

elastos white paper

Smart-web powered by blockchain

Prepared by: elastos foundation

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Description

This document is the Elastos white paper version 0.2, which includes additional descriptions of Elastos strategic goals and technology roadmaps. Elastos will be continuously updating this white paper to reflect new developments. For the latest information on the Elastos white paper, roadmaps, team, foundation management, investors, and strategic partners, please visit the Elastos official Web site: http://www.elastos.org

Contact

Elastos Foundation:

Elastos (Shanghai):
The 11th floor, Huahong International Building
No. 463 the Tanggu Road, Hongkou District
Shanghai, China 200080

Elastos (Beijing):
Plug & Play, Building G
Zhongguancun Yingzao Street
No. 45 Chengfu Road, Haidian District
Beijing, China 100084

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Email:

The white paper group: whitepaper@elastos.org

The global community: global-community@elastos.org

The Elastos fund: Elastos-fund@elastos.org

Public relations: pr@elastos.org

Investor relations: ir@elastos.org

The Elastos council: elastos-council@elastos.org

Other relations: contact@elastos.org

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Disclaimer

Elastos will be continuously developing its technology and organizational structure, but aims to keep the current governing principles of the Elastos community as well as the allocation plan of Elastos tokens.

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1. Introduction to Elastos

Elastos aims to create a new kind of Internet, powered by blockchain technology. On this new Internet, people will be able to own digital assets and generate wealth from them. Today, there is a seemingly infinite supply of digital books, movies, music and games. But people do not necessarily own their digital property. You can purchase a digital book, for example, but you can't sell it to anyone else. So, do you really own it? Elastos wants to make digital assets scarce, identifiable and tradable. Property rights pave the way for wealth creation, and Elastos intends to build a new World Wide Web that respects those rights.

The goal is to create an Internet that allows users to access articles, movies and games directly, without going through a media player or another platform intermediary. Elastos will use blockchain technology to issue IDs for digital content, making it possible to know who owns which digital assets. On the Elastos Internet, filmmakers will know how many times their movies were viewed. The combination of Elastos and blockchain technology lays the foundation for a trustworthy and secure Internet of Wealth.

Elastos will be a platform for decentralized applications (Dapps) that runs on a peer-to-peer network with no centralized control. People can access these Dapps via their mobile phones, without changing their operating system. The old Internet is a Web of information. If you click a URL, you get data. Elastos is creating a Web of apps. When you click a URL, you get code. The Elastos Web will be a special economic zone where Elastos tokens function as the base currency.

Elastos is open-source software whose development process has been sponsored by industry giants such as the Tsinghua Science Park, the TD-SCDMA Industrial Alliance and the Foxconn Group for more than 200 million RMB. Elastos has published more than ten million lines of source code, including four million lines of original source code.

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2. Technology Background

The Bitcoin Blockchain is a decentralized, immutable ledger that allows people to put their trust in data. Ethereum implemented a programmable blockchain that could support smart contracts, enabling people to put their trust in code. Smart contracts, put simply, allow for transactions to be automatically executed once contractual obligations are met. Sellers will only get paid, for example, after their products are successfully received by buyers. Companies that do crowdfunding can assign specific production tasks only after they have raised a certain level of money. Otherwise, funds will be returned to participants.

Thanks to smart contracts, we don't need to worry about breaches of contract or the credit scores of our trading partners, because the blockchain will execute transactions after both parties have fulfilled their promises. This system eliminates mistrust between buyers and sellers. The question is: How can we apply this smart contract system to an even wider array of businesses? Could we use it to operate an electronic bookstore, or a trading platform for video games or movies?

Ethereum smart contracts are useful when applied to financial and semi-financial projects, as well as to online voting. Elastos believes, however, that Ethereum-based Dapps have the following limitations:

- Storage and speed. Storage capacity is limited to the blockchain itself, which can only save a limited amount of data with a very low speed. The popularity of the blockchain game CryptoKitties induced Ethereum congestion, highlighting the difficulty of running smart contracts on the main public blockchain alone.

- Bugs. Smart contracts are neither stoppable nor revisable once they are executed. This is logical and protects both parties: Agreed upon contracts cannot be stopped or changed. But smart contract bugs, such as the DAO attacks, do exist. Moreover, there is no way to prove that a program has no bugs.

- Cost. At present, smart contracts, data recording and contract executions are all conducted on the blockchain. It means that many nodes are repeatedly doing the same tasks. Ethereum requires that every time you do a task, you pay a fee. So executing contracts on Ethereum can become expensive.

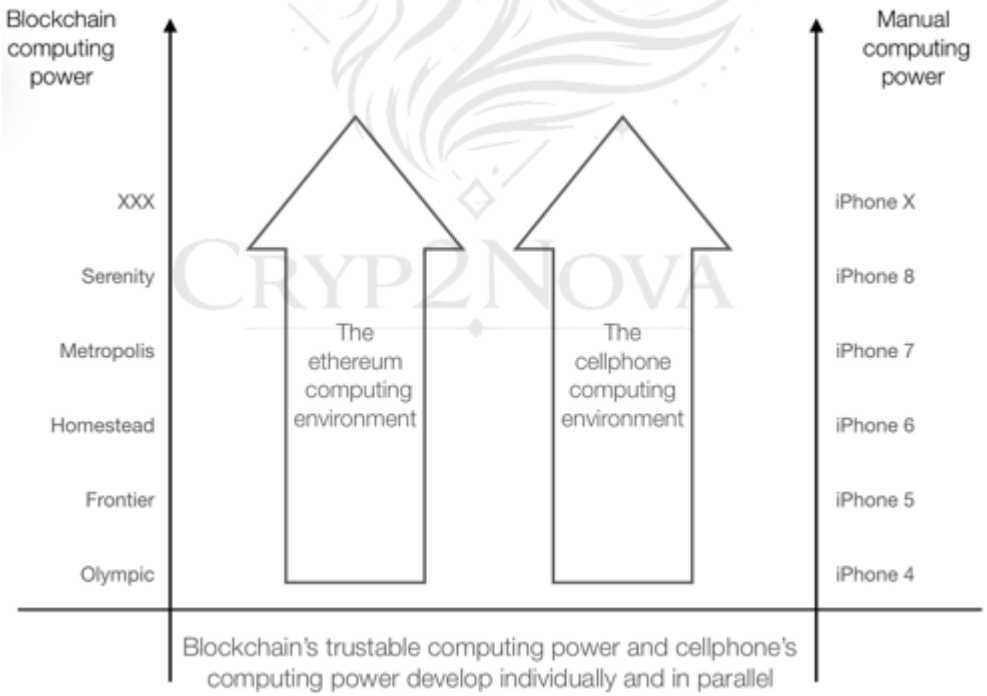
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- Junk data. There is an accumulation of historical junk data on the Ethereum blockchain. Once published, a smart contract will be saved on the blockchain forever. Junk and redundant data have a negative influence on blockchain efficiency, and this can lead to Ethereum congestion.

- Lack of Flexibility. The coupling between the blockchain and the Ethereum Virtual Machine (EVM) that executes smart contracts make them inseparable. Upgrades to the blockchain impact the EVM, and vice versa.

- Security. Smart contracts running on Ethereum or Ethereum-like systems are subject to middleman attacks when they go off the blockchain and on to other Web sites.

Due to the problems mentioned above, Elastos believes that it is difficult and inconvenient for users to read digital books, play games, and do encrypted chatting with Ethereum smart contracts. Furthermore, people are accustomed to using their mobile phones to run apps. Elastos wants users to be able to access the blockchain's trust-based system via the mobile devices that are already using.



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As the above figure demonstrates, no matter how powerful a user's cell phone is, it does not speed up Ethereum's computation. No matter how many Ethereum upgrades there are, its credibility guarantees do not extend to people's daily mobile phone use. This is due to the fact that Ethereum computing and mobile phone computing were developed and executed in parallel and are not integrated.

Today's smart contracts are designed to run on the blockchain exclusively. Elastos, by contrast, will run Dapps that are enabled by blockchain technology, but do not have to run on the blockchain itself. Elastos will allow users to access those Dapps via their current operating systems. Dapps will run on Elastos Runtime, which runs on top of Android, iOS or PCs.

In summary, Ethereum is great for smart contracts. But Elastos believes that there are two main reasons why the Ethereum EVM is not suitable for running Dapps:

- Blockchains are made for consensus-based record keeping, but can lack computation speed or flexibility.

- Current blockchains are designed to record transactions, not to store data. There is simply not enough space on the current blockchain to store a large quantity of digital movies and books.

To address the first problem, Elastos proposes to adopt a flexible main chain and sidechain blockchain design structure. The main chain is only responsible for basic transactions and transfer payments, while the sidechain executes smart contracts to support various applications and services.

To address the second problem, Elastos runs applications on Elastos Runtime as opposed to on the already congested blockchain. This method is also more secure. With Elastos, all network data must be sent through a trustable and identity-verifiable channel. Identification and authentication come from the blockchain ID. In this way, the blockchain's credibility can be transferred to Elastos Runtime. Elastos Runtime can have various forms: an independent OS, a Virtual machine, or a software development kit (SDK) that integrates into native apps of other mainstream operating systems.

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The Elastos design philosophy integrates the convenience of mobile phones with the credibility of blockchain technology, allowing users to access apps without going through a third-party intermediary. Elastos will create an environment in which digital assets can be traded peer to peer.

3. Elastos: A Blockchain-Powered World Wide Web

The design philosophy of Elastos originated from Rong Chen, a former senior software engineer at Microsoft. Building on his experience at Microsoft, Chen wanted to create a platform in which applications and services are not allowed to access the Internet directly. Without access to the network, malware would not be able to steal user data or attack other services on the Internet. Chen's vision was subsequently developed into an open-source, lightweight operating system for virtual machines (github.com/Elastos). In 2017, blockchain technology was integrated into Chen's vision, enabling development of the Elastos Smart Web.

The Elastos Smart Web is composed of four pillars:

- Elastos Blockchain. Elastos wants to build a decentralized Smart Web, where each device, individual, Web site and digital asset has a trustworthy ID. Blockchain technology enables the establishment of trust on the Internet.

- Elastos Runtime. Elastos Runtime is a lightweight operating system that prevents applications and services from directly accessing the Internet. Elastos Runtime runs on a customer's mobile device or PC.

- Elastos Carrier. Elastos Carrier is a completely decentralized peer-to-peer platform. This carrier takes over all network traffic between virtual machines and conveys information on applications' behalf.

- Elastos Software Development Kit (SDK). Applications need the Elastos SDK to access their IDs and Elastos Carrier services on the Smart Web.

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Elastos has the following features:

- The Elastos public chain is clean and simple, and hidden from third-party applications and services.

- Elastos prevents overload of the main chain by having a few predefined sidechains built into the Elastos Carrier platform.

- Elastos promotes the property rights of digital content. Elastos has the capability to issue tokens for digital assets or applications and to establish the ownership of digital content through smart contracts.

- Elastos Runtime runs on the OS of customers' mobile devices. Apps are free to run and their performance is comparable to existing mobile apps. Elastos supports traditional programming languages, making it relatively easy to write code. Elastos also supports popular programming frameworks.

- The separation of apps from the network ensures that digital content won't be leaked.

- Even when Elastos apps are running on operating systems such as iOS, Android and Windows, the local OS won't be able to sabotage the property rights of digital assets. The value of digital assets is preserved.

- For non-Elastos apps such as Android or iOS apps, users can access the Elastos Smart Web through the Elastos SDK. Users can log into non-Elastos apps using their Elastos Smart Web ID. Users can also keep their non-Elastos app data in their Elastos cloud storage.

- Both Elastos smart contracts and Elastos Dapps run on the Elastos Smart Web. This creates a closed platform and avoids the necessity of moving on and off the blockchain. This closed platform creates a special economic zone where users can feel secure while trading digital assets. This enables a closed cycle of production, transaction, and consumption that is necessary for creating wealth.

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Here is a quick summary of the unique Benefits of Bitcoin, Ethereum and Elastos:

- Bitcoin = Trustworthy Ledger
- Ethereum = Trustworthy Ledger + Smart Contracts
- Elastos = Trustworthy Ledger + Smart Contracts + Monetizable Dapps and Digital Assets.

Current blockchain technology allows for the recording of property rights. But while users can prove that digital books belongs to them, they can't necessarily prevent people from stealing or reading these books without permission. In such an environment, it is very difficult to monetize digital assets. Elastos aims to solve this problem by creating an environment in which the execution of a digital asset (i.e., the viewing, buying or selling of a digital movie) all take place on the Elastos Smart Web, and therefore abide by the rules of smart contracts. The creator of digital content can use a tool, provided by Elastos, to determine the number of digital assets to produce. Authors, for example, can decide that they only want to have 5000 copies of their books in circulation on the Smart Web. Setting a finite amount of digital content produces scarcity and enables the realization of capital.

Elastos also wants to enable consumers to become investors. Say there are only 5000 digital books in circulation, and that these books become extremely popular. That means that every one of those books will increase in value, creating potential wealth for the people who bought them. After enjoying the book, the customer could sell it to someone else for a higher price. Users can also buy limited edition game apps. After playing those games in Elastos Runtime on their cell phones, they can sell the games to other people. Because these games are limited editions, their value will fluctuate on the second-hand market.

In another use case, filmmakers could raise money for their movies by crowdfunding through issuing their tokens. The filmmakers could write a smart contract saying that every time someone watches the movie, token holders will get a small share of the fee. The filmmakers may also write another smart contract to let moviegoers sell the movie peer-to-peer or via social networks and receive commissions.

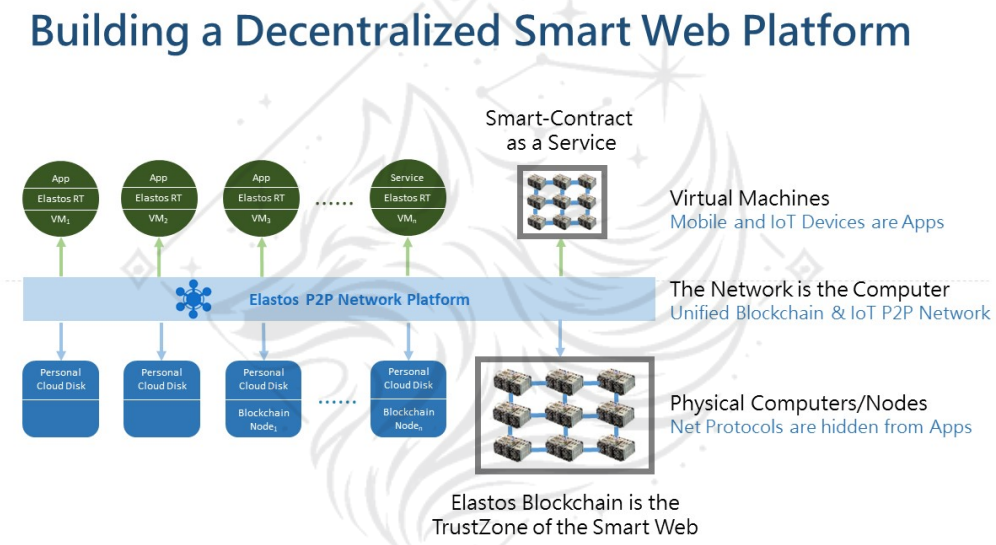
This system creates financial opportunities for both creators and consumers, thus incentivizing more people to use Elastos. The accumulation of more users will incentivise more digital content creators to produce and publish content on the Elastos platform. This increase in content could then attract even more users, and those additional users will

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create more content. This is a positive cycle that will result in a large amount of valuable digital content that can be used to generate wealth.

4. Decentralized Smart Web Platform

The chart below illustrates the relationships among the key components of the Elastos platform:



4.1 Digital Assets Right Authentication, Trading, and Circulation

Scarcity in the agricultural age has been replaced by big data in the information age. Today, digital resources can be duplicated without cost. Even as digital assets are widely produced, circulated and consumed, they are not necessarily generating wealth. When digital resources are not authenticated, this leads to side effects like piracy and a lack of motivation for original innovation.

Blockchain technology addresses this problem by making digital assets authenticated and scarce. Elastos supplies the infrastructure for the authentication, trading and circulation of digital assets. When any kind of digital resource is published online through the blockchain,

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it will have proper authorization, and afterwards this resource can be used for trading and circulation.

The Elastos wallet must be used to publish a digital asset, and the balance should be enough to pay the mining fee. The publisher of a digital asset can then create requests for authentication, which will include information such as the user's wallet address, Uniform Resource Identifier (URI), the price and amount of the asset. Afterwards, the hash number will be calculated and the transaction will be recorded as an unspent transaction output (UTXO) on the chain. When the record of asset authentication is published on blockchain, it will become a tradable digital asset. After the asset is purchased, the ownership of the purchased digital asset is transferred to the customer, which means it can be sold again.

4.2 Decentralized Applications (Dapps)

Based on existing cryptocurrency and blockchain technology, so far there is no Dapp that can compete with mainstream apps. The reason for this is that computing power and input/output operations per second (IOPS) of Dapps are relatively weak. Current blockchain infrastructure can be easily overwhelmed. Elastos will introduce a new computing paradigm and enable decentralized applications to perform with an IOPS comparable to mainstream applications.

The Elastos blockchain is designed to use a main chain and sidechains. To avoid bloating the main chain with unnecessary data, all the smart contracts and applications will run on sidechains. Users can easily develop secure Dapps, and boot them from hardware devices based on the Elastos Operating System. Otherwise, they can use the Elastos Runtime environment on traditional operating systems (Android, iOS, Windows, etc.) to develop decentralized applications. Elastos Runtime can be accessed via both the VM and the SDK.

5 The Elastos Blockchain

Similar to the operating system on a mobile device, users need a trustworthy location to store important data. The Elastos blockchain works as this trust zone for the entire network operating system.

The Elastos blockchain applies main and sidechain solutions to facilitate the smart economy and a healthy decentralized application environment. This means that every application can

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create individual sidechains. The Elastos blockchain provides built-in, complete, easy-to-use sidechain support. They will also be customizable, allowing clients to pick a different consensus method depending on the use case.

Tokens can be published on sidechains. These tokens may participate in two-way asset transfers across the main and sidechains. At the same time, due to merged mining, energy consumption will be minimized to avoid vast electricity costs and coal emissions.

5.1 Trade and Block Design

The Elastos blockchain structure is based on the existing cryptocurrency systems design first introduced by Bitcoin. This includes requirements for block authentication such as the previous block hash, the Merkle tree root hash, a nonce for the consensus algorithm, timestamps, difficulty goals, and more.

Elastos improves on the current digital currency experience and adopts a sidechain design philosophy. Elastos can adopt features that improve sidechains such as removing validation scripts from the transaction structure. The sidechain is the foundation for running Dapps on Elastos, while the Elastos main chain structure provides infrastructure and support for the sidechains and enables convenient asset transfer.

5.2 Merged Mining

The Elastos blockchain utilizes merged mining with Bitcoin, the process by which consensus is reached on both chains simultaneously. In this case, the Bitcoin blockchain works as the parent blockchain to Elastos, with the Elastos chain as its auxiliary blockchain. The mining pools will deploy merged mining code and miners will submit proof of work to both blockchains at the same time. Energy consumption does not increase with merged mining, and will be equal to the energy consumed for mining either alone. Through this mechanism, the Elastos blockchain has an extremely strong guarantee of computing power and will then be able to provide blockchain innovations at a global scale. It makes full use of existing Bitcoin computing resources in addition to being environmentally friendly. Additional benefits of merged mining include:

1. The transfer of trust over multiple chains. The Elastos main chain is merged mined along with the Bitcoin main chain. This merged mining characteristic can be extended to

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Elastos sidechains as long as the sidechain adopts the same proof of work consensus. Thus, layers of chains can be merged mined recursively, which establishes a hierarchy of trust among chains.

2. Isolated nodes. An auxiliary blockchain, or sidechain, dependent on merged mining does not need a consensus of multiple nodes. In the extreme case, one chain only needs one node and does not diminish the reliability of the ledger information on the main chain or other chains. No other blockchain consensus algorithm has this kind of advantage.

5.3 Token Distribution Plan

The Elastos Token, or ELA, is the intrinsic token on the Elastos blockchain. It can be used for trading, investing in digital assets, paying for blockchain processing fees and so on.

ELA is the basic unit. In addition, to pay respect to the cryptocurrency torchbearer Satoshi Nakamoto, Elastos would like to use Satoshi ELA (Sela) as the minimum currency unit for ELA. 1 ELA is equivalent to 10^8 Sela.

Elastos will issue a scarce amount of tokens. The total number of Bitcoins will eventually reach 21 million, and Elastos would like to create a total of 33 Million ELA. The ELA distribution plan and implementation procedures are as below:

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ELA (units: 10000)	Purpose	Notes
1650 (50%)	Ecosystem Development	Based on the time when the Elastos genesis block is created, Elastos confirms the Bitcoin holder and might send them ELA free of charge. The detailed rule is as following: • Target: Feedback to cryptocurrency community and creation of effective circulation • Amount: Bitcoin holders can achieve the equivalent amount in ELA • Channel: Issuing ELA only through authorized cryptocurrency exchanges • Method: The Elastos Foundation will authorize exchanges to issue tokens, nobody can automatically obtain ELA • All the ELAs that are not claimed will be invested in Elastos.They will not be used for the daily operation of the Elastos Foundation
500 (15%)	Angel Investors	Elastos angel investors are made up of Elastos founders and key partners. The Bitcoin proceeds will go to the Elastos Foundation
800 (24%)	Private & Public Crowdfunding	The investor community is the backbone of Elastos, and it will support and facilitate Elastos development. All the raised cryptocurrency will belong to the Elastos Foundation, and it will be used to develop the Elastos platform. The Bitcoin proceeds will go to the Elastos Foundation
350 (11%)	Elastos Foundation	These funds are pre-allocated for supporting Elastos Foundation operation and investing in the Elastos ecosystem

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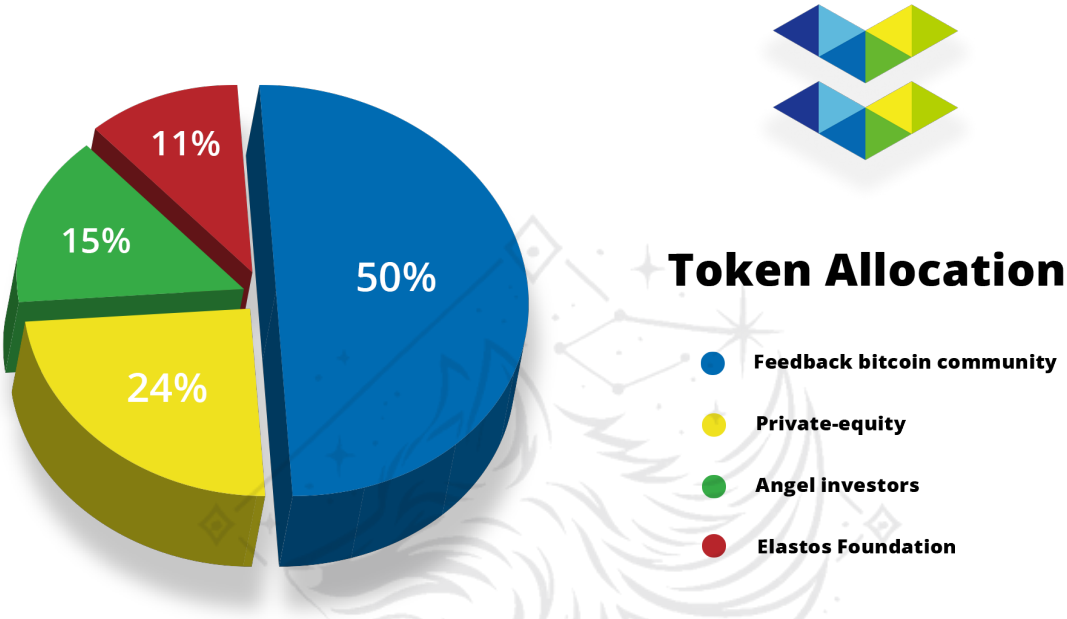


fig2. conversion relationships

To compensate for the natural loss of tokens, such as users losing their wallets, as well as to keep up with slight inflation, the amount of ELA in circulation will increase annually at a fixed rate of 4%.

ELA will be produced every two minutes during Bitcoin merged mining. These newly minted coins will be allocated to the Elastos Foundation and miners. The Elastos Foundation will take 30%, the remaining 70% belongs to miners.

5.4 Sidechains

Any system built with blockchain technology has less computing power than a traditional computer, and so will not be able to meet the various requirements of Internet applications (such as video games or streaming a high-definition movie). This is a fundamental reason why blockchains still cannot be applied on the Internet at a large scale. The Elastos team

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recognizes this fact, and therefore believes that blockchain development should not rely solely on the main chain for computation. Elastos aims to scale their blockchain system by providing support for sidechains, which will help meet requirements for running applications with high IOPS.

The Elastos main chain will be responsible for the small but very important role of trading and transferring ELA, thus providing stability to the blockchain system. Elastos wants to avoid bloating the main chain with unnecessary smart contracts. Instead, only major infrastructure upgrades will take place on the main chain. All other smart contracts can be implemented on sidechains, enabling scalability.

This kind of hierarchical and structured design philosophy will pave the way for a future blockchain paradigm, such as the aforementioned development from stand alone computation to a distributed one. This is a key innovation in blockchain technology, and more important than the partial technology of singular consensus algorithms and chains.

The team will implement basic services as sidechains for global and public use. These services include ID generation, token distribution, digital asset trading, and fast payment systems. These basic services, all important infrastructural components, are part of the Elastos Smart Web. In addition, the team will also provide support for third-party sidechain development.

Transactions are the most important part of the interface between the main and sidechains. The transaction procedure for sending tokens from the main chain to a sidechain is equivalent to sending from a user account on the main chain to a multisignature address corresponding to the sidechain. The process automatically checks that the sidechain can identify the transaction and deposit the equivalent value of sidechain tokens to the sidechain account.

Main to Sidechain Transaction Procedure:

- User creates a random secret and its corresponding hash.
- User constructs a multisignature address on the main chain. To unlock, both the secret and the user’s private key of the multisignature address must be provided.
- User sends the transaction and their secret’s hash to the sidechain transaction processing node.

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- The transaction processing node on the sidechain generates the token-sending transaction after authentication by hash and private key of multisignature.
- User provides the secret to unlock the transaction and receive the tokens from the sidechain.
- The tokens are deposited to the multisignature address.

The transaction procedure for sending ELA from sidechain to main chain is equivalent to sending ELA from a multisignature address on the main chain to the user account on main chain.

Sidechain to Main Chain Transaction Procedure:

- User creates a random secret and its corresponding hash.
- User creates a transaction on the sidechain. To unlock, the secret must be provided.
- User sends the transaction and the secret's hash to the main chain transaction processing nodes.
- The transaction processing node on the main chain generates the token-sending transaction after authentication by hash and private key of multisignature.
- User provides the secret to unlock the transaction and receive the tokens from the main chain.
- The multisignature address corresponding to the sidechain unlocks the withdrawal and spends the relevant tokens.

To control the security of ELA on a multisignature address, the address can only generate a token withdrawal transaction as outlined above.

5.5 Smart Contracts

If computationally-expensive smart contracts are deployed on the main chain, even if they are not invoked, every node in the network will need to constantly update. This is a burden on pure verification nodes, as mining nodes can still receive the fees for processing transactions. To avoid this, the Elastos main chain limits smart contracts usage and delegates them to sidechains. Each sidechain can design smart contract functionality independently, similar to how NeoContract supports the NEO blockchain.

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6. Elastos Carrier: a Decentralized P2P Network

Elastos Carrier is the decentralized internet service provided by the ecosystem of Elastos. Its nodes may be executed within any internet-connected environment, including local area networks within a home or workplace. By using UDP-based NAT (User Datagram Protocol, Network Address Translator) transparency techniques, all pairs of nodes will have the power to establish connections with one another, even direct connections. This will allow for the plentiful utilization of every node's individual capacities, which will serve to increase the effective horse power of the network as a whole.

The set of foundational services will include decentralized domain names, decentralized computation, and decentralized storage. There will be foundational support provided for the development of Dapps. Within such an environment, the user may possess his or her own data and computation under an abundant level of privacy protection. At the same time, the user will have the power of renting out his or her own equipment at will, by means of the Elastos Blockchain, and can collect remuneration according to the amount of computation and storage that was consumed, providing motivations for an Elastos marketplace.

7. Elastos OS: A Secure, General Purpose Operating System

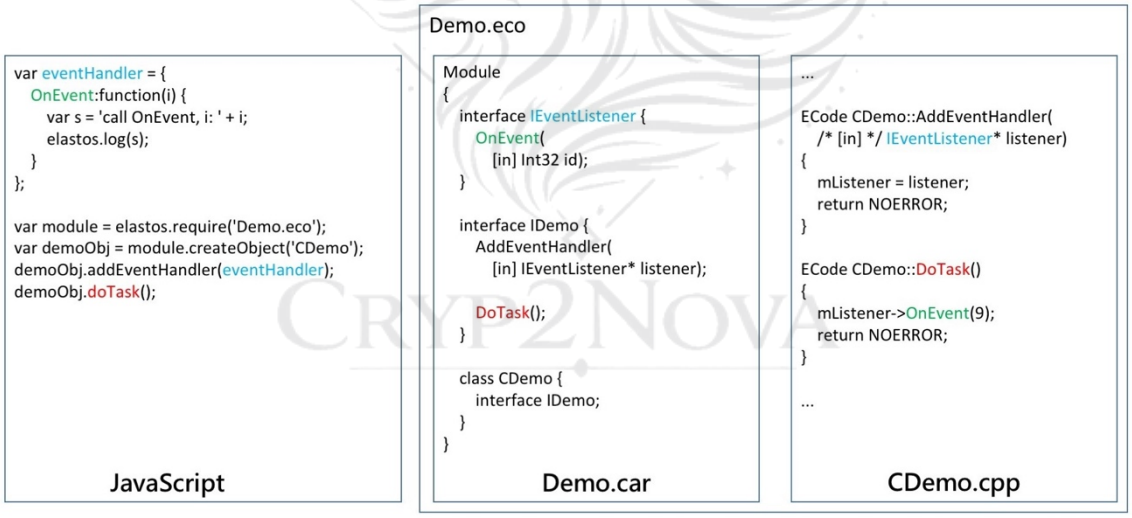
Elastos OS is a general-purpose operating system that is based on a respect for security. It is an operating system made to address the needs of the Internet of Things (IoT), of invention kits such as the Raspberry Pi, and of mobile devices. The latest version, namely the third, has been undergoing a process of commoditization since May of 2013. It has successfully achieved beta quality, having been executed and scrutinized on the Moto X (XT1085) phone and the Lamobo-R1S smart router. The total amount of code involved has exceeded 10 million lines.

With respect to security, Elastos OS prohibits direct process creation and does not allow direct interaction with TCP/IP, depending instead upon the system to automatically spawn and determine the location of local, proximate, and distant (or cloud-based) microservices. The system will automatically generate remote procedure (RPC) calls and provide event-based responses, thereby evading possible malicious actions on the part of either the application or the remote service, and recusing itself from relaying viruses further on.

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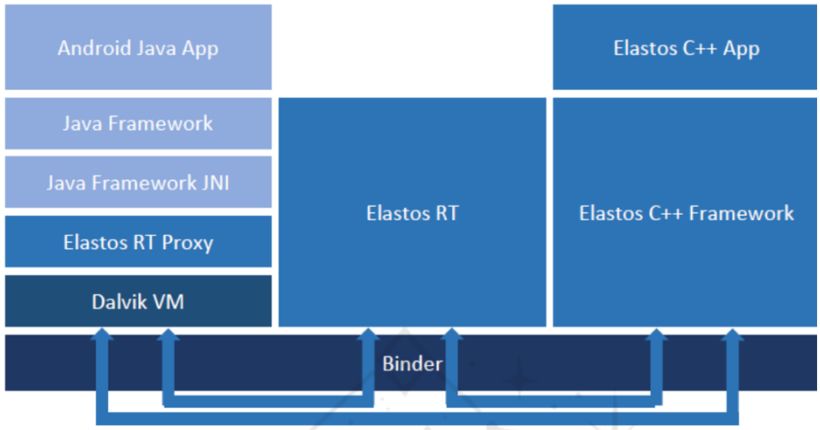
Elastos OS provides an intrinsic and improved decentralized support system for applications being developed, making it easy to interface with Elastos Carrier for the obtainment of the foundational services, and to interface with Elastos Chain to obtain services related to credit and exchange. The resulting Dapps may blithely and simultaneously handle Elastos transactions and other types of digital assets, including: source code, data, e-books, video, and gaming items. They might be handling copyrights, transactions, and circulation, among other things.

The system will utilize C/C++, Java, and HTML5/JS as the primary modes of development. Its C++ API will largely mirror Android's Java API, which will allow for the unified three-in-one management of cloud access, monitoring, and interfacing. Components written in Java, HTML5/JS, and C/C++ will be able to call upon each other in a modular fashion, with no need to manually deal with the JNI. As such, the system truly conforms to the maxim of "write once, run everywhere." The system will support the Component Assembly Runtime (CAR) architecture, as demonstrated by the example below, which uses a CAR component to establish communication between a program written in C/C++ and one in HTML5/JS.



The C++ framework of Elastos OS makes use of Android's application interfaces, which leads to convenience for the developer as well as portability. Elastos OS will even go so far as to execute Android programs directly, thereby achieving the state of affairs as depicted below:

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One may think of Elastos Runtime as the C++ version of the Java Virtual Machine as well as Java's framework. It might even be referred to as the C Virtual Machine (CVM). Elastos OS services and applications will be executed within this CVM, allowing the same services to exist in harmony with a variegated landscape of nodes and hardware platforms.

8. Elastos Runtime Environment for Dapps

Although Elastos OS can be obtained at any time in order to enjoy complete and primary support for the development of Dapps, there are other numerous occasions where the user would prefer to utilize another operating system which is already at hand. In such cases, one can make use of Elastos Runtime, a runtime environment which likewise offers complete support for the applications in question. Developers will be able to choose between Elastos Runtime for Android, Elastos Runtime for iOS, and Elastos Runtime for Ubuntu Linux, depending on their needs.

8.1 P2P Network Interface

Dapps must communicate with each other by means of component interfaces, as they have no means of directly connecting to the internet. This approach is easier, safer, and more natural:

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```
5
6  TrustID myfriend = "0xE94b04a0FeD112f3664e45adb2B8915693dD5FF3";
7  IChat * pChat = CChat::New(myfriend);
8  pChat->Chat("hello");
9
```

The code above does not need to consider serialization/deserialization or encryption/decryption, nor does the programmer need to be involved in writing new protocols. All of these things can be satisfied Elastos Runtime's CAR interface. All which one must do is to edit the CAR document below, and then draft the corresponding functions. Compared with the customary socket-based API, Elastos Runtime is far easier to use. Moreover, one may perform digital asset transaction as seen below:

```
13
14 interface IChat {
15     Chat(String message);
16 }
17
18 class CChat {
19     interface IChat;
20 }
21
```

The following code demonstrates how to transact:

```
24
25 ECode CChat::Chat(String message) {
26
27     // your code ....
28
29     return NOERROR;
30 }
31
```

Applications written using Elastos Runtime are simpler than P2P network applications written using the customary socket API.

8.2 Digital Asset Operations

As shown in the preceding examples, we no longer use IP addresses or domain names for network communication because the current Internet is not trustworthy. However, Elastos Runtime will perform runtime verification a confirmation during Elastos Runtime development by means of the trust zone, which is to say, the Elastos Blockchain.

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```
33
34  ECode _CChat::Chat(String message) {
35
36      ... ...
37
38      //  Check whether ID is exist
39      if (Exist(trustID) == FALSE) {
40          return ERROR;
41      }
42      //  Check whether the current APP ID is on the blacklist
43      if (InBlackList(_Current_App_TrustID) == TRUE) {
44          return ERROR;
45      }
46      //  Check whether the current user ID is on the blacklist
47      if (InBlackList(_Current_User_TrustID) == TRUE) {
48          return ERROR;
49      }
50      //  Check whether the called count has exceeded the upper limit
51      if (Called_Count > MAX_CALL_COUNT) {
52          return ERROR;
53      }
54
55      //  More checks
56      ... ...
57
58      ec = CChat::Chat(message);
59
60      ... ...
61
62      return ec;
63  }
64
```

At this point, digital asset transactions may be performed. The following example verifies digital asset ownership:

```
66
67  TrustID aMovie = "0x32B77CBB265175D1A927c9A3F816de577BDDdE05";
68  TrustID owner = "0xd4fa1460F537bb9085d22C7bcCB5DD450Ef28e3a";
69
70
71  if (Elastos.RT.Trust.CheckOwner(owner, aMovie) == TRUE) {
72      // yes, He is its owner.
73  }
74  else {
75      // error
76  }
77
```


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Finally, a transaction is created and sent:

```
82
83  Elastos.RT.Trust.SendTransaction(buyerID, sellerID, 1000, aMovieID);
84
```

9. The Elastos Foundation

The Elastos project has a long history. Its precursor dates back to 2000 when founder Rong Chen returned to China to start his business. Since then, Rong Chen has been devoted to developing a secure and general operating system for the Internet age. In 2017, the Elastos project became a global, free open-source software project that is driven by the Elastos community. The developed software source code and documents are published with the free open-source software license. The Elastos project is run through the Elastos Foundation. Elastos embraces the free open-source and digital currency community, supports mutual learning and promotes the advancement of human civilization.

9.1 The Elastos Community

The Elastos global community includes fans, developers, community organizers and Elastos token holders across the globe. Elastos is committed to further building this global community. Elastos also has a community of local user groups all around the world, and they work for the community as volunteers. These user groups organize, maintain and develop Elastos local communities. Their tasks include promoting digital currencies and blockchain philosophy, studying Elastos technology, participating in Elastos project development, writing and translating documents, organizing monthly, local community gatherings and assisting in organizing official Elastos global activities.

9.2 Elastos Talent

We are still in the early stages of digital currency and the blockchain. The industry is rapidly developing, and there is a lack of talent. The Elastos founders initiated the program, “We are All Satoshi Nakamoto,” at the Tsinghua iCenter through the Distributed Autonomous Coalition Asia (DACA), which aims to cultivate high-level blockchain technology talent. Since its implementation, this program has cultivated a large amount of industry talent, some of whom gradually became pillars of the Elastos team. The Elastos Foundation will

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continuously support the DACA training projects, and collaborate with the Tsinghua iCenter to cultivate technological development for the Chinese blockchain community.

9.3 Elastos Vision

Elastos is working to become the technology that powers the smart economy. The Elastos Fund will invest in the continuous development of decentralized applications. Elastos wants to create a new World Wide Web that is safer and smarter, and that can one day be known as the Internet of Wealth.

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