or advertising agencies integrated to the ecosystem through DATx Protocol, can have access to DATx ecosystem database, so that their advertisements can be more accurately targeted to users.

Digital advertising platform is a typical multi-sided marketplace. The main players include advertisers, publisher, advertising platforms and Internet users.

DSP is a system and an online advertising platform. It helps advertisers to deliver ads on PC or Mobile. DSP provides advertisers with one unified access interface to manage multiple Ad Exchange accounts.

1) United launch platform, integrated multi-source traffic

It provides an intuitive, handy and comprehensive operating platform for advertisers, so that they can easily manage multiple advertisements through multiple media on a united platform . It can simplify the process of media buy and is able to integrate and manage different media traffic

sources, avoiding the waste of resources as in traditional and complicated media buy.

2) Audience purchase oriented

Except for subverting the traditional media buy mode, DATx has also upended the traditional ad logic, and clearly defined the purchase mode with an audience orientation. Advertisers are not buying the media, but leveraging users underlying the media. The advertising platform extracts user features through big data analyses for ad delivery, the typical features include interest (e.g. auto website/App, English articles, a certain brand), behavior (ad engagements, even a recent click on current advertisers' own ads). The feature tags will be increasingly abundant when it develops with advertising demand and data mining. Advertisers can even explore their own interests of users behavior in the open, anonymous blockchain distributed databases; and precisely deliver ads to this group of users, achieving extraordinary ad performance. And this group of users are more likely to be interested in the ad (even if not, this will be reflected on their engagements with the ad).

3) Real-time optimization algorithm based on AI

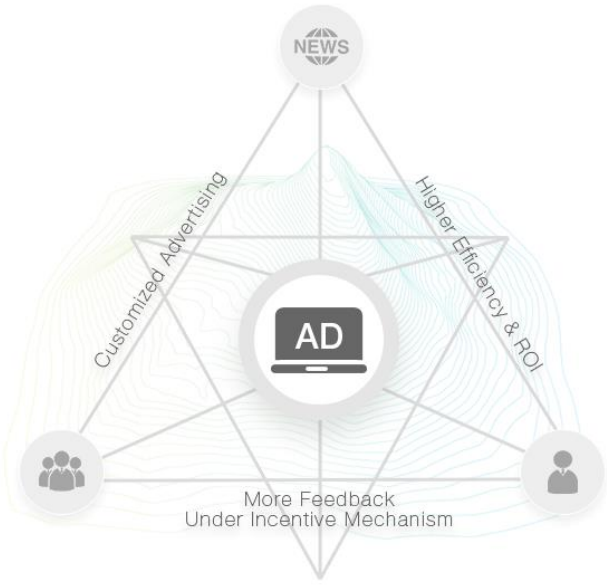
Advertising is all about objectives, satisfy the advertiser's ad target with optimization algorithm is the basic guarantee of service quality. Through the optimization of machine learning algorithm, the system will help advertisers automatically determine the target audience (may be excavate potential users that advertisers are unaware of), and optimal bidding strategy (getting quality users at lowest costs).

4) Comprehensive and consolidated data reports

Just as aforementioned challenges that the advertising market has, advertisers cannot fully control all ads to avoid repetitive ad distribution. This requires a unified operating platform, and requires DSP to provide advertisers with timely and comprehensive data reports, including information of cost, frequency, effectiveness, order status and so on.

4.2 OBJECTIVE OF DIFFERENT ROLES IN THE ECOSYSTEM

The advertising platform connects the upstream Advertiser and the downstream Publisher.



Advertisers care about if they can locate the desired customers and get them at minimized cost.

Publishers care about:

1. Maximized ECPM from the same traffic.
2. No resistance of end users caused by the appeared ads.

End users are concerned about being disturbed by unappealing ads. Since end users' viewing ads will provide valuable data to the ecosystem, they will be rewarded properly.

Advertising platforms then hope to connect with as many advertisers as possible to enrich their inventory, and meanwhile, they can connect with more publishers and get high quality traffic. The quality of traffic is determined by the features of the app, the user group, the location of the advertisement, and the display priority and rankings of the advertisement.

We firmly believe that the efforts of DATx will build a better advertising ecosystem, so that the effectiveness of advertising and user experience will be improved greatly. At the same time, users tend to be our active users because they can be incentivized in the ecosystem.

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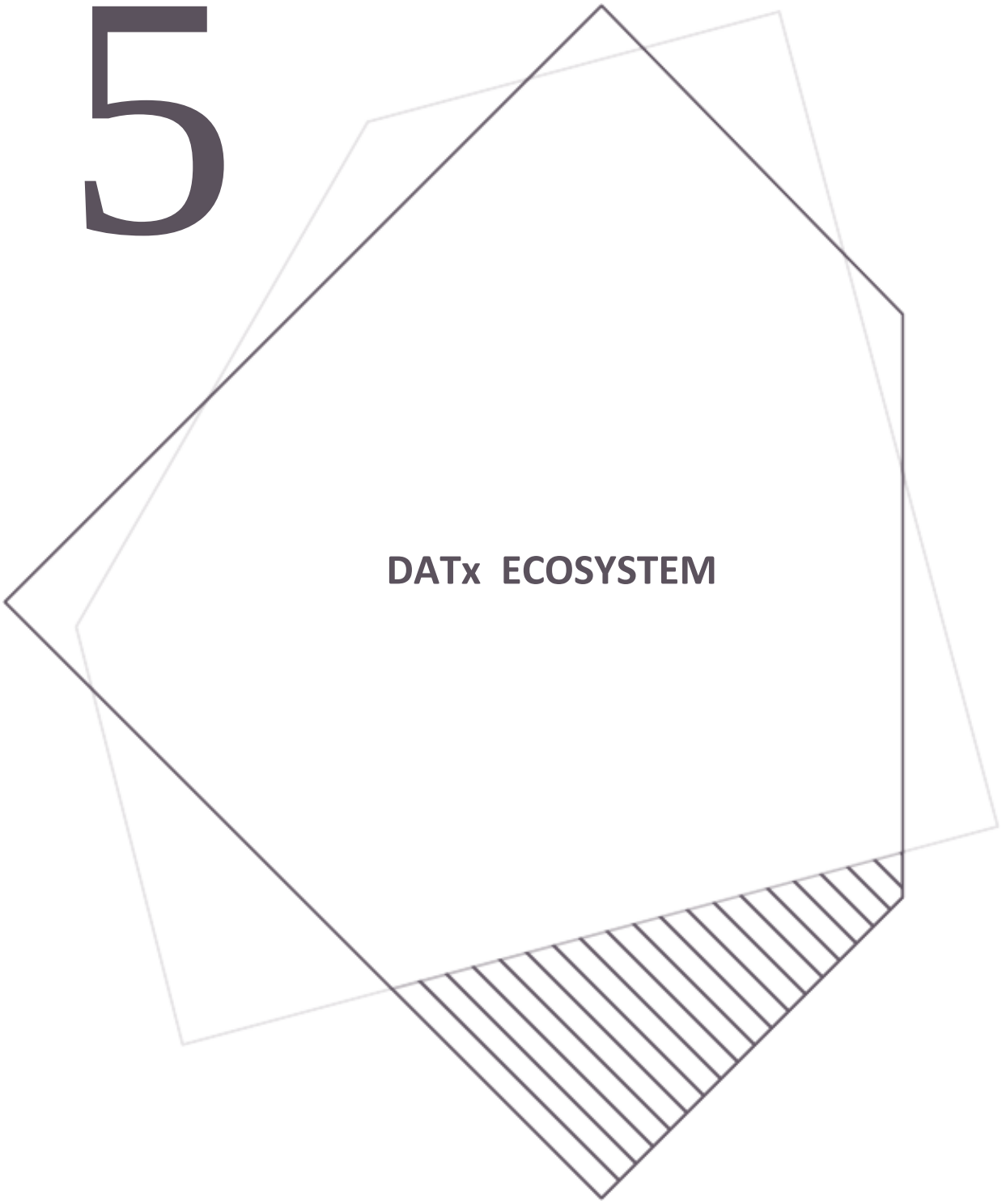
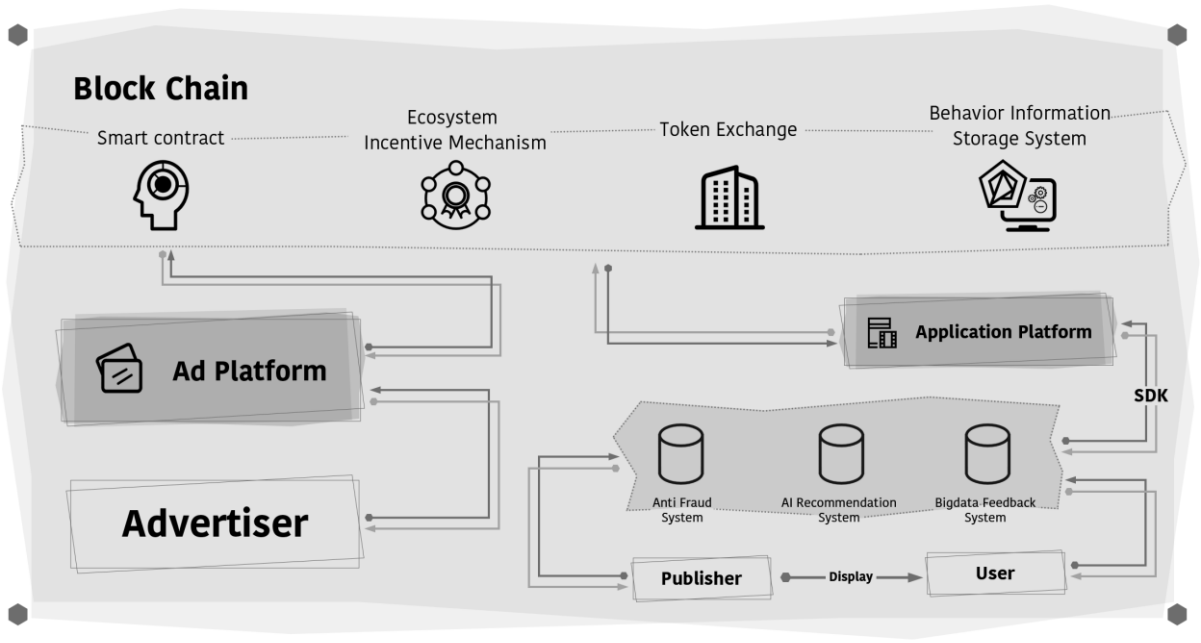


DATx ECOSYSTEM

5. DATx ECOSYSTEM

5.1 ECOSYSTEM DIAGRAM

The diagram is shown as following:



The Ecosystem consists of Behavior Information Storage System, Incentive Mechanism, Token Exchange, Advertising Platform, AI Recommendation System and Anti-Fraud System etc.

Incentive System: According to interactions between users and ads/channels, the system regularly settles token accounts of users and channels.

Behavior Information Storage System: User Behavior Profile Analysis data will be encrypted and kept on blockchain.

Application Platform: Including Applications that connected to DATx blockchain via SDK, including Web/APP.

Advertising Platform: On the Platform, Advertisers can provide ad serving suggestions and check delivery performance, while Publishers can acquire ad SDKs and IDs and check the ad performance. Ad delivery analysis is recorded in the blockchain, with decentralized mechanism

ensuring fairness and transparency, both ad resources and channel resources can be fully reflected to bring in higher value.

Big Data Feedback System: This system will conduct user behavior information collection and big data analysis.

AI Recommendation System: The system is empowered by an AI algorithm engine to provide its users precise and personalized ad recommendations.

Anti-Fraud System: As an open advertising system, criminals may have motivation of making a profit via illegal ways. Anti-Fraud system has to be involved to ensure the entire ecosystem to develop in a correct direction.

5.2 PRODUCT FORM

Generally, ads do not appear in high frequency, while media usually integrate multiple ad channels to maximize its ROI. A user typically won‘t see ads from a particular medium very frequently; even when she sees them, she mostly does not interact with them (an ad placement with quite high average CTR is usually considered cheating). It's nearly impossible to motivate a specific user's low behavior given its low frequency.

To solve this dilemma, we will introduce the following innovations.

5.2.1 CUSTOMIZED NATIVE ADS

We need to customize our native ads design so that users can better interact with DATx ads and get incentives.

Native ads is an ad type presented by specific media in a more relevant way based on advertisers’ material. We hope to add some elements in the form of native ads based on DATx Ecosystem and let users better understand that the ad is from the DATx, so that they can engage more proactively.

Mainly we consider the following aspects:
a) It needs to be able to make it easier for users to identify the ads from DATx, so they are more willing to provide real data to get incentives.
b) The ads can be linked to users via device ID (users may see our ads in a number of apps within a day, and we need to let the users "login" in a very effortless way.)

c) Users can choose to link device ID to their own UID. If users have more than one device or some users may switch to a new cell phone, they still can better synchronize the data.
d) Users can interact with the advertisement in following scenarios (e.g. click a logo on native ads):

(1) View user profile, and make changes

(2) View user ratings

(3) Comment on the ad material they see

(4) Check ads engaging behaviors (e.g. clicks, downloads, likes and dislikes) and make modifications, such as mark some as "false click", "not in person", "wish to hide" and so on.

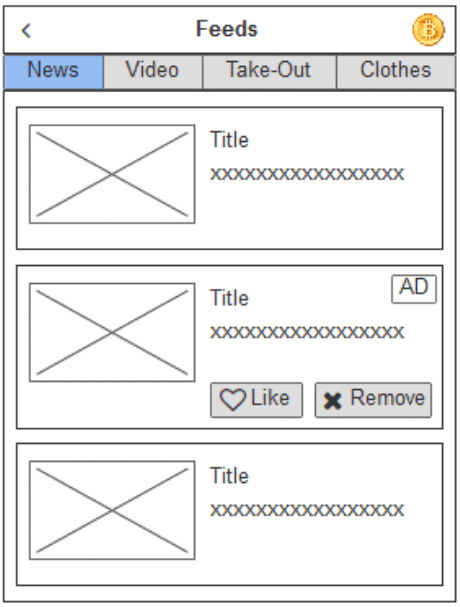
e) These data will be stored in a decentralized + centralized file system and analysis will be encrypted on blockchain and applicable for other advertisers in the DATx ecosystem.

5.2.2 NATIVE ADS FEED

Advertising is content. Combining ads with different types of content feed, the apps will keep users for longer. Information traffics Native ads basically leads new forms of advertising to switch from single ad format to content feed. In this way, we can set up ads feed when users immerse themselves longer here.

Many apps actually do not have the capabilities to run content, and a new ad style that incorporates feed will help them better improve user stickiness. Users exploit more content if they find the content interesting, and contribute more behavioral data to gain better rewards. Of course, not all apps fit in such forms of advertising.

Native ads feed provides personalized recommendations based on user feedback, including both content and advertising. There are various navigation categories, such as news, video, food ordering, clothing, cosmetics, etc. Users can switch on content feed from the chosen categories of interest. In each of the chosen categories, users can browse news or video, order a takeout or purchase desired ads. The system will give personalized recommendation based on user feedback, and users can also comment on given content and ads. The following style shows a sketch, which can be just a feed without subcategories.



5.3 DATx DECENTRALIZED USER BEHAVIOR ARCHIVE

A number of blockchain projects store user data in centralized data units and then analyze the data with some other techniques. However, this method of data storage is still performed by a centralized data center. The ownership and usability of data are not completely attributed to the users, which deviates from the decentralized idea of the blockchain.

5.3.1 DATx USER BEHAVIOR ARCHIVE SOLUTION

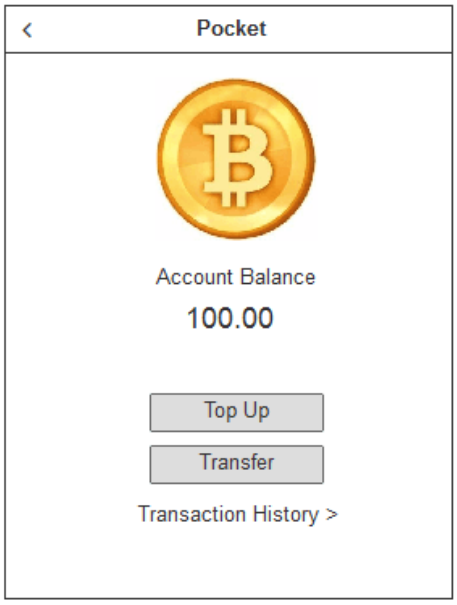
Based on blockchain technology, we construct an account system (DATx user behavior archive), and combine it with cryptographic information encryption technology.

These accounts include personal data centers and data sets. A personal data center includes user data on their own dimension, such as the user's sequential behavior data, preference data, virtual image and so on; under the premise that users would authorize, they can aggregate the sequential data fragments scattered in each application of the blockchain. The data set formed by these data fragments makes key data source for intelligent analysis.

Normally, when users, media, or advertisers access to our ad ecosystem, for each of them we create a user profile - the DATx account, the only and unique identity.

The DATx account contains the behavior information of the account, and the proprietorship of the information is recorded in the blockchain and an exclusive archive is generated for the account, i.e.

the DATx user behavior archive.

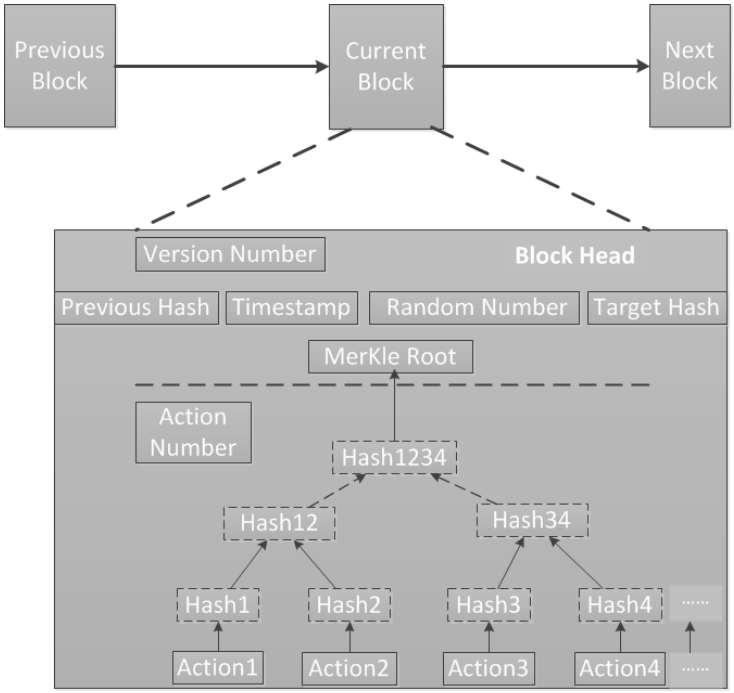


If advertisers and publishers register on our advertising open platform, their DATx accounts are generated.

For users, firstly we weakly link the user and the device ID if no intention is shown to register, and automatically generate a weak DATx account for the user with the device ID. The unique ID is the device ID. Then, we need a proper way to let the user consent our ideas, and able to quickly recognize our advertising. Then with a simple view on their own data such as registration information, a strong DATx is generated. At this point, the information on the weak DATx account of the device on which registration occurred is migrated to its strong DATx account, and the user is rewarded.

We record all the user's behavior information in the DATx user behavior archive based on the blockchain technology. And most importantly, these behavioral messages are organized in an orderly way in the blockchain, and are no longer a mess.

In our blockchain, the block is a data structure that records transaction and user behavior information. Each block is composed of block header and bocky body; the block body is only responsible for recording all transaction information and user previous behavior information, while most of the functions of the blockchain are realized by the block header.



1) Version number, indicating the relevant version information of the software and protocol;
2) The parent block hash, referred as the hash of the parent block in the blockchain. Through this value, each block is connected to form the blockchain, and it plays a crucial role securing the blockchain;
3) Merkle root, every transaction has a hash associated with it. In a block, all of the transaction hashes in the block are themselves hashed (sometimes several times -- the exact process is complex), and the result is the Merkle root;
4) Timestamp, records the time produced by the block, in second accuracy;
5) Difficulty value, the difficulty target of the block related math problems;
6) Nonce, records the value of the answers to the relevant math problems in the block.

When users owns an archive, some of their publisher activities (such as like, not interested in, stay, etc.) will be recorded in the blockchain. The timing of these actions is accurate to the second.

The user has full ownership of the data, and the third-party have to be authorized by the user to use the data. Authorized data will also be in a good privacy protection. Therefore, our DATx decentralized user behavior archive, ensures users' complete data ownership, protects user rights and also guarantees that we can establish a complete user archive for advertisers and media's BI analyses.

The user account displays the user's token balance and transaction details, users can browse their own behavior information and have security permission settings to set their own behavior

information usability.

Among them, it needs to be emphasized that:
1. The data completely belongs to the user. Data is stored and encrypted on decentralized resources, any organization or individual can not access the user's raw data;
2. The data in the user's consent is open but with restrictions. After the user agrees to authorize, the data can be researched on the big data of the user's partial data under the differential privacy encryption of the cryptography, but the personal data can not be analyzed and the data cannot be viewed, copied and tampered with.
3. Users will be rewarded with tokens when they agree to allow limited access to their behavior information. Users can exchange token in token exchange market. This incentivizes users to participate in the advertising ecosystem. If the user agrees to share more personal information for customized delivery on the platform, more token can be rewarded.

5.3.2 VALUE OF INFORMATION IN DATx BEHAVIOR ARCHIVE

Information entropy is the measurement of the amount of information needed to eliminate uncertainty, which is the amount of information that an unknown event may contain. However, too much entropy of information is not a good thing, and it represents the disorder of the whole system, which is so disordered that we can't get valuable information out of it.

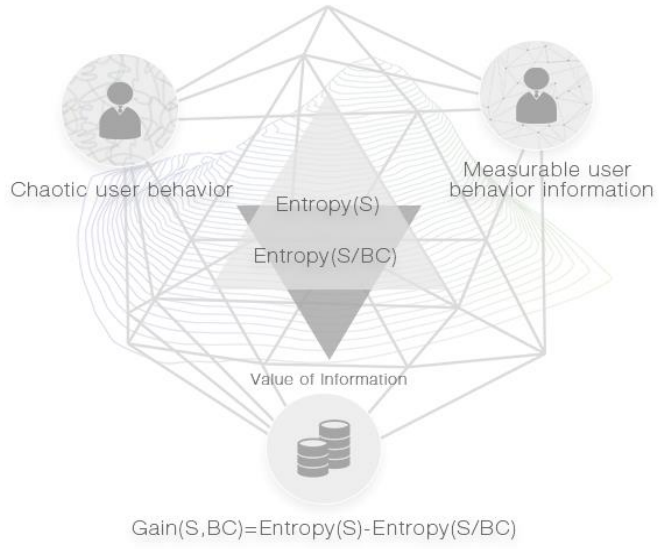
For example, for an advertisement, we don't know what kind of behavior the user will generate, and the user's behavior is very uncertain. If uncertainty levels up, the greater the amount of information, the greater the entropy.

The value of information depends on the decrease of information uncertainty degree, according to the basic point in information entropy theory.

The user behavior per se is chaotic, but the user information in blockchain can help us to reduce the uncertainty, so the information entropy, and also enables the algorithm to estimate the user's personal preference after we record user’s feedback into blockchain. The degree of uncertainty reduction (information gain) of each feedback behavior of the user represents the value of each feedback behavior of the user.
After entering the user's information into the blockchain, the value of user information is expressed as follows:

Gain(S,BC)=Entropy(S)-Entropy(S/BC)

Of course, according to the user's information gain, we should endow users corresponding reward.



After we build the user's smart account based on the blockchain technology, under the premise that the user agrees to authorize, to aggregate data fragments scattered in each application of blockchain, including the dimensions of the user's own data, such as advertising behavior data, other APP application data, relational data, preferences, and virtual image, etc. Data set is a collection of the amount of certain sort of data, which is the most critical data source of personalized analysis.

In BI analysis, we build a complete persona profile of the user by aggregating the data fragments scattered in each application of blockchain to achieve the real personalized advertising recommendation.

The user's information on the blockchain can be very valuable, we expect such an incentive mechanism to generate a positive cycle of traffic. As more and more users, publisher and developers join, the traffic increase will attract more advertisers to do the delivery, and it will also benefit the platform to achieve more accurate recommendation algorithm. The more participants in the network, the greater the value of the platform will be, which will directly reflect the long-term appreciation of the DATx Token on the platform.

The user account system based on the blockchain (DATx account system) corresponds to the user's behavior in real world, which is the key to the application of the blockchain to the real

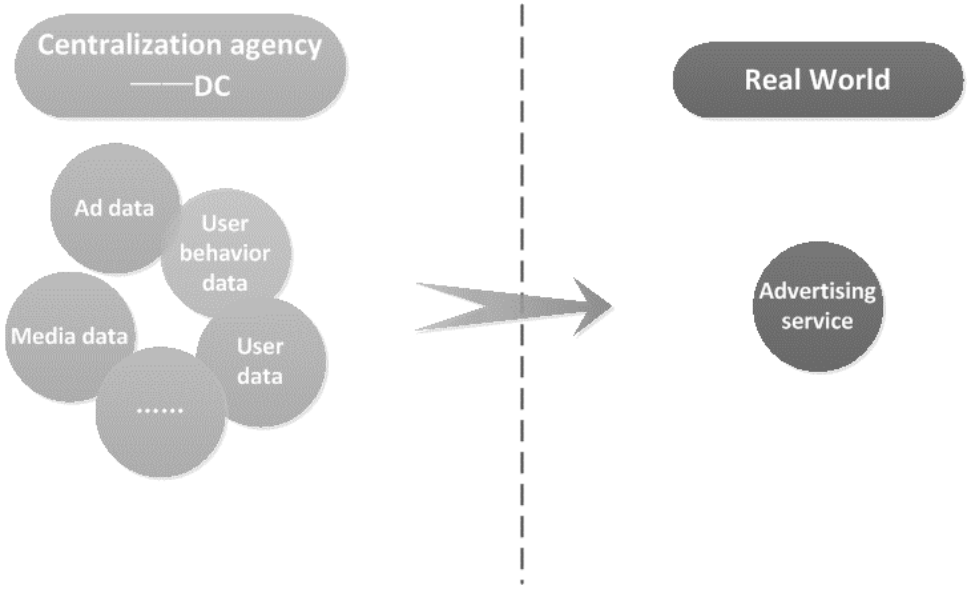
application. By verifying the assets of the account owner's digital world to be real individuals', we connect them to the real social services website to create a richer ecosystem.

Our block chain's account system (the DATx account system) records users' behavior information. And most importantly, these behavioral messages are organized in an orderly way in the blockchain, and are no longer disorganized. Many blockchain projects use completely centralized data structures to perform user data storage, and then analyze the data with other techniques. But this kind of information storage is still carried out by centralized data center, which runs counter to the decentralized idea of blockchain.

5.3.3 IMPORTANCE OF DATx USER BEHAVIOR ARCHIVE

1) The importance to advertisers and the publisher

Usually, publishers and advertisers access user data from different sources through their own technology, then set up a data center to store and analyze user data, then implement marketing activities. For example, the publisher capitalize on user data in its own data center to provide advertisers with a "crowd-targeted" service, and advertisers use their user data to "redirect" their ads. In this case, the data collected by each advertiser and the publisher is stored on the respective servers, forming a data isolation, thus unable to form a comprehensive and accurate user portrait, and the personalized advertisement delivery efficiency is relatively low.

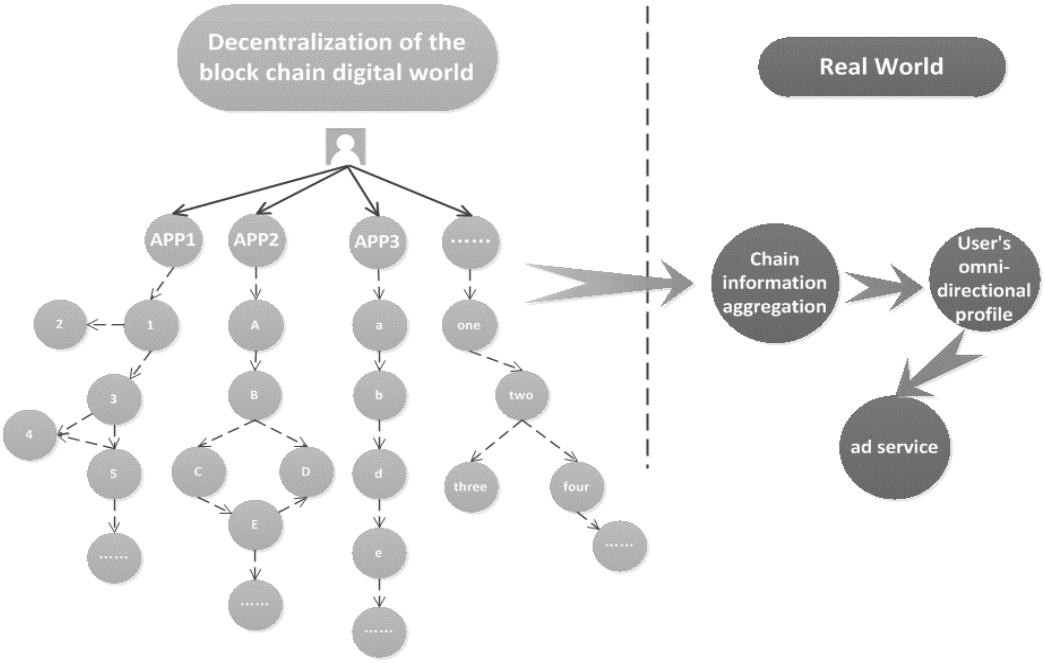


When we record the user behavioral data in the blockchain, it will be a different story. In the blockchain, every step of the user behavior is ordered and visible.

Any ad platform that joins DATx will have access to these data to better target users and provide a better ad experience; similarly, any advertiser who advertises via DATx will also have a better chance of knowing their real ads performance, and reach to more accurate users.

When the user looked at which ads on what platform, what was the ad content, how long did the user view the ad, when did the user click on the ad, did she download, subscribe, or purchase the product. All the user's actions constitute a complete chain of events, and this is the user's behavior chain. With thousands of such event chains on different websites or in different APPs, we can learn more accurate user interests. With this chain of events, you can continuously observe user behavior.

The complete chain of user behavior records in the blockchain allows us to simulate complete user personas in order to know the business truth behind the various user views, clicks and purchases of the publisher.



For example, advertisers whose objective being conversion will try not to lose users, and retain them once they come online.

Well then, DATx decentralized user behavior files can help analyze how users are lost, why they left, and where they are switching.

Our DATx Decentralized User Profile records complete user behavior data. If the advertiser demands, we can specify user data on sheets by hour, by day, by user level, or by event level.

Through this sheet you can know the basic user events, such as login or purchase, you can know users quality, which users are about to leave. And such data can be updated daily or hourly.

Advertisers or publisher would integrate and analyze relevant data, from which they can reveal patterns of online visits and advertising. Then combine with digital marketing strategies to identify problems with current online campaigns, and provide a basis for optimizing or replanning their online marketing strategy.

2) The importance to the user

In users' perspective and in the era of centralization, all user generated data on is centrally stored in each application and platform, and the ownership and use rights of the data are not completely attributable to the user.

Whatever campaigns the advertisers and the publisher carry out, the users are completely unaware that their own data is used for benefit exchanges. As a rule of thumb, ownership of user data should belong to users, and users can choose to provide their own preferences for personalized advertising services, or hide their own data or choose to provide only partial data.

Blockchain-based user account system (DATx account system), will correspond the user's behavior in the digital world and physical behavior, this is the key blockchain can land in the real application. Through behavior profiles of the account owners in the digital world, we portray the users' real personas, and link them to the physical social services site, to achieve more precisely customized ad services, so as to create a richer advertising ecosystem.

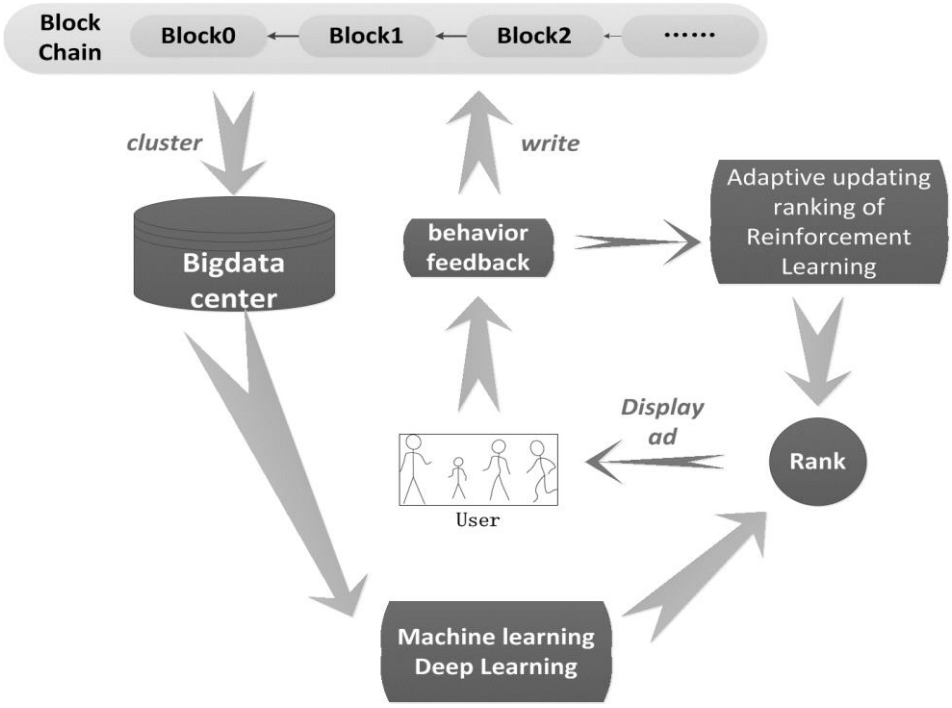
5.4 AI CUSTOMIZED ADS RECOMMENDATION

The core data needed by the AI recommendation system is user feedback. The recommendation system without user feedback is a disabled recommendation system. If there is no feedback:

1) There is no continuous optimization of the annotation data;
2) There is no real data to evaluate the effect;

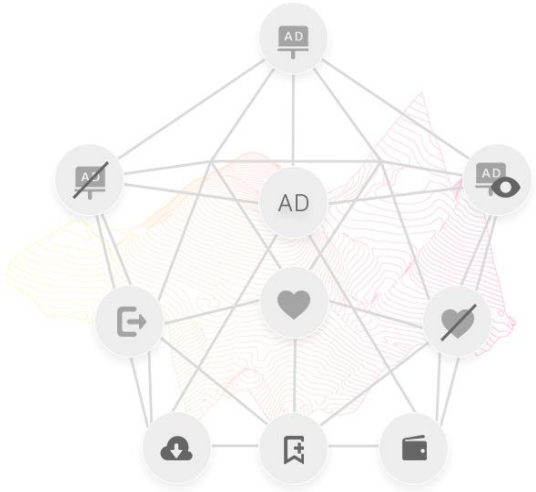
In a word, if there is no feedback data, no data loop, and the product metabolism will be a big problem.

The user behavior information recorded on the blockchain makes our feedback mechanism more complete. We use feedback to motivate users to generate feedback, click on ‘likes or dislikes’ to show feedback, because users know they are expressing their attitudes and give a clear-cut attitude in a more quantitative way. The other feedback is the natural behavior left by the user when using the product. The user leaves behind the data, not to tell his preferences, but we can "try to figure it out" to the user's preferences. Because these are all users of natural behavior, usually more truly and fully reflect its attitude, but also closer to product targets.



Our ad algorithm engine involves responding to massive amounts of ads and users in real time. The number of users is huge, their behavioral characteristics, and their preference for advertising content are also rich and diverse. Therefore, it is necessary for the algorithm engine to sort out the users with different characteristics in a targeted manner, and in this way, the order-led transaction can be promoted. Among the company's proven technologies, Deep Neural Network (DNN) and Logistic Regression (LR) have been used to make offline sorting models, while online sorting models are updated online based on Reinforcement Learning (RL) intelligence to So that we sort of get the maximum return.

If in the blockchain, the user's behavior is recorded as follows:



This is very similar to the Markov chain. Take the ranking engine as an Agent, the user as the Environment, then the advertising ranking problem can be considered as a sequential decision problem. Agent's selection of each ranking strategy can be regarded as a trial-and-error, which can be user feedback, click transaction, etc. as a reward from the Environment. In this repeated trial and error process, Agent will gradually learn the optimal ranking strategy to maximize the cumulative reward.

It is natural to understand the recommendation of a full-link multi-scenario as a continuous decision problem: as an Agent, the recommendation system needs to continually decide what to recommend to the user. Reinforcement Learning is one of the best ways to model the agent: by recursively modeling changes in the short-term state of Agent, they ultimately lead them to progressively optimize their long-term goals.

Let $V\pi(s)$ denote the value function of the state s (the state in the ring above) in the ad ranking strategy π. ri is the instant reward in ith step, then the value function is:

$$V\pi(s)=E\pi[i=0\infty\gamma iri|s0=s]$$

Where $\gamma\in[0,1]$ is called the fold factor, indicating the importance of future rewards relative to the current rewards.In particular, when γ=0, it is equivalent to considering only long-term returns without considering impublishertely. When γ=0, long-term rewards and instant rewards are seen as equally important.

Finally, the optimal strategy of our advertising ranking can be expressed as:

$$\pi *=arg\pi V\pi(s) ,(\forall s)$$

That is, we are looking for strategy π* that maximizes the value function under any initial conditions.

5.5 INTEGRATED APPROACH

SDK：For App developers.

JS：For Websites.

6

TOKEN AND ECOSYSTEM INCENTIVE MECHANISM

6. TOKEN AND ECOSYSTEM INCENTIVE MECHANISM

6.1 TOKEN (DATx)

As the digital assets in the system, tokens are transferred to the participants in the ecosystem (end users, advertisers and publisher) to help the realization and transfer of value.

6.2 SMART CONTRACT SYSTEM SCENARIOS

1) Send the DATx Incentives according to the contribution of publisher;
2) Distribution of incentives based on user behavior (since incentives for an AD interaction are limited, it is too expensive to implement smart contracts for each user behavior)
3) Use the smart contract do lucky draw base on the contribution of active users ;

Platform rewards are to maintain and develop the ecosystem. Each participant in the ecosystem will be rewarded with tokens based on their activity and contribution to the system. To attract new publishers and users, the token distribution is a bit higher in the early stage. As the number of participants increases and the amount of available tokens becomes less and less (for example : halving per year), the token distribution decreases in the later stage.

The rules for users to obtain tokens are: in the early stage of token issuance, the user clearly gives feedback and obtain tokens according to the conversion formula, with an upper limit on daily token income. Tokens are halved over time to encourage early adopters and constrain the token sum circulating in the system.

6.2.1 USER INCENTIVE MECHANISM

User feedback can help us reduce entropy and let us know what users like. Therefore, the degree of uncertainty reduction (information gain) of each user feedback represents the value of this feedback. Therefore, according to the user's information gain, we should give users corresponding rewards.

Given that Scoreuserk represents the final score of user k, the Scoremin is 0, and the Scoremax is 100 points, i.e., Scoreuserk$\in$[0,100]. This score is equivalent to the substitution of tokens. The calculation of fractions is as follows:

Scoreuserk=i=1nj=1mwiwijScoremax

Assuming that the user has n feedbacks to the advertisement, wi represents the weight coefficient of the i-th feedback, i=1, 2, 3, 4…., n. The weight coefficient is calculated by information gain or GBDT algorithm, however, in order to make the calculation simple; the coefficient can be determined by experts.

The user k will generate n behaviors for the advertisement because of his special preference in the i-th feedback of the advertisement, which indicates the user's participation in the advertisement. We use wij to indicate the weight of this engagement，j=1,2,3,4….,m.

The pseudo-code of the calculation method is as follows:

0: **Inputs:** $\boldsymbol{\omega} \in \boldsymbol{R^d}$ the weights of behaviors
1: *observe all users* $\boldsymbol{u \epsilon U_t}$
2: **for** t=1,2,3,…,T **do**
3: *observe all behaviors of a user* $\boldsymbol{\alpha \epsilon R^m}$
4: $Score_i = \boldsymbol{\omega_t \alpha_t} score_{max}$
5: **end for**

It is very important to motivate users to generate feedback behavior, but the importance of user feedback behaviors varies. As shown below, the classification and weight coefficient of feedback behaviors are listed in the following table.

User feedback behavior	Weight coefficient	Content	Component weight coefficient
User advertising interaction	w_1	Like	w_{11}
		Not interested	w_{12}
User interaction evaluation	w_2	User evaluation of effective label extraction (natural language processing)	w_{2j}
User residence time	w_3	Time	w_{3j}
User conversion behavior	w_4	Advertising clicks	w_{4j}
	w_5	Download	w_{5j}
	w_6	Purchase	w_{6j}
	w_7	Subscription	w_{7j}
…	…	…	…
Others	w_n	…	w_{nj}

1) User advertising interaction

Users engage with content and ads, express their preferences through "likes" or "not interested", and help the system to achieve personalization. Here, whether users click "like" or "not interested" can help us locate users' interests, so "like" or "not interested" have the same weight.

2) User interaction evaluation

Users' engagements with content and ads further express their interest in this kind of native ads.

If the user did not comment on the native ad content, the score is 0. If the user evaluates the ad, then the word label of the rating content is extracted with the natural language processing algorithm,

and the user is graded according to the quantity of valid words. The calculation formula is shown below.

$$w2j=\min(w2,w2\times\lg(n+1))$$

w2 is the weight of user interaction evaluation on the total score of users, and *n* is the effective label number for users.

3) User residence time

The length of time the user stays in the content provided by us indicates the quality of the content and whether it can meet their needs well.

Generally speaking, when a user stays on a page for a long time, it indicates that the content of the page is of high quality and able to satiate the user. And we can get the user's preference information since the user is interested in this content. In this case, we should give the user appropriate reward.

When the user has a short stay on the page, it indicates that the content of this page has low quality, and has no features, which can't satisfy and attract users. In this case, we can also give users appropriate incentives to extend the user's reading time.

4) User conversion behavior

When users click, download, buy and subscribe to ads, they can more accurately indicate that users are interested in such advertisements. Therefore, the corresponding reward should be given to the user, and the specific reward method should be changed according to the charging methods of CPM, CPC and CPA.

5) Other behaviors

6.2.2 PUBLISHER INCENTIVE MECHANISM

a) The publisher can get rewards from DATx after accessing to the ad SDK supported by DATx Protocol. Traffic needs to be rated with specific quality. Similarly, if the publisher helps the DATx ecosystem get high quality active users (active users refer to the users who have completed the registration), the corresponding DATx incentive will also be obtained.

b) The specific traffic quality can be considered according to the following dimensions: user residence time, user interaction with advertisement, etc.

For example, for a certain channel p, there are lots of ads slots in channel p. Let's say our advertising platform puts advertisers on some of the ads slots in channel p.

Rewarding of the channel is closely related to the user quality.

1) We make statistics on the advertising space that we advertise on the channel p；

2) For each Ad

2.1) Based on each user's session duration, the user’s engagement with the ad, the quality of ad placement is calculated；

2.2) Summarize the quality of each ad placement and calculate the total score of the ad.

3) Count all ad placements scores on channel p；

4) Reward channel p according to its total ad scores.

The pseudocode is as follows:

0: **Inputs:** $\omega \in R^d$ the weights of user’s behaviors

1: *observe all ads on a Publisher* $p \epsilon P_t$

2: **for** all $p \epsilon P_t$ **do**

3: *observe all behaviors of all users* $b \epsilon R^m$, $u \epsilon U_t$

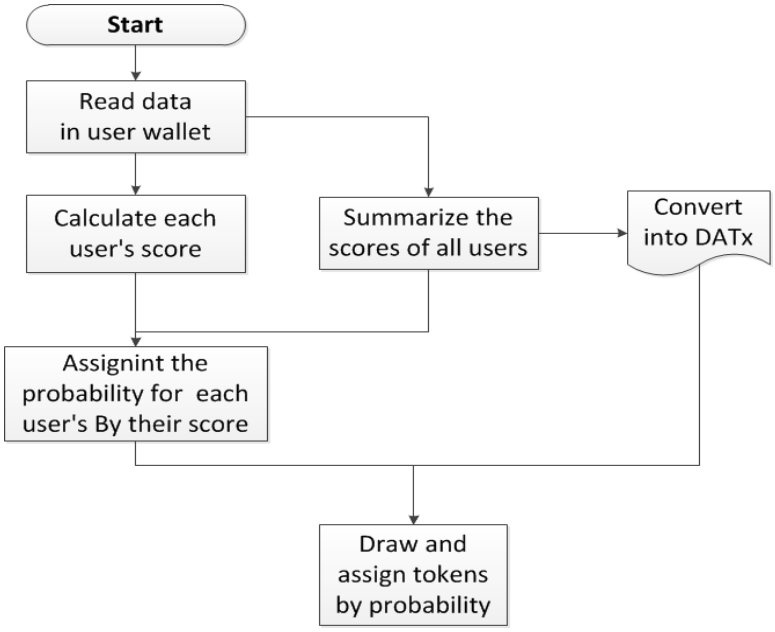
4: $Score_p = sum(\omega_p b_p score_{max})_{u \epsilon U_t}$

5: **end for**

6.3 TOKEN CONSUMPTION

1) The advertiser can purchase the traffic by holding the DATx and meanwhile refer to POS, for advertisers holding enough DATx for a long enough time, the discounts on their purchases should be higher. The previous Publisher could use the DATx that was previously incentivized by the platform to continue to buy and sell Ads in the DATx advertising system (the Publisher becomes the advertiser's role at this time) to gain more users.

2) The system will distribute small amount incentives to individual users fairly and periodically, similar to lottery draws. The distribution journey is as follows:



To summarize the flowchart:

1) Read the user's wallet data on the blockchain weekly;

2) Summarize the scores of all active users in the week (those who have viewed the ads and generated feedbacks during the week), and convert them into DATx tokens and generate the prize pool;

3) The score of each user is calculated separately, and the probability of winning is generated correspondingly based on the total score of the prize pool; users with high scores are more likely to win, but users with lower scores still have a chance, so these user can become an active part of the ecosystem.

The winning algorithm is conceived as follows:

Premise: this winning algorithm is not a completely random algorithm, and the probability of winning is tied to the user's score.

Model: probability model.

Specific ideas:

1) Initialize the probability of winning, assuming the total score of this week's pool is 100DATx, and the probability of initializing each user is 30%.

2) Adjust probability according to user score:

3) During the lottery, scoremax and scoremin are available to active users this week. Then the probability PI of each user is adjusted to:

pi=scoreiscoremax-scoremin30%

In this way, users who are more active have a greater chance to win, and also ensure that users who are less active still have a chance to win, thus encouraging them to become more active.

To be clear, assume that the user scored 10 points, with a total score of 100，then his winning rate is 10%. It's not the same as taking 10 times to win once. This is obviously wrong, the winning lottery number of probability model is based on the normal distribution, and each draw is independent, you won't win the tenth time because you didn't win the prize nine times before.

According to the simulation statistics, the standard deviation of 10% of the winning rate is 9.62 - most of people will win the lottery by 10 ± 9.62 times, and should be rewarded after 20 times lucky draw.

4) Assign tokens to the winners and record them in the blockchain.

6.4 ANTI-FRAUD MONITORING

It is undeniable that some fraud actions might be done which harms the positive development of the whole ecosystem.

Traffic fraud is driven by market interest, the main problem is that the previous monitoring was all collected by http services in large scale advertising (especially RTB).Information collected includes: IP, browser information, device information, time, website information, etc. The industry conducts fraud monitoring, which is basically the post facto log analysis to find out abnormal data and blacklist overheated websites.

6.4.1 LOGIC OF FRAUD

1) Fraud session

In terms of the whole advertising process, frauds exist in three stages: impression, click and conversion (including but not limited to registration, activation, interaction, purchase, etc.)
The session of Impression: Fraud behaviors specialized for Impression session is the mostly simple and crude way, and it is also a most efficient fraud behaviors, which is usually happened in the publisher of CPM settlement.

- The session of Click: it is commonly happened in the publisher with CPC settlement. As advertisers increasingly value CTR, some non-CPC settlement publisher will also fraud on clicks to improve CTR.
- The session of conversion: In order to reduce risks, advertisers directly negotiate with the publisher about CPA and even CPS settlement. But the rate of evolution of fraud has exceeded the speed of the advertiser's response.

2) Approaches to fraud

In most cases, the demand side focuses on non-human traffic, but fraud is much more than that. Here are a few common ways to fraud:

- Fake users: typically, robots are used to transform IP, cookie, and even device ID to disguise different "users" to swipe ads or click ads.
- False traffic of real users: this kind of fraud is the advanced version of robot fraud. It takes advantage of the real user device, which makes the user attribute characteristics of the fraud traffic closer to the real traffic.
- True user traffic: this kind of fraud is more advanced than the former two. In some cases, it is typically sailing under false colors. In other cases, the traffic gets hijacked via HTTP or DNS which is not exactly traffic, and may be more accurate to be named "illegal traffic".

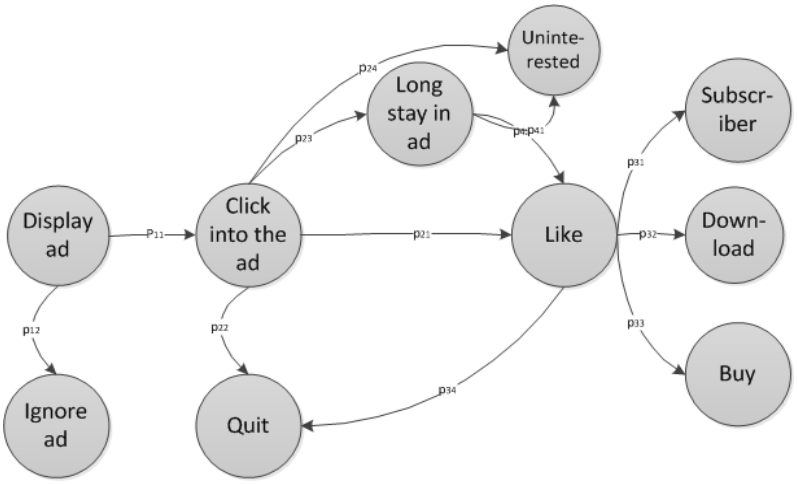
6.4.2 ANTI-FRAUD BASED ON DATx USER BEHAVIOR ARCHIVE

The DATx user behavior archive builds the user's exclusive, secure information security account. These accounts include personal data center and data set. The personal data center includes user's own dimension data, such as the user's ordered behavior data, preference data, virtual image and so on.

In order to prevent the phenomenon of malicious fraud, the DATx user behavior file provides a good solution. In our anti-fraud system to provide the anti-fraud policies, such as abnormal based on time difference protection, additional equipment validation information and IP calibration strategies and other strategies are based on discrete degree DATx user behavior records to prevent fraud.

1) Abnormal time difference protection strategy

According to the checking analysis, click and activate the time difference set range to exclude abnormal data. By updating the version of the SDK integration fraud protection module, add more equipment validation information, the SDK will launch a data channel encryption during data transmission, increase the cost of fraud, ensure the security of the data transmission.



For example, in the user behavior chain, a real user, there is a certain time difference from the click to the convert. If the time of user's behavior 1 (click on the ad), and the time of transferring to next move (click like or subscribe or download) is too short (within a few seconds), then you can preliminarily judge that the user may not be true, but a dubious machine click.

2) Device authentication information policy

After the user authorizes, the DATx user behavior archive will record the user's device ID, cookie, and IP information. The user ID is generally based on IP, cookie (or device ID) for resolving users.

Users with a DATx user behavior profile we can easily know if certain users have frequent exposure or clicks. Some publisher will use robots to change the IP to disguise. In this case, the information in the DATx user behavior archive can be taken into account to identify the traffic.

The user's IP or cookie in the DATx user behavior file is different, but when this group of IP or cookie browser type, resolution, user window size, the operating system version number and equipment brands are the same, it will cause the attention of the anti-fraud system to take the necessary measures.

3) IP dispersion calibration strategy

According to the DATx user behavior archive, each records the IP that the user has requested. Suppose that the IP access information recorded in a user's DATx user behavior file exceeds the peak range of the set IP number within a short time, it will be recorded by anti-fraud function automatically. By using a large number of fraud logs, if the IP that is clicked or activated during a certain period is too centralized, that is the performance of the data exception.

7

DATx BLOCKCHAIN EXPLORATION

7. DATx BLOCKCHAIN EXPLORATION

Advertising Platform involves massive user scale, thus requires fast response time, which poses a great challenge for blockchain to cope with user behavior data in real time. Meanwhile, it does not make sense technically and economically if all user behavior data are processed via Ethereum smart contracts, considering its limitation on response time, throughput and expensive Gas fee for every single transaction.

Different from existing mainstream blockchains' generic one-for-all approach, we are proactively developing our own DATx blockchain to resolve above mentioned industry specific challenges to achieve DATx mission as the next generation revolutionary blockchain for programmatic advertising industry.

DATx Blockchain will bring in innovations in blockchain technology from below perspectives:

1) Better compatibility with major existing blockchain ecosystems (such as Bitcoin UTXO Core infrastructure, Ethereum Virtual Machine (EVM));
2) More flexibility in smart contract trigger mechanism and consensus protocol;
3) User-friendly development system;
4) Lower transaction costs;
5) Lower latency ;
6) Better TPS performance;
7) Hybrid Model of centralized and decentralized data architecture;
8) "POI" - Power of Identification to balance data commercialization and user privacy.

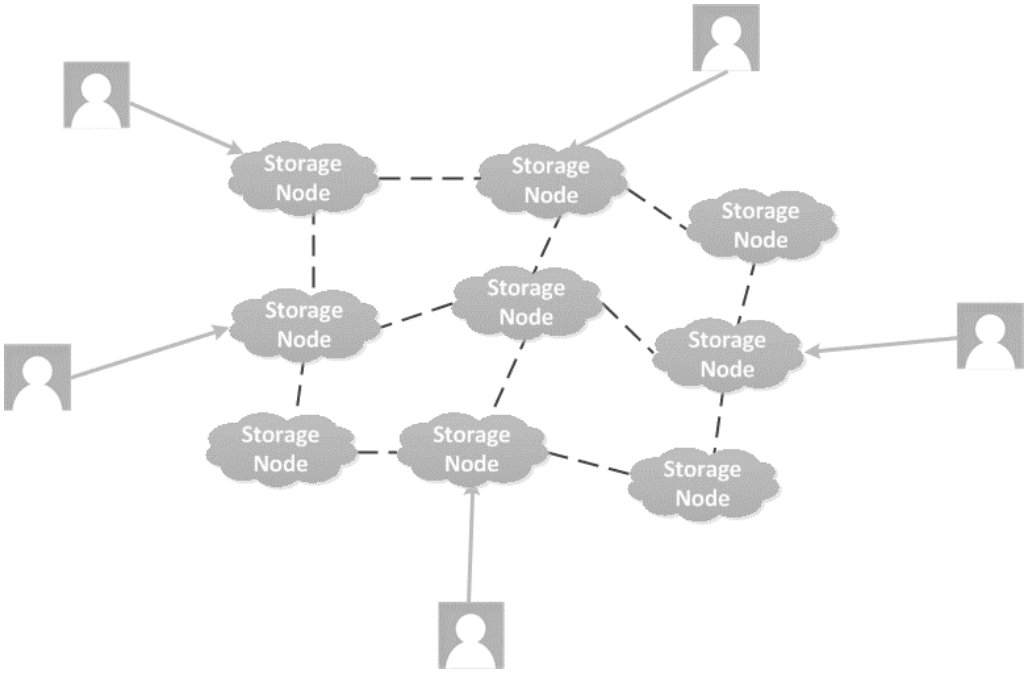
DATx will build an open source platform, provide blockchain infrastructure for programmatic ad ecosystem participants, and increase their advertising effectiveness and ROI. DATx will highly consider commercial scalability and make DATx blockchain a easy-to-implement, tailor fitted infrastructure for all relevant ecosystem participants.

7.1 DATx USER BEHAVIOR ARCHIVAL STORAGE DESIGN REQUIREMENTS

DATx needs to support distant storage of user behavior archives. The core function is that users store their behavior data in network nodes, and later the users could acquire and access above data anywhere.

Storing user behavior data in one network, means that other network nodes (i.e. storage nodes)

will have the data archived, and these nodes will be responsible for returning the data for users' access requests and ad platforms' big data analyses.



Due to the importance of the network nodes, DATx forms the following hypotheses:

1) Storage nodes are untrustworthy: in worst scenario, the storage nodes could steal, modify the archived data. Therefore, forceful mechanism should be applied to prevent and terminate this kind of malicious behaviors.
2) Storage nodes are profitable: economic income is required to maintain the storage nodes, especially, when data requires high privacy and security, higher fees should be charged for the storage nodes. And it should be guaranteed that storage network nodes are fairly paid for.
3) Storage nodes are unstable: when data access is requested, the storage nodes cannot be online simultaneously, and could go offline anytime.
4) Network might not be of good will: if a network flaw exists, someone possibly will take advantage of the flaw and attack the nodes for personal profit.

DATx is mandatorily designed to securely store the data of above features.

7.2 PRINCIPLE OF STORAGE NODE SELECTION

The selection of storage nodes is essential in DATx user behavior archive system.

In DATx system, any user or participant (including advertisers, publishers, ad audiences) of DATx ecosystem could become a storage node. The users are entitled to choose their own storage nodes, or to become the storage nodes.

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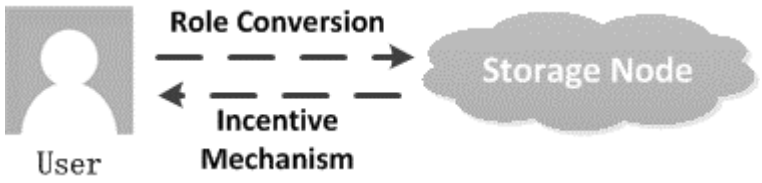
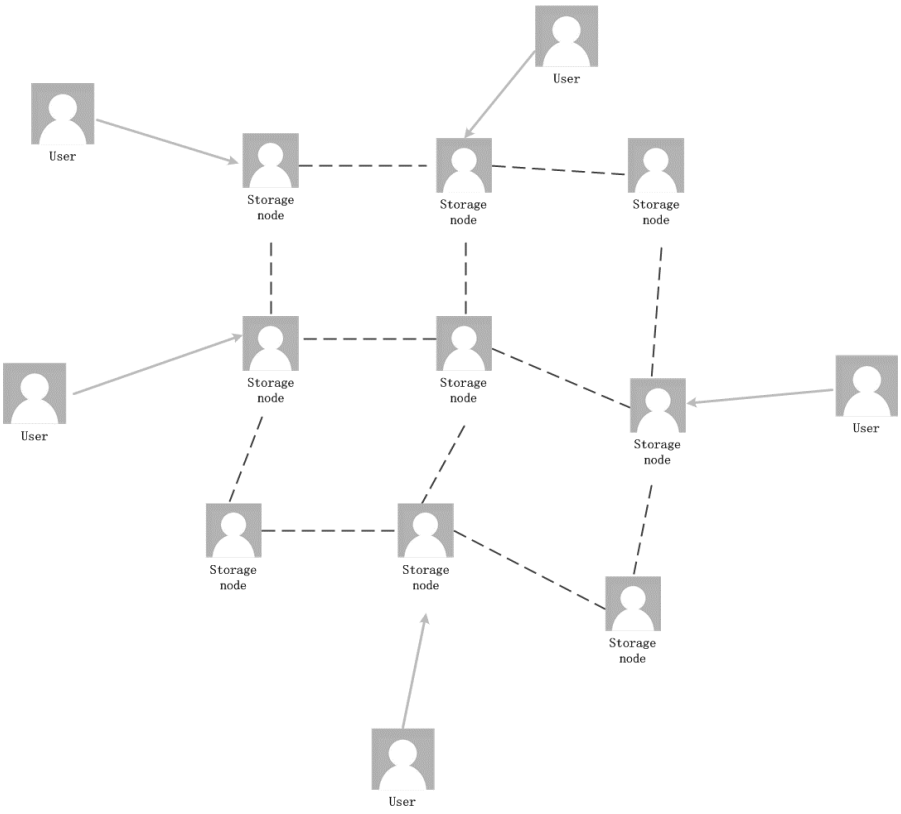


When a user becomes a storage node, he will be rewarded with DATx Token. Moreover, if a user stores data in the node, this node will be rewarded extra token.

To be noticed, attackers could try to lower the price and disguise themselves to manipulate users' choices.



An archive contract is the contract between the storage demand side and a storage node. The demand side agrees to pay for a storage node, so the node stores the data for the demand side in a given term of time.
Having storage nodes to archive requires an incentive mechanism. The archive contracts provide forceful incentive mechanism and motivation for nodes to securely store data.

Having properly stored user behavior archive, the storage nodes will be rewarded, otherwise, they will be punished.

When a archive contract is enforced, both the storage demand side and the storage node put a certain amount of tokens as deposit under the contract.

Once the storage node completes the contract, the contract deposit is paid to the node, with its own deposit returned along. If the node defaults, its contract deposit will be deducted.

Archive contracts are recorded in a blockchain, it turns to be a third party regulator for these contracts. When archive contracts are completed, the storage node must provide proof and certifies that is still has the data archived. Not until the storage node provides the proof, can it retrieve its deposit and payment from demand side. And if the node is unable to provide the storage proof in time, is cannot be rewarded.

7.3 ARCHIVE CONTRACTS

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When a archive contract is enforced, both the storage demand side and the storage node put a certain amount of tokens as deposit under the contract.

Once the storage node completes the contract, the contract deposit is paid to the node, with its own deposit returned along. If the node defaults, its contract deposit will be deducted.

Archive contracts are recorded in a blockchain, it turns to be a third party regulator for these contracts. When archive contracts are completed, the storage node must provide proof and certifies that is still has the data archived. Not until the storage node provides the proof, can it retrieve its deposit and payment from demand side. And if the node is unable to provide the storage proof in time, is cannot be rewarded.

7.4 ARCHIVE REDUNDANCY

It makes no sense that the storage demand side would store the data only on a single node, because as DATx hypothesized the storage nodes are inevitably unstable, meaning they cannot be all-and-real-time online or they just go down.

Under this circumstance, simultaneously store data on multi nodes can spread the risks. If a user profile is archived on five different hosts, only when all five hosts go wrong, the data loss could occur. This, is a technology of storage replications. The storage replication replicates n copies of the original data, and distribute to various nodes; once a node fails it could resume lost data from other nodes. However, this storage replication technology largely increases storage costs, thus unable to support rapid development of blockchain technology.

There is an alternative, called Reed-Solomon Codes. If original data goes invalid when a user accesses the data, k redundant data blocks have to be downloaded prior of remusing all original data blocks. In this way, random access to a single original data block would be a loading mess, due to the incredible downloading volume.

Based on the probability distribution of random access and sequential access, DATx realizes data storage with Regenerating Codes, which take s smaller bandwidth to resume compared with Reed-Solomon Codes.

First, partition a user behavior file of M bytes into n parts according to MDS, and store in n nodes respectively, each partition of M/n bytes, and any k partitions can be used for the original data reformation.

Once a node fails, redundancy must be constantly refreshed, and this leads to transfer of enormous data in the network.

At this time, we should effectively reconstruct new partitions to cope with such failure. A new partition copy should be replicated directly from another node storing this partition, but traditional error-correcting codes need original data to generate a new coding partition. While we consider generating an error-correcting coding partition with accessing only error-correcting coding partitions.

In the initial strategy, the node storing new partition (so-called Newbie) downloads k partitions and reconstruct the file, then it generates new coding partition from original file. Consequently, the data transfering M bytes only generates M/k bytes partition.

We confirm a minimum data volume it requires that a Newbie generates a MDS or semi-MDS partition, this is called optimal maintaining MDS (OMMDS). We particularly prove that M-byte download volume is the minimum in information theory, if the Newbie can only connect to k nodes, download data and generate partitions. If the Newbie is allowed to connect over k nodes, then the data volume required for download would significantly reduce. For example, k=7, n=14, the Newbie can connect to n-1 nodes, then only 0.27 MB data is required to generate new partitions, 73% less than with the initial strategy.

Nevertheless, relevant extra expenses would be also required, and consequently the hybrid solution provides better secure bandwidth than OMMDS. In order to improve the hybrid solution, we must have foresight over MDS.

Here we bring in the new solution, Regenerating Codes, which minimize the data download volume required by a Newbie under the symmetry of MDS that we insist. On a higher level, RC improves OMMDS through the data downloaded by the Newbie, instead of discarding the data. As a consequence, RC has larger partitions than MDS, while costs only minor bandwidth maintaining expenses, even though the Newbie interacts with k nodes. For instance, k=7, a Newbie needs to download only 0.16 MB data, 39% less than OMMDS, and 84% less than the initial strategy. Furthermore, we conducted simulation experiment of nodes stability measured in real distributed storage system, the results state that when k=7, RC reduces bandwidth by 25% than the hybrid solution. The larger k is, the better RC performs.

7.5 DATA ENCRYPTION

Data ENCRYPTION is to protect data privacy and security in case that storage nodes try to spy, steal or damage the data. Before users behavior data is uploaded to the network, all DATx users

behavior archives have been through advanced cipher, and a decipher cannot occur on storage nodes, but only after download. In no circumstances can storage nodes decipher its stored data.

We utilize a cryptography mechanism to guarantee the information security. It is a mathematical algorithm that maps data of arbitrary size to a bit string of a fixed size (a hash) and is designed to be a one-way function, that is, a function which is infeasible to invert. The only way to recreate the input data from an ideal cryptographic hash function output is to attempt a brute-force search of possible inputs to see if they produce a match, or use a rainbow table of matched hashes.

Hash function is given as:

$$Hash(original\ information)=Message\ Digest$$

Ideal hash function generates output varies with input.

A cryptographic hash function allows one to easily verify that some input data maps to a given hash value, but if the input data is unknown, it is deliberately difficult to reconstruct it (or equivalent alternatives) by knowing the stored hash value.

For example, a user interact with an ad at a certain moment, and this is recorded in blockchain, then following is executed:

$$Hash(a\ user\ is\ doing\ something\ with\ an\ ad\ at\ this\ time)$$
$$= GAHGAH787DAFAFt$$

The ledger then would record an item as GAHGAH787DAFAF, which stands for the action the user takes with the ad at the moment, the original information is hidden, and user privacy is ensured.

The linked blocks form a chain. This iterative process confirms the integrity of the previous block (any change of the information changes hash value, failing to be verified), all the way back to the original genesis block (once verifying the hash value of the last block, the whole ledger is verified).

We also apply a cryptosystem, known as asymmetric public-private key cryptosystem. In such a cryptosystem, the encryption key is public and it is different from the decryption key which is kept secret (private). To clarify it briefly, let us have a look at a classic asymmetric public-private key cryptosystem - RSA (Rivest–Shamir–Adleman) algorithm.

The keys for the RSA algorithm are generated the following way:

1) Choose two distinct prime numbers p and q. Prime integers can be efficiently found using a primality test, so that $n = pq$.

   For security purposes, the integers p and q should be chosen at random, and should be similar in magnitude but differ in length by a few digits to make factoring harder.

n is used as the modulus for both the public and private keys. Its length, usually expressed in bits, is the key length.

Compute $\lambda(n) = lcm(\lambda(p), \lambda(q)) = lcm(p-1, q-1)$, where λ is Carmichael's totient function. This value is kept private.

Choose an integer e such that $1 < e < \lambda(n)$ and $gcd(e, \lambda(n)) = 1$; i.e., e and $\lambda(n)$ are coprime.

Determine d as d ≡ e−1 (mod λ(n)); i.e., d is the modular multiplicative inverse of e (modulo λ(n)).

This is more clearly stated as: solve for d given d·e ≡ 1 (mod λ(n)).

e is released as the public key exponent.

d is kept as the private key exponent.

More generally, for any e and d satisfying ed ≡ 1 (mod λ(n)), the same conclusion follows from Carmichael's generalization of Euler's theorem, which states that m λ(n) ≡ 1 (mod n) for all m relatively prime to n.

Cited from: https://en.wikipedia.org/wiki/RSA_(cryptosystem)

(N,e) is encapsulated as public key, (N,d) is encapsulated as private key.

Suppose m is plain text, then encryption is to calculate ciphertext c:

The public key consists of the modulus n and the public (or encryption) exponent e. The private key consists of the modulus n and the private (or decryption) exponent d, which must be kept secret. p, q, and λ(n) must also be kept secret because they can be used to calculate d.

When the key is long enough, RSA encrypted information would be never be deciphered.

7.6 SUMMARY

We specifically propose our own technology to realize our objectives. Our public chain not only can meet advertising needs, but also potentially support businesses with similar demand. During our way of explorations, we have better integrated real user behavior in our public chain design, what we call as Power of Identification (POI).

8

DATx PRODUCT ROADMAP

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STAGE I (2018 Q2 - 2018 Q4)

Ad Platform Integration + POI User-oriented Behavior Data Implementation

1) Avazu as the first advertising platform to be compatible with DATx. Achieve customized native ads and acquisition of active users;
2) Implement incentive mechanism for users, publishers and advertising platforms;
3) Establish user-oriented decentralized behavior archive, set as a data foundation for advertising eco-DMP;
4) Develop anti-fraud system based on user behavioral data, better cleanse the ecosystem.

STAGE II (2019Q1 - 2019Q4)

Ad Content Upgrade + AI Customized Content Recommendation

1) Establish the form of native ads feed;
2) Attract additional advertisers to deliver on our ad platform based on new ad form of content feed;
3) Implement personalized recommendation system based on AI and user-oriented decentralized behavior archive, and continuously optimize the ad performance.

STAGE III (2020Q1 - 2022Q4)

Ecosystem Booming + Enhanced Value Creation + DATx Blockchain Implementation

1) Integrate subsequent advertising platforms to DATx and become part of the ecosystem;
2) Attract more advertisers join to our Ad platform based on native ads;
3) Integrate more D-app into DATx ecosystem;
4) Implement DATx blockchain, the No. 1 blockchain for programmatic advertising.

9

DATx CORE TEAM

9．DATx CORE TEAM

The development of DATx is initiated by Cosima Foundation, in cooperation with QTUM Foundation and Avazu.

Core team includes a development team of over 80 engineers, product managers, architects and UEX experts.

Other Team Members include:

Ralph Sas

Ralph graduated from the University of Avans Hogeschool Den Bosch in Germany. Currently, he is the acting CEO of DotC United Group and the CEO of Avazu Europe Europe/NA/Latam, a subsidiary of the mobile advertising platform. He is the Member of the Board of Directors of Avazu Holding.

In addition, Ralph ever worked for ZinQ Media and R&D Media, both of these two companies are the leading company in mobile internet and online digital marketing of Netherlands.

Guus Esbir Wildeman

Guus graduated from the University of Hogeschool INHOLLAND, he is an expert in Affiliate Marketing, Social media, SEO, PPC, PPV, online promotion areas.

He served for DotC United Group for over 3 years and now is the current COO of Avazu Europe /NA/Latam, before that, he was ever a Sales Director of EU area of iQU.

Guus devoted his efforts into Creating a perfect connections between gamers, publishers and advertisers and try to earn more robust marketplace for online games. By using his previous

intelligence platform - sophisticated GameriQU™ across the Internet, social media, mobile devices and more, carries a big and deep influence in European countries.

Robert Körbs

Robert Körbs graduated from the University of Applied Sciences Berlin (which was listed in the first place of West Europe area) ,he specialized in Business Computer Science. Until now, he had more than 8 years of work experience in digital marketing, user access, Ad business, as a pioneer team leader of running start-up ecosystem.

At present, Robert is holding the position of Managing Director of Avazu Europe/NA/Latam. He ever worked for sub corporation of Hitfox group, ad2games,a digital innovation marketing game company, with the title of the Head of Advertiser Relations.

Alejandro Bonsignore

Alejandro has been professor within Law and Social Science at UADE university, one of the top ranked universities in Buenos Aires, with experience of leading roles for major companies in the Digital Advertising industry, such as Improve Media Network. He has deep knowledge about the Aviation Industry after working many years as Consultant. Today, Alejandro is the Director of Business Development at Avazu LATAM.

Ben Pony van Kessel

Ben Pony van Kessel graduated from Amsterdam University of Applied Science, and is currently the Director of Business Development at Avazu Europe. Ben came in contact with the online marketing industry in young age working for an multinational lead generation company where he

achieved great heights of success by being responsible of devising business development strategies and the entry and settlement in new markets. Having a past experience in sales, Ben was able to develop strong skills within the online marketing and international sales field.

Stefan Suripatty

Stefan Suripatty is the current European and North American Director Advertiser Relations at Avazu Latam. Stefan served many years as Senior Developer of R&D Media, an internationally operating Media company that operates in B2C Mobile & Internet entertainment, Ecommerce and Online lead generation industry. Stefan has worked many years within the Online - and Digital Advertising Industry with major companies such as R&D Media and Bandbreed and had an initial career as web developer.

Justin Turner

Justin Turner graduated from Esdal College with Economics and Society.
For many years Justin had leading roles at IQU, which is an online performance marketing company specialized in games. Currently, iQU serves more than 6000 gaming specialized publishers with more than 150 game offers. Justin is the European and North American VP Affiliate Manager at Avazu LATAM. Justin has over 5 years of experience within the advertising and publishing industry, with great knowledge about Online and Mobile Performance marketing and great insights in the gaming industry.

Kiki Henrichs

Kiki Henrichs is currently European and North American Global Sales Director at Avazu Latam. Kiki has many years of experience within Media buying and online advertising, for example managing major clients at Match My Brand, part of the AEGIS group.

Amos Fang

Amos Fang graduated from National chio-Tung Tung University and formerly served as the R&D Assistant Manager of CyberLink, which is one of the leading Multimedia software companies, with PerfectCorp as its subsidiary, one of largest Taiwanese Mobile Internet enterprise.
He has nearly a decade of experience within International Business Development with success in online & offline user growth in global market for E-Commerce clients such as Alibaba, Yahoo and Amazon. Currently, Amos is Head of APAC Business at DotC United Group.

Olle Falkenäng

Olle Falkenang graduated from Uppsala University and was former Project leader at oBike Global. Olle has many years' experience within Online - and Social Media Marketing for the Retail and Gaming industry for companies such as Electronic Arts and Gamestop, and has extensive knowledge and insights within Business Development and Sales Management from IBM.