Sintrop: A Blockchain for Social and Environmental Impact Applications

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Abstract

Blockchain technology has the potential to significantly impact the fight against climate change and humanity's social problems, many different applications are possible to be built with smart contracts. The problem is that decentralized blockchains process very few transactions per second, so projects with real-world impact need to compete for transactions with memecoins, NFTs and others speculative low-value tokens and projects. This competition increases gas fees, limiting the number of impact business models able to operate. What is needed is a decentralized blockchain infrastructure focused on applications that can make the world better. We propose a public peer-to-peer impact blockchain, running with proof-of-work consensus algorithm with the aim of operating mostly with renewable energy.

1 Why another chain?

We first developed the Regeneration Credit[1] protocol, a peer-to-peer funding system to incentivize the regeneration of terrestrial ecosystems. Then we had to choose which blockchain to launch the project on. Ethereum[2] was our first option, the first testnet versions were launched on top of EVM, the Ethereum Virtual Machine. But Ether is expensive. It increases the financial barrier for user adoption of the technology, especially in more complex applications like the Regeneration Credit. Unfortunately, launching it on top of Ethereum was discarded. So we turned to layer 2 solutions. The bridge system requires transferring assets from one chain to another, an additional step that is a barrier for user adoption. But the biggest problem of second layer blockchains is the need for trust in private groups, which goes against the fundamental principle of blockchain technology. Any other solution that required the project to rely on centralized institutions to exist, such as blockchain-as-a-service, was not an option. We could also develop an appchain, or a private blockchain, but, again, it was against Bitcoin[3] core value: decentralization.

Many blockchains sacrifice decentralization to gain scalability, and some memecoins, low-value tokens and NFTs projects live on a speculative basis without adding real value to society. There is a huge gap for real-world decentralized applications with the intention of making this world a better place. To fill this gap, we decided to create another chain: A blockchain for social and environmental impact applications.

2 Impact as core value

Blockchain technology has the potential to solve problems that can help us fight climate change, water scarcity, pollution, food insecurity and many other issues that put us at risk of extinction of our species. We inherited a Planet with an incredible amount of life, consisting of many different species and functions. Unfortunately, humanity has been destroying Nature at an alarming rate.

Entropy is the measure of disorder in a system, the loss of energy that generates a negative energy balance. While syntropy is the measure of order in a system, the energy gain through processes. It can also be translated in terms of life: entropy occurs when we reduce the amount of life on the planet, whereas syntropy[4] refers to the process of increasing and complexifying life, the natural evolution process of the Planet, which has been reversed by the massive exploitation of resources and pollution by human beings.

Impact as a core value refers to a project, group, or individual contributing to the increase of life on this planet through sustainable habits and processes. Our goal is to build a system that fosters life on Earth through decentralized applications.

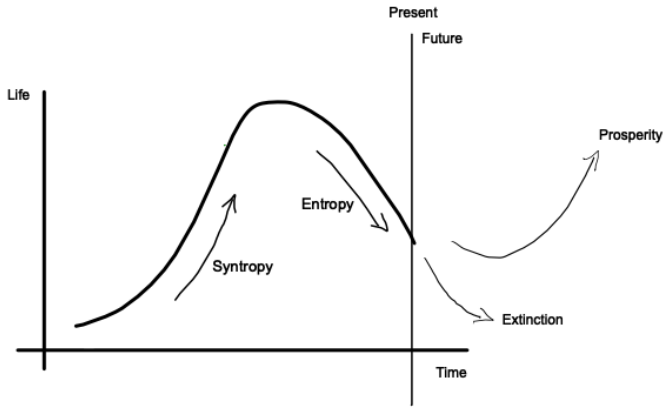

Figure 1: If we analyze the number of living organisms as the sum of all species multiplied by the number of living individuals, we see that this number naturally increases over time—it is Earth's natural process. However, it is now dropping exponentially due to human exploitation. Over the past centuries, we have been destroying the Planet as if its resources were infinite. If we continue at this pace, we are heading toward a global mass extinction.

3 Decentralization as core value

In 2009, Bitcoin[3] was introduced to the world. A disruptive technology that, for the first time in history, enabled a decentralized way of storing and transacting value between two parties without the need to trust a central authority. The primary purpose of this technology was to eliminate central authorities by creating a (P2P) network of computers, where each node stores a copy of the transaction's history and is capable of sending and receiving transactions. The decentralization level is a spectrum, it is not a binary yes or no concept. Some projects can be more or less decentralized, with Bitcoin being the most decentralized of all. Over time, many blockchain projects have prioritized scalability over decentralization. While this trade-off improves transactions per second (TPS), a major limitation of Bitcoin[3] and Ethereum[5], it loses the main purpose of the technology. Scalability is definitively a big problem, but it should not be obtained by sacrificing decentralization. Private or permissive blockchains, where only limited or selected validator nodes can secure the network, are a good example of this trade-off.

Decentralization as a core value means that we share the original vision of Bitcoin. The network is open and transparent, anyone with the appropriate hardware is welcome to run a node and maintain the network. Also, the token distribution is a key aspect. The Sintrop cryptocurrency, the native gas fees utility token of the project, will not be pre-mined, being the only way to mint new tokens with the reward per block when finding new blocks in the Proof-of-Work (PoW) system. In smart contracts we discourage the use of *ownable* contracts that a specific *owner* wallet address has privilege functions. When such functions are required for contract deployment and configuration, *renounceOwnership* must be called to keep it decentralized.

4 Sintrop Virtual Machine

The network consists of a set of peers composed of servers, nodes and miners. Together they compose the SVM, the Sintrop Virtual Machine. A server is a publicly known node that can accept new peer connections. Nodes are computers that can connect to public servers but cannot receive connections from other nodes. Both servers and nodes store a full copy of the blockchain transactions history.

Miners are computers that can run their own nodes but can also mine on behalf of a server, contributing to the network's Proof-of-Work hashing power without needing to store the full blockchain. The more nodes, servers, and miners the network has, the stronger its decentralization, security, and censorship resistance.

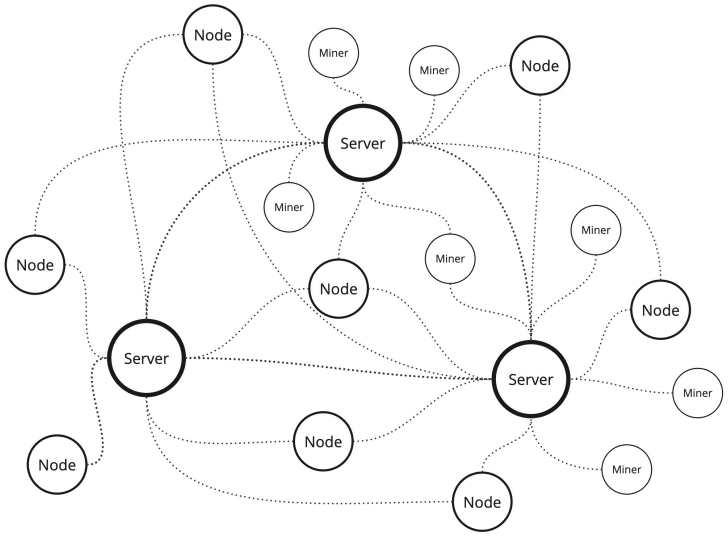

Figure 2: Node architecture that compose the Sintrop Virtual Machine

5 Smart contracts platform

The Sintrop Virtual Machine is a smart contract platform that allows developers to deploy contracts with a predefined set of functions and variables. Once deployed, a contract will always execute as programmed, enabling wallets to interact with its predefined functions without the need for a central authority to define the rules. The value of this technology is to shift trust from centralized groups to open-source distributed code. Over time, people will realize that it makes much more sense to trust distributed algorithms than people.

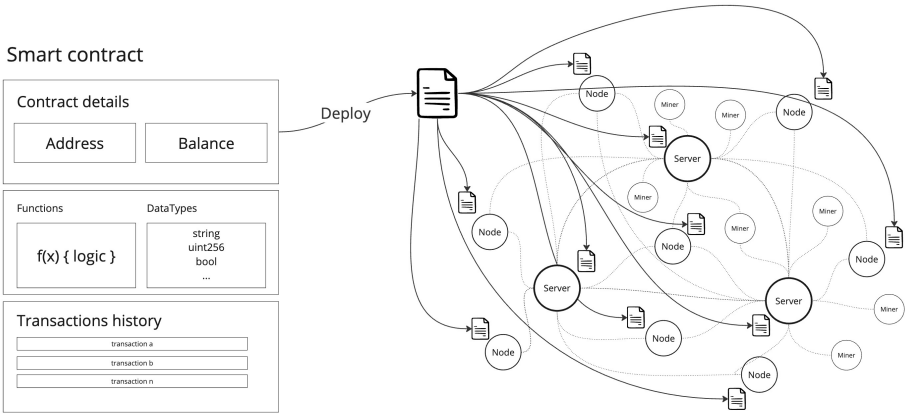

Figure 3: Deployed smart contract

6 Why Proof-of-Work?

The consensus mechanism is a crucial component of any blockchain. Bitcoin introduced Proof-of-Work (PoW), a consensus model where miners use hardware and electricity to compete in finding blocks and securing the network. Later, some projects adopted Proof-of-Stake (PoS), an alternative mechanism that relies on protocol coins to validate blocks.

Both approaches have their pros and cons. The biggest advantage of PoS is its low energy consumption. Since block validation occurs through staking, the only hardware required is for operating nodes, without the high-energy demand of PoW mining. However, this is also its biggest disadvantage. When a network is secured through staking, it requires pre-mined coins, which are then used to maintain security. This can be seen as controversial, since you are creating an asset and using the same asset to validate transactions. In this sense, PoS resembles traditional fiat systems, whereas PoW establishes a distributed, electricity-based electronic cash system. Although PoW mining can lead to centralization with the development of specific hardware and mass assembly of equipment, it is the fairest form of distribution ever implemented to date. No pre-mined coins, just the work to find new blocks.

Table 1: SINTROP block reward will follow the Ethereum Classic monetary policy. Being each *era* the set of 5 million blocks, the reward will drop 20% every *era*

Era	**Starts at block**	**Block reward**
1	1	5
2	5.000.001	4
3	10.000.001	3,2
4	15.000.001	2,56
...	...	...

7 Renewable power

Humanity's need for energy has both advantages and drawbacks. On one hand, reducing consumption benefits the planet, as every energy source, even renewable ones, has an environmental impact. On the other hand, energy drives technological advancements that improve our lives in countless ways. Although all energy sources have some negative impact, the path to a clean and technological future depends on renewable energy, and we must move in that direction. Fossil fuels are widely recognized as a major driver of climate change, leading critics to blame Bitcoin and other blockchains for their high energy consumption. However, this issue extends to nearly every sector of the economy that relies on energy. The key concern is where the power comes from.

By the nature of their business model, miners are incentivized to seek the cheapest energy available, which often comes from renewable sources, sometimes even self-produced. We encourage nodes and miners to power their machines using solar, wind, hydro, and other low-impact renewable energy sources. Our goal is to build a blockchain infrastructure entirely powered by renewable energy. To further promote sustainability, we aim to develop an application that rewards renewable energy production.

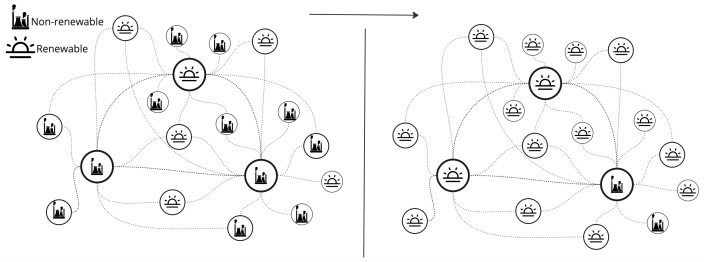

Figure 4: Network peers path from non-renewable energy source to renewables

8 Applications architecture

At its core, an application consists of one or more smart contracts. Nodes can interact with them directly using the blockchain's Command Line Interface (CLI). While the CLI software offers independence, it is technically complex and not user-friendly for ordinary users. To improve accessibility, Graphical User Interfaces (GUI) can be developed, allowing users to interact with contracts through a client that sends transactions via an RPC server. A native client operates without third-party services. For example, self-hosted block explorers, which provide a built-in GUI for reading and writing contracts. Applications can also develop customized clients to enhance the user experience. As long as they remain open-source and free from centralized services, it is considered a native client. The core and native layers together form the censorship-resistant layer, which is essential for maintaining decentralization.

The fewer centralized services an application relies on, the stronger its decentralization. However, to enhance the user experience, some applications may incorporate third-party software and private databases for low-value data storage, while ensuring that core rules and high-value data remain on-chain. External services can be valuable in processing complex information, though they introduce centralization and dependency. For example, in the Regeneration Credit system, smart contracts manage core rules and data, while an external software component could help users evaluate environmental impact by providing satellite images and data.

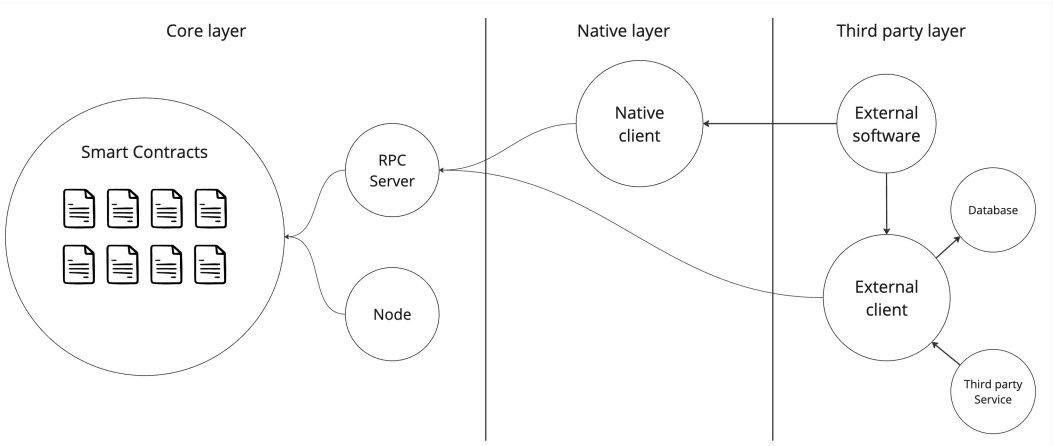

Figure 5: Applications architecture. The core of an application is the set of smart contracts that compose the rules. Native clients provide a graphical interface without third party software. Private software can provide services and resources at the third party layer.

8.1 App Store

One characteristic of public blockchains is that people can develop anything on top of it. And this is great, it allows us to innovate without censorship. But it has a downsize, many applications compete for transactions, increasing the gas fees to perform an action. In other words, a real world project that aggregates value to Nature and society has to compete for transactions with memecoins, NFTs and others not so useful financial applications. An app store smart contract can be developed to allow users to vote if an application is generating a positive impact or not, same for decentralization level. Only community-approved projects will be listed on the Sintrop App Store and recommended to users.

9 Limitations

The technology has some limitations, both at the blockchain and smart contract levels. At the blockchain level, the network transactions per second (TPS) is a significant limitation. Projects that require many transactions to operate are less likely to succeed due to the high cumulative gas fees. For example, a fully decentralized social network, where posts, likes, and comments require transactions

in a smart contract, is far from feasible because users would have to pay gas fees for each interaction. At the smart contracts level, contracts have a limited code size, complex logic applications are hard to implement and secure. Contracts also have limitations in terms of code, being solidity a programming language with some restrictions.

10 Possible Applications

Besides the limitations, smart contracts are limitless. Many incredible and diverse applications can be built with them. Applications that can change the way humans interact with each other and redefine society—there is so much potential to explore. It is possible to imagine a whole new society governed by immutable code, instead of people defending their own interests. We can have fully smart contract-governed groups and communities, shifting trust from people to open-source code.

It is up to our imagination to create solutions for real-world problems. The key is the value stored. A like in a post, for example, is a very low-value transaction. A high value transaction is when an important information is stored instead, principally if it is common-use data. For example, the Regeneration Credit stores the ecosystem impact of regenerative areas and their impact on carbon and biodiversity. Fewer transactions are needed, and the value of each is high.

10.1 Regeneration Credit

Blockchain technology is about creating economic incentives, and a form of incentive is to reduce the gap between sustainable practices from non-sustainable ones, and use it to speed up transition. The Regeneration Credit is the reason for the existence of this project. It is a (P2P) funding system designed to incentivize the regeneration of ecosystems. Humanity has been destroying nature for centuries, and our survival depends on bringing life back to Earth. The problem is that people currently have more economic incentives to deforest an area and exploit its natural resources, such as wood, soil, and water, than to regenerate it. If, in the future, regenerative agriculture becomes more profitable than degenerative agriculture, it could be a huge step in accelerating our transition to a regenerative world. The project aims to create an additional income for people who are regenerating ecosystems, so they can sell the digital representation of their impact in exchange for new tokens.

10.2 Sustainable Credits

A similar logic to the Regeneration Credit can be applied to different areas. For example, it is possible to create a system to fund renewable energy power plants with tokens, making solar, wind, hydro, and other renewable sources more profitable. The same model can be applied to other sectors such as recycling, bio-construction, and various other sustainability projects.

10.3 Services rewards

Many services are of common interest to all, and we can develop projects to reward those services. For example, independent firefighting, where people with the appropriate equipment join forces to fight fires, should be one of the most important services of all. In other words, a smart contract-based reward system could be used to incentivize firefighting efforts.

10.4 Education systems

Unfortunately, blockchains, at least for now, do not store videos, photos, and other types of media. They only store numbers and letters. However, when combined with external data storage, other ideas emerge. Hashing algorithms and decentralized storage solutions, such as IPFS[6], can be used to create unique strings that reference images and videos stored outside the blockchain. This opens up new possibilities for smart contracts, including the creation of decentralized education systems.

10.5 Decentralized Autonomous Villages

Two people who agree on an exchange of value can run their own nodes and make transactions without needing a trusted third party. The same principle applies to larger groups. It is possible for a group of

people to establish a blockchain-ruled community. Even entire villages can run on smart contracts—it only requires the collective agreement of the community. When combined with self-sufficiency, a new, independent, and decentralized form of relationship between human beings and Nature can emerge.

This leads to several possibilities, including voting and governance mechanisms, where people can proactively exercise their role, rather than voting for a representative who may defend their own interests. The village's smart contracts can be developed over time, creating a framework that makes it easier for new projects to adopt the system.

Another interesting point is that we often see a polarized dispute between capitalism and communism. People try to impose their own truths on others, and this, when combined with greed and competition for resources, often leads to violence. In decentralism, each village could have its own guidelines and build contracts according to its preferred system, whether it's a more 'capitalist' or more 'communist' approach. This allows individuals to choose to live according to their own ideals, rather than having them imposed.

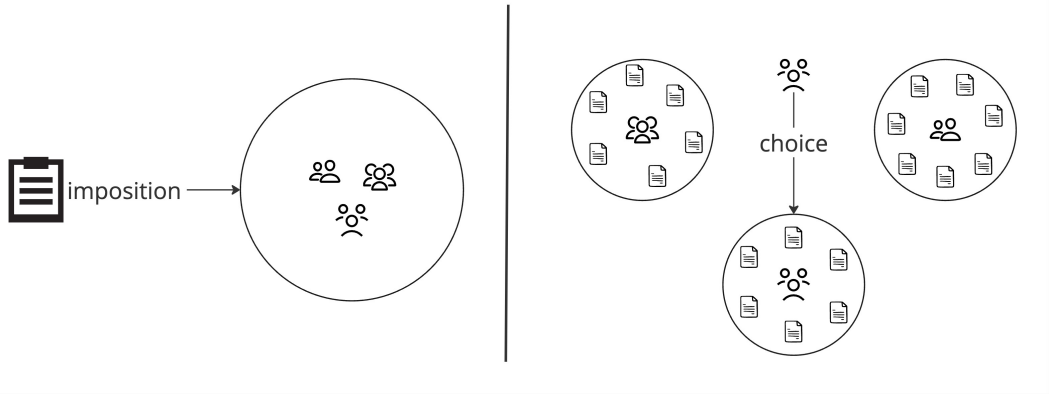

Figure 6: Imposition vs choice

10.6 Land reform

Private property has been a major force of human relations. On one side, it is the foundation of capitalism and society. But when we look at native ecosystems, it is very questionable whether anyone has ownership of a land that is home to millions of other forms of life. In the ideal world, every degraded piece of land would be distributed to people to live on and regenerate then. But in the capitalist world, a "land owner" could sell it in exchange for some years earning a common-based fee over the village transactions, in a private land reform.

11 Going beyond

Blockchain and smart contracts technology is still super young, there is so much for its evolution, in so many directions. However, I believe there will be a future, whether it takes centuries or millennia, where smart contracts, or an evolution of them, will be so common that people will no longer understand how life was possible before them. I say this with the hopeful belief that humanity will find a way to avoid its own extinction. That is why projects that focus on regenerating life are among the most crucial ones.

Going beyond, a possibility is to create a blockchain powered operation system, where community-approved apps will be available to users. In the beginning, network servers are going to be used to connect and show the blockchain data to users. In a second moment, a path to node decentralization is the development of light mobile nodes, where the blockchain can be used as a distributed data layer of the OS system so that users can receive and send transactions on their own.

12 Conclusion

In this work, we proposed a P2P smart contract infrastructure focused on social and environmental applications. Impact and decentralization are our core values. Impact, because our mission is to make this world a better place through technology. And decentralization because we want to be as much decentralized as possible. The network is the set of nodes, servers and miners. Together they compose the Sintrop Virtual Machine, a smart contract platform and a public blockchain. The SINTROP coin, native gas fees utility token, will not be pre-mined and it is going to be distributed overtime in the Proof-of-Work consensus when finding new blocks, being mining the only way to get new coins. Our goal is to power computers with renewable energy, and we encourage nodes to generate their own renewable power. Many incredible applications can be created with smart contracts, and it is up to us to create a better world, fight climate change, and return power to the people.

References

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Glossary

blockchain The blockchain technology is a network of computers, where each node stores a full copy of the transactions history, processing and storing data in a distributed architecture. 1

bridge The term 'bridge' is often used by second layer blockchains to reference the code and smart contracts responsible for managing assets from one chain to another. 1

consensus mechanism A consensus mechanism is a protocol that brings all nodes of a distributed blockchain network into agreement on a single data set. 4

decentralism New regime where rules and relationships are based on open and distributed code. 7

Ether Ether is the native gas fees cryptocurrency of the Ethereum network. 1

EVM The Ethereum Virtual Machine (EVM) is the computation engine for Ethereum that manages the state of the blockchain and enables smart contract functionality. 1

fiat Term used to reference government-issued currency that's not backed by a physical commodity such as gold or silver. It's backed by the government that issues it. 4

gas fees Gas refers to the fee required to successfully conduct a transaction on a blockchain. 2, 5, 6, 8

layer 2 A consensus mechanism is any method used to achieve agreement, trust, and security across a decentralized computer network. Proof-of-work (PoW) and proof-of-stake (PoS) are two of the most prevalent consensus mechanisms. 1

memecoins Meme blockchain clones or meme smart contracts that do not have utility, living on a speculative basis on top of an image/person/animal. 1, 5

NFTs Non-fungible tokens, or NFTs, are blockchain-based unique tokens, commonly used to represent something. It cannot be copied, substituted, or subdivided. 1, 5

ownable Open zeppelin ownable contract, a smart contract that defines a wallet to be the owner of a contract after deploying it, being able to perform privileged actions. 2

owner The wallet that has the power to perform privileged actions when using the ownable.sol contract available from OpenZeppelin. Usually is the wallet that made the contract deploy. Ownership can be transferred or renounced. 2

peer-to-peer Peer-to-peer, or P2P, is a type of distributed network architecture in which computers connected to the system also function as servers, storing and processing transactions that occur directly between users, without the intermediation of a third party. 1

proof-of-work Proof of work is the original cryptographic consensus mechanism, first used by Bitcoin. 1

renounceOwnership Function of the ownable.sol contract from OpenZeppeling that allows the owner to renounce the privilege, transferring it to the zero address. 2

Sintrop SINTROP is the native gas fee utility cryptocurrency of the Sintrop network. 2

smart contract Small computer programs, deployed to a blockchain, that contain rules and data and allow wallets to interact with them without a central authority. 3

solidity Solidity is a contract-oriented language and is designed to compile code for the Ethereum Virtual Machine. 6

SVM The Sintrop Virtual Machine (SVM) is the computation engine for Sintrop that manages the state of the blockchain and enables smart contract functionality. 2

token Smart contract data unit, usually used with standard functions. 1, 2

wallet A cryptocurrency wallet is a device, physical medium, program or an online service which stores the public and/or private keys for cryptocurrency transactions. 2, 3

Legal disclaimer

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