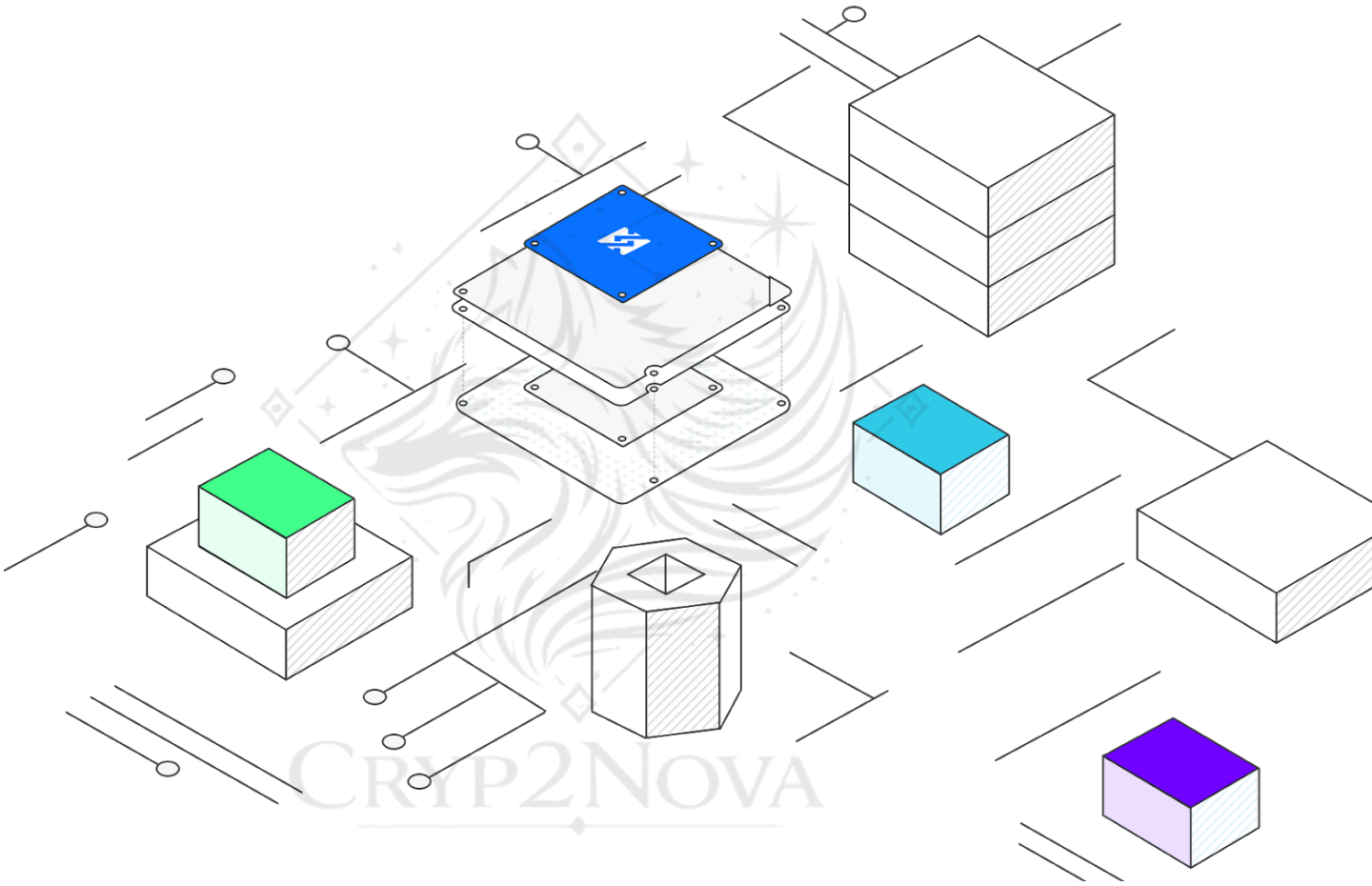
0xcert protocol

Whitepaper 0.6



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[1] This version and its contents are current as of 2019-07-09 and supersede all previous versions of this Whitepaper or any public statements made about 0xcert and the ZXC Token Sale which are available upon request sent to info@0xcert.org. This English version is to be relied upon as the most accurate and updated as other language translations may have mistranslations and be outdated. Starting with this version, the 0xcert Whitepaper will be updated and renewed with the latest data every 6 months.

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Abstract

Create, own, and validate unique assets on the blockchain with 0xcert - **the first open protocol** built to support the future of digital assets, powered by non-fungible tokens (NFTs).

The 0xcert protocol offers **tools for building powerful decentralized applications (dapps)**, aimed at easy authentication and management of digital or real-world tangible assets (such as ID, educational certificate, in-game item or a house) on the blockchain. In addition to common functions for transferring and managing standard non-fungible tokens, the 0xcert protocol provides **another layer of conventions for creating certified non-fungible tokens for unique assets**. These tokens are called Xcerts and are created through a custom minting process. Xcerts represent opinionated non-fungible tokens, which also hold an imprint of an asset. With 0xcert protocol, we can validate a proof of existence, authenticity, and ownership of these digital assets without third-party involvement.

Due to the complexity of low-level blockchain solutions, the broad adoption of non-fungible tokens and blockchain, in general, is slower than it could be. The lack of conventions prevents interoperability among applications. Developers trying to develop their decentralized application using non-fungible tokens face long development time and massive risk in their development process and security, lowering the overall efficiency and adoption rate. The resulting ecosystem of digital assets is under risk of being fragmented, with non-interoperable dapps and underlying data. One of the major problems in the future may not be the technological barrier to issuing ownership rights of different unique assets on the blockchain, but rather the authenticity of issuing entities. Currently, there is no mechanism to attest credible NFT issuers.

The vision of 0xcert is to provide an **open protocol for standardized and certified non-fungible tokens to a wider tech audience**. With 0xcert, you can build on top of the non-fungible token standard, employing a **complete toolset, development framework, and a set of conventions for various use cases**. This results in shorter development time, lower risk, and cuts of the cost associated with developing blockchain solutions. A wide range of decentralized applications and business models can be supported, giving companies the power to utilize the potential of the blockchain technology fully. 0xcert

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has built an open-source 0xcert protocol that translates one-of-a-kind digital or real-world assets into non-fungible tokens (NFTs) as a unique proof of ownership available from the blockchain.

Moreover, 0xcert has developed a framework with a set of on-chain and off-chain rules for managing Xcerts and other standard non-fungible tokens. Our mission is to equip application developers with a secure blockchain-agnostic platform, powerful tools, and community-embraced conventions for managing non-fungible tokens. The 0xcert Framework is a pluggable settlement with an advanced integration layer for different dapps and relay applications. This enables developers to focus on the application layer and quickly build applications for issuing university certificates, KYC applications, applications for loyalty programs, warranties, badges, credits or even a decentralized non-fungible exchange.

The ZXC utility tokens play a vital role in the 0xcert infrastructure. These are fungible tokens that are compliant with the Ethereum's ERC-20 standard. The ZXC token will be utilized to support dapps built on top of the 0xcert protocol with minimum possible fees. Since 0xcert is an open-source project that strives to be community-driven, decentralized governance model could be introduced, as well.

We recognize that one of the fundamental problems within the blockchain space may become the authenticity of issuers in the future. A decentralized issuer verification registry may be an acceptable and self-sustaining solution to the problem. The community would have an option to either verify or reject new Xcert issuers through a staking and rewarding mechanism based on the ZXC token.

Furthermore, 0xcert is also building out a whole ecosystem of parties involved in the non-fungible space, as well as specific application developers, companies from various verticals, researchers, organizations, and communities. Planned growth activities will not only positively impact and extend further adoption of technologies developed by 0xcert but also expand the scientific horizon of non-fungible tokens in general.

Disclaimer

This Whitepaper was issued by 0xcert d.o.o. (the "Company") and should be read in conjunction with the Company's Terms and conditions (the "Terms").

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1. Introduction and Vision

We are living in one of the most exciting times since the beginning of the Internet. The advent of blockchain has redefined technology and set a course for the future of everything. Banking, insurance, advertising, as well as many other industries are adopting this new paradigm of governance through a new concept introduced by Satoshi Nakamoto back in 2007.

Although blockchain's utility has expanded to numerous use cases, the core value of the technology remains. It is a tamper-proof, transparent, and secure decentralized ledger that maintains a list of records that cannot be altered retroactively. Blockchain was first built for financial capital; now, it is ready to take on social and professional capital: achievements, qualifications, accreditations, credentials, and certification.

But the really exciting paradigm shift comes with blockchain's ability to tap into the physical world. With the introduction of unique decentralized assets presented as non-fungible tokens[2], the idea of decentralized storing of intangible assets such as copyrights, patents, and goodwill, as well as tangible assets such as property, equipment, and inventory is now possible like never before.

With the emergence of different business opportunities related to the tokenization of physical assets, also surged a **growing need for standardization and a base protocol that would allow for simple proof-validation of existence, authenticity, and ownership of such tokens.** Furthermore, the future of a new technology of this magnitude should be made available to everyone.

The vision of 0xcert is to provide an open protocol for non-fungible tokens to a wider tech audience. With its help, we can drastically shorten development time, decrease risk, and cut costs associated with developing blockchain solutions. A wide range of decentralized applications (dapps) and business models can be supported, giving companies the power to fully utilize the potential of the blockchain technology. Non-blockchain companies will be able to make use of a decentralized and distributed ledger to easily incorporate the non-fungible technological features into their applications while not requiring their development team to be proficient in low-level blockchain programming.

[2] E.g., ERC-721 standard on the Ethereum blockchain.

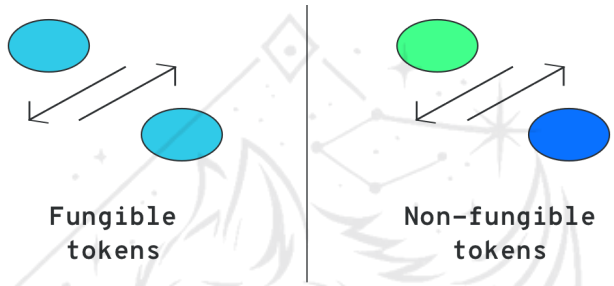
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Blockchain is moving faster than anyone dared to predict. With the 0xcert protocol, we are opening the door for all to this important time in history, where everything you own, not just financial assets, will now have a way to exist securely in your digital wallet.

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2. Opportunity

The most common tokens of today's crypto economy follow the Ethereum's ERC-20 specification. These tokens are used for a specifically defined utility within predefined systems and thus carry value. Tokens that are issued by the same source are identical and mutually interchangeable. This characteristic is called fungibility; hence, these tokens are called fungible tokens. Token holders can buy and sell these tokens on exchanges, which is also the primary mechanism of their price valuation.



Recently, another form of tokens, called **non-fungible tokens (NFTs)**, started getting attention in the crypto community. Non-fungible digital assets represent the next stage in the blockchain evolution. The first good use case for NFTs was introduced with CryptoKitties. These were one of the first popular crypto-collectibles: assets that were unique and could be stored in your Ethereum wallet. You could buy, sell, trade, and even breed them. Later on, the Ethereum implementation proposal 721 (EIP-721) got introduced and confirmed as an Ethereum standard (ERC-721) in March 2018.

NFTs have the potential to improve many applications and enhance existing business models. **For the first time, users are actually able to hold distinguishable tokens that carry not only value but also unique information in their blockchain wallet.** Numerous companies from different verticals are looking into this new technology as a solution for what was previously not possible on the blockchain. According to OpenSea[3] , three new companies a day start working on implementation with the NFTs. NFT use cases range from identities (KYC), collectibles, to education certificates, and more.

However, there are four major challenges we see that hinder the development and adoption of NFTs as well as the possibility for a greater technological and business impact:

[3] Source: Keynote from OpenSea, 3/23/2018 at the event Explore 721 Dallas

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1. **Low speed of development:** due to the lack of a pluggable framework, the development of dapps can take months and therefore severely increase the go-to-market time, which results in much slower adoption and higher competitive risks.
2. **Lack of conventions and interoperability:** different verticals require different conventions which are currently missing to ensure interoperability. Equally important is the gap of interoperability between applications, which needs to be addressed in order to maximize adoption and business impact.
3. **Missing registry of verified issuers:** a big missing part is a registry of issuers of NFTs, which would serve for authentication and validity of the issuers. Creating a common registry will reduce verification time as well as reduce business risks.
4. **Limited open-source and blockchain-agnostic solutions:** current NFT applications are siloed for specific purposes and currently Ethereum-focused, but with opportunities emerging in other blockchains (EOS, NEO), too. The opportunity to have an open-source and blockchain-agnostic protocol will open far greater opportunities for dapps and usage of NFTs.

Furthermore, there is a need for a unifying technological layer connecting these assets through a higher-level standardization model. Building on top of the existing low-level technology would mean that each development team builds its own framework from scratch. The work gets repeated every time, and each solution has to perform a separate audit. There are currently no processes and rules in place that would allow for a faster, secure, and interoperable issuance and verification of these assets, consequently hindering the potential for wider adoption.

The year 2018 is frequently called the year of NFTs, and the timing for the 0xcert protocol is now. With the ERC-721 standard in place, we believe that there is a solid foundation for NFTs, which results in an increased demand for a quickly deployable and effective development environment. We believe that the need for the 0xcert protocol will be driven on both the demand and supply side, notably for:

a) End users who will require at least parts of the blockchain and NFT functionality
b) Developers and service providers who will require faster and more secure development tools to remain competitive in the market.

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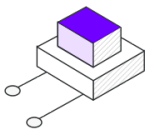
3. Solution

The 0xcert protocol utilizes the blockchain network, a distributed ledger technology that was first built to support the Bitcoin cryptocurrency. Blockchain can be best described as a distributed ledger that maintains a list of records called blocks. Each block has a timestamp and is built on top of an already existing block, preventing any data from being altered retroactively.

Blockchain offers a unique way of solving the problem of secure online transactions and double spending. Due to its transparency and distribution of information to many decentralized blockchain nodes, it is nearly impossible to manipulate or duplicate existing data records, making it potentially suitable for recording events, records, identities, certificates, transactions, and other documentation.

0xcert provides a framework with a set of on- and off-chain rules for managing Xcerts, standardized and certified non-fungible tokens. Our mission is to equip application developers with a secure blockchain settlement, powerful tools, and community-embraced conventions for managing the NFTs.

Key characteristics of the 0xcert protocol can be outlined in four larger dimensions:



1. Pluggable settlement for faster development

The 0xcert protocol is a solid pluggable settlement which supports numerous business models. It clears away the low-level blockchain complexity thanks to its solid and flexible infrastructure that ensures interoperability between dapps by default.

Using a plug-and-play framework shortens the development time from months to days. Readily available APIs and SDKs in Python, Ruby, NodeJS, and JavaScript will allow traditional developers to start building blockchain applications right away.

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2. Conventions for data interoperability and standardization

The 0xcert protocol provides conventions for minting certified non-fungible tokens for unique assets. **With the use of the protocol, proof of an asset can be written into the token directly. These proofs are built following the industry-specific conventions and enable data interoperability among various applications.**

With the help of the community, we are structurally establishing a minimum standard that prevents data-siloing and poor user experience with future implementations.

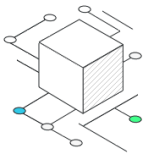


3. Decentralized verification registry through curated registries

An important piece of the proposed protocol will be authenticating and assuring the validity of issuers building with the 0xcert protocol. Each NFT issued requires a deployed main (token) contract and a mechanism that will attest the validity and the issuer's identity.

We are proposing a token curated registry to pursue a decentralized approach in validating the issuers of NFTs. Ultimately, a new issuer would stake a portion of tokens to get listed, while the existing holders will have the ability to approve or challenge the listing.

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4. Open-source and blockchain-agnostic

0xcert is an open-source and community-driven project. Its first implementation is built on the Ethereum blockchain; the subsequent version included the support of the Wanchain blockchain. Due to the blockchain-agnostic nature of the protocol, further expansion to other blockchains is possible.

The protocol may also include decentralized governance (DAO) mechanism to allow the community to vote for further improvements. Because the project is open-source, the community will also be able to rely on industry experts for specific conventions in particular verticals. This, in turn, may positively impact the growth of new business models built on top of the protocol.

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4. 0xcert Protocol

0xcert is an open-source permissionless protocol for non-fungible tokens on the blockchain. These tokens are stored in cryptographic wallets and are owned by users. In addition to various common functions for transferring and managing standard non-fungible tokens, the 0xcert protocol provides an additional layer of conventions for creating non-fungible tokens from unique assets. These tokens are called Xcerts and are created through a custom minting process.

Xcerts represent standard non-fungible tokens, which also hold an imprint of an asset. With the 0xcert protocol, we can further validate a proof of existence, authenticity and ownership of these assets without third-party involvement.

As opposed to Xcerts, which are non-fungible tokens, the 0xcert protocol also makes use of a fungible ERC-20 utility token, called ZXC. Xcerts are all unique tokens that carry certain information, whereas ZXC tokens are uniform and are used for various utilities described later in the document.

The first implementation of the 0xcert protocol is focusing on the Ethereum blockchain. The 0xcert protocol is designed to be blockchain agnostic, has been upgraded for the Wanchain blockchain, and supports building on other blockchains, as well.

In this section, we will provide an overview of the basic principles of the 0xcert protocol with a focus on non-fungibles and decentralization. This is followed by a specification of the 0xcert protocol and the 0xcert framework. The section concludes with a description of the parts of the framework: Devkit, decentralized exchange, and decentralized miner.

4.1 Overview

The advent of the blockchain has redefined the technology and set a course for the future of everything. But despite being a very potent technology, it is also very complex in nature. Writing and deploying smart contracts is difficult and can be a very perilous task. This fact prevents many people from adopting blockchain technology and building their decentralized applications on top of it.

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Our mission is to equip application developers with a secure blockchain settlement, powerful tools, and community-embraced conventions for managing non-fungible tokens. The 0xcert protocol extends the non-fungible paradigm with an opinionated certification and standardization layer for unique assets, which is based on the 0xcert conventions. All this allows for creating certified non-fungible tokens on the blockchain, which also carry an imprint of a unique real-world (tangible or digital) asset.

The protocol supports a wide range of use cases where non-fungible assets and ownership play a role. Because the data is stored in decentralized blocks, the information can be fully trusted and verified by anyone and anywhere.

The 0xcert protocol is an open-source project so anyone can use the fully functional 0xcert protocol with no limitations. Developers have the ability to manually mint, burn, verify, and transfer Xcerts. The protocol uses a publicly accessible network of digital wallets and smart contracts on the blockchain, making it extensible through third-party modules and a variety of dapps.

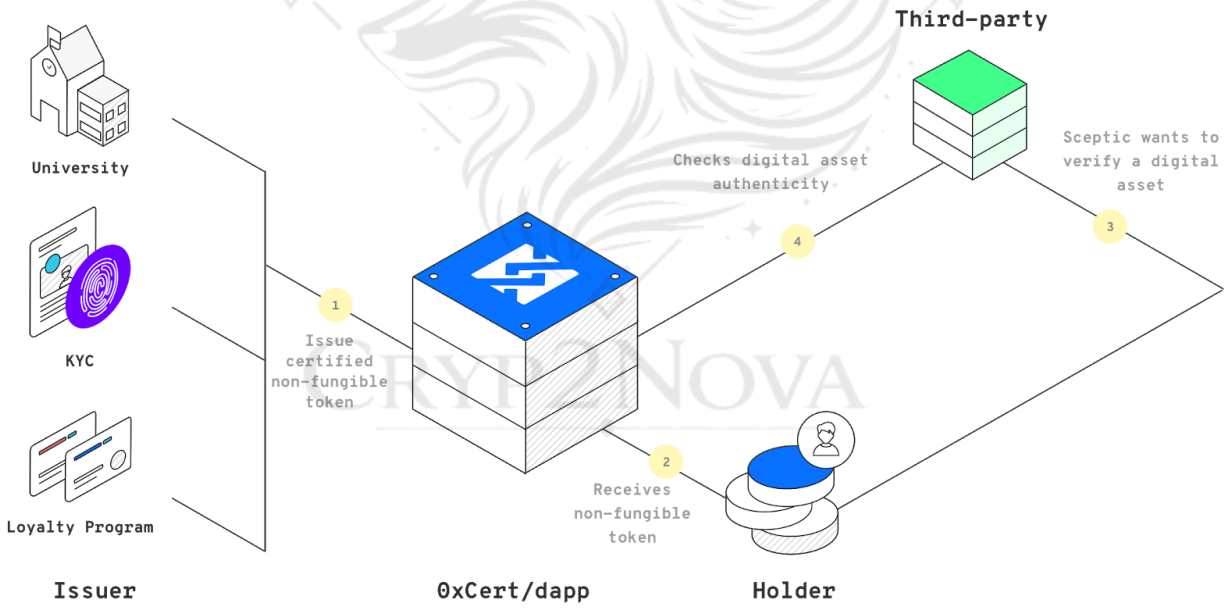


Figure 1: 0xcert protocol can act as an intermediary between parties

0xcert is an opinionated framework and supports numerous business models used by third-party dapps. These applications sit on top of the protocol and can use the protocol tokens as a fuel for their service.

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The dapps form a network of public and private services for unique assets and offer higher-level features that simplify and automate the process of creating and managing non-fungible tokens, provide public and private listings, rewarding mechanisms, integration gateways and more.

4.1.1 Fungibility

The most common tokens of today's crypto economy follow the Ethereum's ERC-20 specification. These tokens are so-called fungible tokens because tokens of the same kind can be mutually interchangeable. If we make an analogy with fiat currency, a dollar bill can be exchanged for any other dollar bill, which does not create any difference in value for the holder.

Recently, another kind of token called non-fungible token started getting attention in the crypto community. Though we knew non-fungible tokens before, it actually all started with Crypto Kitties - tradable collectibles that set the foundation for the currently accepted ERC-721 standard. Unlike the ERC-20 identical tokens, the non-fungible tokens are unique in nature and carry data.

The 0xcert protocol goes even further and introduces an Xcert as a standardized and certified non-fungible token based on the ERC-721 standard and 0xcert conventions that carries information about a particular unique asset. This mechanism is unique to the 0xcert protocol and is described in later sections.

ERC-721 has given us an incredibly powerful standard on the Ethereum network - non-fungible tokens. The 0xcert protocol extends this standard and makes it opinionated. This will drastically shorten development time. For example, think about what Rails did for Ruby. 0xcert is dealing with the application layer, where developers need to act fast and agile. In order to ensure interoperability among applications in the future, Xcerts follow specific conventions. This will prevent incompatibility on a higher level, which might happen if every NFT issuer deploys their own version of an industry standard. Having this level of standardization built on top of the strong ERC-721 standard prevents high-level fragmentation and safeguards long-term sustainability.

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Fungible tokens



Non-fungible tokens



0xcert tokens

4.1.2 Decentralization

The protocol utilizes the blockchain network, a distributed ledger technology that was first built to support the Bitcoin cryptocurrency. Blockchain is best described as a distributed ledger that maintains a list of records called blocks. Each block has a timestamp and is built on top of an already existing block, preventing any data from being altered retroactively.

Blockchain offers a unique solution to the problem of secure online transactions. Due to its transparency and distribution of information to many decentralized blockchain nodes, it is nearly impossible to manipulate existing data records, making it potentially suitable for recording events, data records, identities, certificates, transactions, and other documentation.

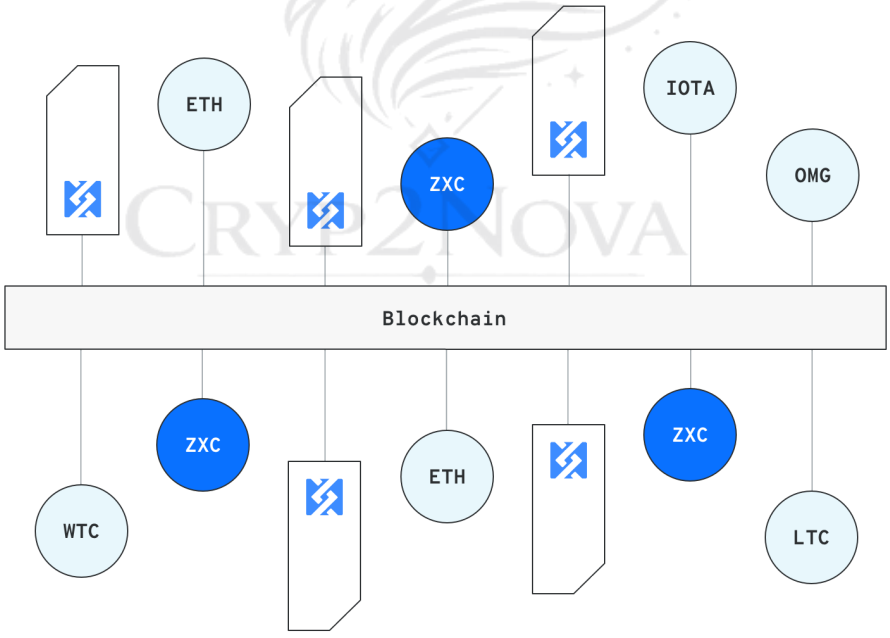


Figure 2: 0xcert protocol uses blockchain to enable decentralization

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By storing hashed data on the blockchain, individuals, companies, and institutions can keep a decentralized record of their asset proofs, while maintaining sensitive data completely private. At the same time, all certified records, their issuers, and owners can be easily authenticated and referenced.

4.2 Specification

0xcert provides a framework with a set of on-chain and off-chain rules for managing Xcerts and other non-fungible tokens. In addition, the 0xcert protocol is a pluggable settlement with an advanced integration layer for different dapps and relay applications.

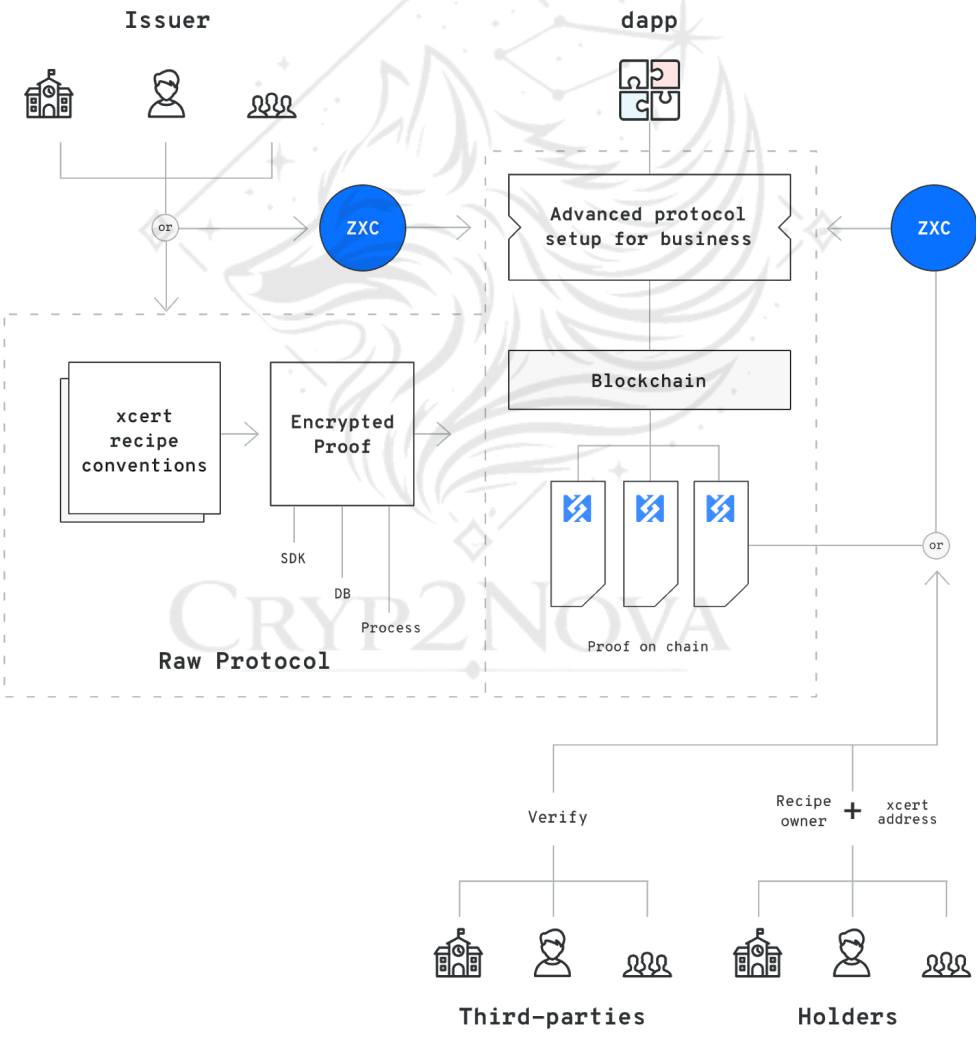


Figure 3: Users can interact with the protocol manually or through higher-level dapps

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4.3 Xcert

Digital assets on the blockchain as non-fungible tokens represent a new paradigm which enables application developers to build advanced and secure applications for managing real-world assets. Users hold asset ownership rights in their cryptographic wallets. They are able to exchange tokens between wallets and have control over the tokens they own.

The 0xcert protocol records unique assets on the blockchain as non-fungible tokens. These tokens are called Xcerts and exist on the blockchain as an item of a specifically designed smart contract.

Xcerts are items of a specifically designed smart contract which implements the non-fungible functionality. An Xcert is identified by an ID which is unique per Xcert smart contract and is always assigned to a cryptographic wallet. Besides the unique ID, a token can carry proof of a digital asset, arbitrary on-chain data, and a URI to additional off-chain data.

An Xcert smart contract is an extended non-fungible token smart contract. It follows the Ethereum's ERC-721 specification making it compliant with the non-fungible token standard. Furthermore, an Xcert smart contract holds assets of a particular 0xcert convention. This makes the contract opinionated and forces predictable data.

The process of converting unique asset data into a cryptographic proof is called "certification". Tokens that hold these cryptographic proofs are thus called certified tokens.

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4.4 Framework

In general, software frameworks provide a standard way to build and deploy applications. The goal is to simplify the development process and allow programmers to avoid low-level details altogether by providing a working system - a framework. Better known frameworks include Rails (Ruby), Django (Python), Laravel (PHP) and Sails.js (Node.js).

The 0xcert framework consists of multiple parts, which enable application developers to build secure decentralized applications with the support for custom business models. The 0xcert protocol is an opinionated all-in-one framework. It is

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blockchain-agnostic, provides conventions, and includes powerful tools for building decentralized non-fungible applications.

In addition to the raw protocol logic, the 0xcert framework includes libraries and a set of smart contracts already installed on the blockchain. The 0xcert framework is a pluggable settlement with an advanced integration layer for different dapps and relay applications.



Figure 4: Dapps on top of the 0xcert protocol form a network of interoperable non-fungible services

4.4.1 Devkit (SDK)

The framework tries to hide away the complex blockchain layer, thereby wrapping the 0xcert protocol features into an easy-to-use SDK. This empowers developers with powerful decentralized tools that they can use as a standard API library.

The 0xcert protocol can, therefore, be easily integrated into existing systems. Applications don't have to struggle with the low-level blockchain complexity and can immediately start using a solid, secure, and flexible non-fungible infrastructure that ensures interoperability between dapps by default.

4.4.2 Decentralized exchange

Decentralized exchange (DEX) is one of the key supporting components within the 0xcert framework. DEX represents a set of smart contracts installed on the blockchain which allow for a trustless exchange of multiple different types of fungible and non-fungible tokens as single atomic operations.

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DEX consists of multiple contracts. To make it upgradeable, the smart contracts communicate through proxy smart contracts. This way, we can upgrade the core DEX contracts while the data is kept untouched.

A proxy is best explained as a smart contract that allows or rejects access to some key functionality and is controlled by a multisig wallet or a DAO. This way, proxies can be trusted since they only allow access to smart contracts that were approved through the DAO process.

4.4.3 Decentralized minter

Decentralized minter (DXM) is another important component of the 0xcert framework. It allows for the trustless minting of Xcert tokens directly to recipients.

The DXM can mint and exchange Xcert tokens for other fungible and non-fungible tokens in a single atomic operation. It also enables an issuer to delegate the mint execution and payment of blockchain fees to the recipient.

DXM consists of multiple contracts. To make it upgradeable, the smart contracts communicate through proxy smart contracts. This way, we can upgrade the core DXM contracts while the data is kept untouched.

4.4.4 Continuous integration

A smart contract cannot be changed after it has been deployed onto the blockchain. Changes can be applied only by deploying a new contract at a new address.

The protocol may include decentralized governance (DAO) mechanism to allow the community to vote for improvements and possibly fork the protocol into multiple versions. The contracts may use protocol tokens to securely drive a decentralized continuous integration of updates with no disruption, while also protecting all the parties and stakeholders.

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5. Use cases

The 0xcert protocol is best described as the underlying technological base layer upon which new use cases can be built. Developers will no longer need to have advanced Solidity skills to create blockchain-based solutions for unique assets. The simple-to-use libraries allow for fast and safe production, which in turn allow for more creativity and flexibility with subsequent solutions.

Below are some examples of use cases where the 0xcert protocol might prove to be useful. It is worth pointing out that this is not a final list of future implementations, but rather a quick overview of potential verticals that can benefit from the non-fungible technology.

5.1 KYC

As the “Know Your Customer” procedure becomes more and more important for ICOs and banks, there is a growing demand for simple, cost-effective, and secure solutions. Currently, there are many KYC providers on the market, but none of them utilizes the power of ERC-721 standard for non-fungible tokens.

With the help of the new standard, users can obtain a reusable KYC token which can be stored and used for every subsequent KYC request. Users simply submit personal data to their KYC provider from which a secure hash is generated. This hashed information can then be sent in the form of an Xcert to their Ethereum wallet. By interacting with a dapp (e. g. through MetaMask), ICOs will be able to whitelist wallets that have previously passed the KYC procedure and hold a valid KYC Xcert token.

5.2 Academic credentials

Although technology has helped to improve the education and academic sector immensely, it has not solved major pain points: certification fraud, interoperability, and credentials verification remain unsolved questions that in turn delegitimize certification institutions, impair international mobility and incur huge costs for all parties involved. The authentication and verification process can benefit greatly from the blockchain technology.

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By storing records of achievements, accomplishments, certifications, and education degrees on the blockchain, users can keep a decentralized record of their certificates from both academic institutions and professional certifying bodies that can be easily attested.

There are three major parties in the academic credentials space: issuers (universities, MOOCs, etc.), holders (students that completed a degree or course) and verifiers (parties that need to verify the authenticity of an academic credential, e. g. employers or LinkedIn).

With the help of the 0xcert protocol, issuers can seamlessly issue academic credentials to the holder's digital wallet. From each academic achievement, a hash string can be created and stored as an Xcert. The non-fungible token that carries the hash string is sent to the holder's wallet and stored as proof for future use. As opposed to previous solutions where the hash string was stored directly on the blockchain as a transaction, users now receive an actual unique digital asset.

Xcerts provide a much more flexible solution than a simple transaction on the blockchain. They can be reissued, have an expiry date, and be easily verified. Imagine that an error was made when issuing an academic degree which is then forever stored on the blockchain. Having the flexibility to reissue it allows for a small margin of error.

Certain continuing professional development accreditations (CPDs) also need to be renewed and often come with an expiry date. Their digital management would be extremely problematic without non-fungible tokens. Having the flexibility of setting an expiry date to a certificate opens up a whole new space for new verticals and business models.

5.3 Art

Artworks are an important part of our cultural tradition; we could even say that it makes us human. Unfortunately, artworks are often the target of forgery, scams, and fraud. Cases of finding entire collections to be forged are plentiful, and have been a repetitive pattern throughout history.

The art industry is one of the largest unregulated markets; therefore, investigating authenticity is strongly advised for buyers prior to purchase. First, by performing extensive due diligence with the help of independent third parties. Second, with

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provenance investigation or history of ownership, the details about previous owners can be tracked in documents or other sources.[4]

For the first time in history, the art world has a chance to transfer ownership rights onto a medium, which cannot be altered and falsified. Provenance can easily be traced and viewed for the entire history of each work of art.

The process can be easily achieved with the 0xcert protocol. Data about an asset, e. g. Certificate of Authenticity (COA)[5], is digitized using a specific convention, stored in cryptographic wallets and owned by their users. The detailed data itself can be accessed only by the owners. However, its existence, authenticity, and ownership can, in turn, be examined and validated by the interested public without any third-party involvement.

This opens up a whole new space for artists. Not only thanks to provenance and forgery prevention, but the blockchain technology opens a whole new concept of fractional ownership.

5.4 Collectibles

From sports cards to Crypto Kitties, these are just a few forms of collectibles. When talking about collectible cards in the physical world, many different options come to mind: baseball cards, airplane cards, tradable collectible games (TCG), etc.

Whatever the case may be, serious collectors are interested in vintage cards. Among those, the highest values are attributed to rookie cards, inserts, sets, and unopened sets. Other major factors collectors would consider when determining a card's value are its age, origin, condition, scarcity, and of course, the featured player. The rarest cards usually come from limited editions and are among the oldest on the market. Values of these cards span from a few dollars to a few million dollars.

In order for a collector to get the most accurate price estimation, several sources of examination and grading are required. Major sports cards grading and autograph authentication authorities, such as Beckett[6], PSA[7], and Collectors Universe[8], now base

[4] https://medium.com/0xcert/millions-art-fakes-and-blockchain-7a7cb80a52a
[5] http://www.artbusiness.com/certaut.html
[6] https://www.beckett.com/
[7] https://www.psacard.com/
[8] https://www.collectorsuniverse.com/

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their grading business mostly on online demand, while several guides for pricing are issued by Price Guide[9] and Krause Publications[10], editing Tuff Stuff[11] magazine and Sports Collectors Digest[12].

In addition, collectors also need to account for various aspects like the total amount of specific cards on the market, the number of collectors, amount of available ownership data, card provenance and of course the price.

Projects like CryptoKitties are basically digitizing the very essence of the card collectors hobby, which is the joy of owning something unique and the thrill of comparing or even trading it with others. Even though card editions are issued in many hundreds of (equal) pieces, as soon as they land into the hands of a new owner, their value cannot be measured as a static feature.

With help from the 0xcert protocol, we can now easily translate real-world asset ownership to the blockchain. In the sports cards collecting field, the authenticity could be traced to the card's manufacturer creating a digital imprint of each card issued. Therefore, when a buyer or collector finds a special insert in the set, they could trace its origins back to the issuer and verify it using a smart contract, without having to rely on third-party authentication institution.

When interested in such an asset, collectors could check and verify every single transaction recorded in its data imprint, making it easier for them to evaluate the card before purchase. After acquiring it, they would be able to tokenize it on the blockchain and/or store it in their digital wallet, with ownership and management decisions solely in their hands, giving them the freedom to sell, transfer, burn, or just store it until a good opportunity for trading arises.[13]

[9] https://www.priceguide.cards/en
[10] http://www.collect.com/
[11] http://www.tuffstuff.com/
[12] http://www.sportscollectorsdigest.com/
[13] https://medium.com/0xcert/erc-721-hitting-a-home-run-77d6b4fca33d

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6. Ecosystem

The 0xcert team is determined to continuously bring value to the open-source community. Our mission is to empower developers with powerful tools and useful applications of non-fungible tokens.

In addition to the 0xcert protocol development, the purpose of the 0xcert team, as the core team behind the 0xcert protocol, is to provide a foundation for trustless, certified, non-fungible tokens on the blockchain and to manage and unify the community by connecting individuals and groups working in the area of non-fungibility and to provide resources and support for the related community-driven incentives.

The 0xcert ecosystem consists of various stakeholders with different roles. Due to the nature of the project, a wide spectre of groups will be involved, ranging from research and development, all the way to for-profit companies. In a generalized sense, the 0xcert ecosystem is made up of four major components: 0xcert Labs, 0xcert Protocol Development, 0xcert Protocol Users, and the Non-Fungible Alliance.

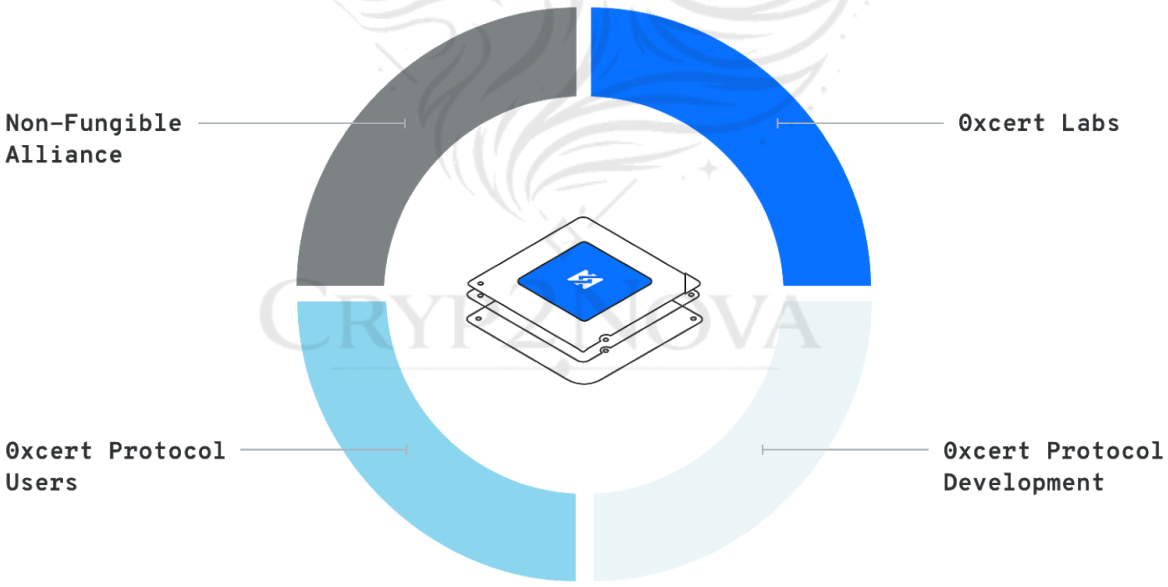


Figure 5: The 0xcert ecosystem

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1. 0xcert Labs

We believe that we can only understand developers, the blockchain technology, and decentralization if the community uses the protocol and builds on top of it. We formed 0xcert Labs as the 0xcert discovery group, which will work on the latest innovations in the space of non-fungibility, decentralization, and the blockchain technology. Research and development are core pillars that will advance the frontiers of blockchain usability and ultimately drive adoption.

2. 0xcert Protocol Development

Since the 0xcert protocol is an open-source project, we strongly believe that its future development should be community-driven. Down the line, we might implement a full DAO for protocol governance, which would further empower the developer community.

3. 0xcert Protocol Users

Adoption is key. A great amount of our time, energy, and resources will be directed toward instilling the adoption of 0xcert technology. This idea is also completely in line with why we are not just developing a protocol, but rather a full framework with extended tools for fast adoption. The blockchain space at large has to be driven by wider adoption, which cannot happen if each new project has to develop their smart contracts from scratch. New blockchain projects, as well as traditional non-blockchain companies, will be a key driving force in the future years.

4. Non-Fungible Alliance

As the space of unique digital assets begins to grow, it makes sense to have a collaboration space where all participants can come together. The NFT Alliance is a collaborative hub for building real-life applications with non-fungible tokens technology. It is an association of corporations, service providers, and developers that closely collaborate on the implementation of unique assets on the blockchain.

6.1 Participants

The 0xcert ecosystem consists of a large set of different parties that have come together in order to create and shape the non-fungible space.

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0xcert Ecosystem components	0xcert Labs	0xcert Protocol Development	0xcert Protocol Users	Non-Fungible Alliance
0xcert Ecosystem participants	Developer community Researchers Partnerships	Developer community Partnerships	Partnerships Developers Projects ICOs Companies	Existing NFT projects and companies

6.2 Promotion & Growth

Each of the four segments described above may have accompanying promotional and growth activities. These range from events and meetups to more comprehensive hackathons and implementation seminars. The 0xcert project is built with large scale adoption in mind; hence, growth strategies are also planned.

6.3 Partnerships

The 0xcert protocol is a concept that brings together various actors from different segments and organizations. Establishing mutually beneficial partnerships will be one of the key progress drivers for the organization. Building strategic alliances with complementary organizations, companies, and individuals can increase the value of the 0xcert protocol and widen its integrational scope even further.

0xcert is building partnerships with stakeholders, which are relevant for its success both in the short-run, as well as in the long-run. Some of the entities we have already established partnerships with are world leading advisory firms to enable us operational compliance as well as leading institutions promoting blockchain-based certification and the benefits it provides.

Currently, we are cooperating with various blockchain organizations and startups, as well as being in talks to make our cooperation public. Future partnerships will be announced on a rolling basis. We will strive to create meaningful and impactful

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relations with key players that can further improve the protocol or can assist in various verticals where key players specialize.

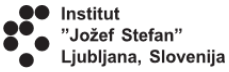
PARTNERS
















PROJECTS BUILDING ON 0xcert

To date, hundreds of projects and developers have built on the 0xcert Framework and other solutions. 0xcert is committed to providing useful tools to the developer community with open-source code published on GitHub.

Developers and projects built upon the 0xcert Framework may refer to the GitHub Issue #442 to provide feedback on code, usability, and applications.

To support everyone dealing with the 0xcert Framework and building decentralized applications on it, we have established a dedicated Framework Gitter channel where our developers interact with their peers daily.

6.4 Ecosystem Growth Pool

As pointed out, the 0xcert ecosystem is a large structure of various parties and activities. We have dedicated a large amount of the token pool, as well as funds raised to the growth and promotion of the whole ecosystem. In total, 12% of the entire token supply (Community pool) and 10% of funds raised (Ecosystem) will go towards the growth of the 0xcert ecosystem.

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7. Token economy

According to William Mougayar, author of "The business blockchain", a token is "a unit of value that an organization creates to self-govern its business model and empower its users to interact with its products while facilitating the distribution and sharing of rewards and benefits to all of its stakeholders." In this section, we present the 0xcert token purpose and characterization, token use cases, and their implementation.

7.1 Token purpose and use cases

The ZXC token is a protocol token and is introduced to align issuing parties with dapps and the community. With the infrastructure built around a system of smart contracts, its primary role is to provide the incentive mechanisms and to support the ecosystem with minimum possible fees.

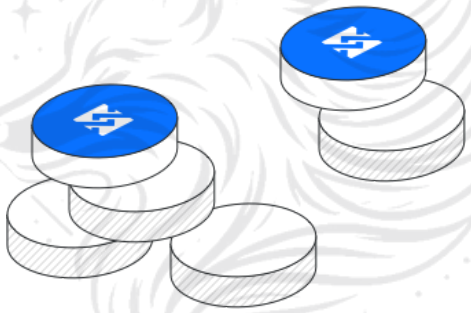


Figure 7: ZXC token is a native utility token of the 0xcert protocol

The ZXC token is also a part of the extended 0xcert ecosystem that spans beyond the protocol itself. We envision its usage on a few layers, which further decentralize important elements of the corresponding ecosystem.

7.1.1 ZXC within dapps

Dapps developed by 0xcert (e. g. KYC and Academia pilot projects) may use the ZXC token as the basic liquid asset for these dapps to operate on the protocol. Similar to gas on the Ethereum blockchain, the protocol token may play a role in all sorts of protocol and dapp activities. The following use cases are foreseen, but not limited to, within a wide variety of dapps:

- Medium of exchange (payment utility for fees and other costs within dapp ecosystems)

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- Staking ZXC tokens within dapps that would require it
- Bidding ZXC tokens for accessing services and/or verification
- Granting access to certain features of the dapp
- Reward and loyalty mechanisms

7.1.2 Decentralized governance

Over time, decentralized governance may be introduced to strengthen the 0xcert community further . As stated above, 0xcert aims to be a community-driven project. Various stakeholders come together to co-create an ecosystem around the protocol itself in an effort to cast an even wider net. In this light, the decentralized governance model may be introduced in the future to drive protocol-level development updates, conventions, and update integration.

Token purpose
The protocol token may play a key role when creating a decentralized autonomous organization. The protocol token may not only be used as a rewarding mechanism, but also as a distributed voting mechanism.

7.1.3 Issuer Verification Registry (IVR)

It is becoming apparent that one of the major problems in the future may not be the technological barrier to issuing ownership rights of different unique assets on the blockchain, but rather the authenticity of issuing entities. The underlying objective is to create a self-sustaining curation ecosystem which could exist without a centralized authority or even the creators themselves.

Currently, the authenticity of issuers is ensured through centralized authorities. For example, higher education institutions have to go through a quality assurance process, which is carried out by an external body to verify if certain standards are met. This is called higher education accreditation that can also be viewed as a curated list or registry of quality educational institutions.

The 0xcert ecosystem may introduce an Issuer Verification Registry (IVR), which would be a form of a token curated registry as proposed by Mike Goldin. This would represent a step toward further decentralization of the whole non-fungible assets space on the blockchain.

As pointed out above, one of the fundamental future problems in the blockchain space may become the authenticity of issuers. This is an issue that touches upon everyone

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involved in the ecosystem. End-users aspire to have only legitimate issuers while issuers want to be recognized as legitimate entities.

Due to the fact that the 0xcert protocol with its corresponding libraries is completely open-source, there is a chance that these tools may be used by entities with ill intent. For example, if a recognized education provider (e. g. Stanford) wants to issue academic credentials on the blockchain, they can do so using freely available tools. Since this education provider may be a well known and respected institution, there is no objection to them issuing tokenized academic credentials. An issue may arise if a diploma mill poses itself as said education provider (e. g. Stanford). It could go ahead and start issuing tokenized academic credentials that may look the same as the originals. This is, in fact, a scenario that happens in real life and can be detrimental to the educational institution, and it can cause a substantial and unnecessary economic cost. End-users and issuers are both affected by this matter. In order to prevent this from happening, a decentralized issuer verification registry may be introduced.

Token purpose
At the moment, there is no strong incentive that would award fairness and honesty in the blockchain space. A self-sustaining verification registry which would use staking and rewarding mechanisms based on the 0xcert protocol token may answer many open questions in this relation. The Issuer Verification Registry (IVR) may use the ZXC token to give curation rights that correspond to the relative token weight of token holders. This is a floating ecosystem which has to be decoupled from price fluctuations of other cryptographic currencies or tokens. Only independent supply and demand of ZXC will create a feedback mechanism that ultimately encourages token holders to maintain and curate a list of authentic NFT issuers.

7.2 Implementation

The ZXC tokens are the native utility tokens of the 0xcert protocol. They are fungible tokens and are compliant with the Ethereum's ERC-20 standard.

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8. Structure

0xcert project is and will be structuring its operations and delivery on its goals and roadmap via different elements, which include: corporation structure, governance, token rules, exchanges, and voting rules.

8.1 Corporation Structure

0xcert is currently and at the time of the token sale organized as a company, registered in Slovenia (European Union), and the token generated and the funds collected will belong to this company. The Company is set up according to the EU laws and regulations.

For future development and roadmap, the following legal entities will enable the project to deliver on the planned roadmap:

a) The 0xcert Protocol Foundation: it will manage the 0xcert as a protocol and will use a proportion of tokens for supporting the development of the protocol developers' and projects' community. Expected time to set up the foundation is in late Q3 2018 or Q4 2018.
b) The 0xcert-for-profit (existing Company): it will function as a service provider to the 0xcert Foundation (initial development and handover of code) and will be funded by the funds generated by the token sale to develop the 0xcert protocol and initial two pilot cases (Academia and KYC). More information in the Roadmap.
c) For the purpose of better organisation and legal purposes, both a) and (b) entities can set up additional entities within planned or new jurisdictions.

8.2 Governance

Both 0xcert Protocol Foundation and 0xcert-for-profit will be governed organizationally at three levels:

a) Board of Directors: The purpose is the overall supervision of the project progress. It consists of some of the current 0xcert advisors and Management team members, as well as potentially some new members. The number of members is limited to five (5). The Board of Directors will be set up within three

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(3) months after the token sale or, in the case of foundation, at the time of setting up the foundation. Meetings will be scheduled on a quarterly basis.

b) Advisory Board: The purpose is advisory for strategic decision making. Consists of some of the current 0xcert advisors, as well as potentially some new members. The number of members is not limited per se. The advisory boards will be set up within three (3) months after the token sale or, in the case of foundation, at the time of setting up the foundation. Meetings will be scheduled on a quarterly basis.
c) Management Board: The purpose is daily operations, operational decisions, and execution. Consists of some of the current management as well as potential new members. The number of members is limited to five (5). The management board will be set up within 1 month after the token sale. For the foundation, it will be set up at the time of setting up the foundation.

In addition, 0xcert will continue producing quarterly reports. Quarterly reports will be produced for each of the entities by the Management Board and confirmed by the Board of Directors and will be publicly available on communications channels and webpage(s). The first report has been published in the first full quarter after setting up the foundation.

We continue inviting interested stakeholders to contribute with their suggestions and comments on our progress and thus engage developers, users, as well as business partners. The suggestions are not going to be binding; however, they will be taken into consideration as valuable input from a wider ecosystem. The team will continue utilizing the existing and future communications channels (e. g. Telegram) to interact with stakeholders, as well as to hold regular ask-me-anything (AMA) sessions, if needed, in addition to other interaction opportunities when deemed appropriate. The team is already and will also in the future be actively engaging in conferences and meetups with various stakeholders to exchange opinions and obtain feedback on work and progress.

8.3 Token

The 0xcert token ZXC and the protocol will be managed by the 0xcert Foundation. The number of tokens will be fixed and cannot be additionally minted. Any changes to the token design will be governed by the 0xcert Foundation and its Board of Directors. The token holders will not have voting rights, but the Management Board and Board of Directors can consult with a wider stakeholder ecosystem: developers, partners, token holders as well as other existing and future stakeholders.

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8.4 Exchanges

0xcert will strive to provide as many diverse opportunities for users to purchase or sell tokens. We will actively engage in partnerships with both centralized and decentralized exchanges. When looking for partner exchanges, we will apply the criteria of legal fit as well as acceptable commercial conditions.

The reach-out to exchanges has been done prior to the token sale event; however, due to the nature of business practices of exchanges, any announcements were only made after the token sale had finished. The 0xcert team can announce and talk about the exchanges only after the official confirmation of both sides (this is suggested by legal partners and exchanges).

We must understand the role exchanges play in the project and how the team views exchange partnerships. Exchanges are partners of the project in terms of enabling the users of the protocol to exchange the tokens in order to use and interact with the protocol.

8.5 Voting

Initially, token holders will not have any voting rights. The governance of both entities is in the hands of the Board of Directors and the Management Board for both 0xcert Foundation and 0xcert-for-profit.

In the future, the 0xcert Foundation can introduce voting rights for token holders in the sense of DAO. This decision and the rules are solely in the hands of the Board of Directors of the 0xcert Foundation.

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9. The business side of things

0xcert company is raising funds through token sales to fund the development of the 0xcert protocol and the establishment of the 0xcert Foundation, which will manage the ZXC token and the protocol. However, the 0xcert for-profit company also needs a stable business model and a go-to-market strategy for long-term growth and development.

9.1 Business model

As 0xcert-for-profit will have an in-depth knowledge of 0xcert as a protocol, we will arrange our future revenue streams as follows:

- Advisory to startups and corporations in implementing NFTs in their business models and applying the 0xcert protocol. Advisory may include, among other services: development, operational processes, and legal support. In the event the knowledge or experience is not available in-house, we will partner with others to provide it. Both advisory fees or equity are options as remuneration.
- Educational programs (training) and professional conferences for both startups and corporations.
- Development of our own dapps on top of the 0xcert protocol and their establishment as separate business units under the (partial) ownership of 0xcert-for-profit.

9.2 Go-to-market strategy

For-profit advisory and educational programs will be based on acquiring and maintaining relationships with startups and corporations. We will have a dedicated sales unit which will reach out to new and existing startup and corporate clients and help them address their challenges related to NFT implementations and solutions. Being the creators of 0xcert protocol, we will leverage our brand and our contacts to enable a steady sales funnel flow.

Based on our overall understanding of market opportunities and challenges, we may decide to enter a specific vertical in order to apply NFTs. We will make sure that we do not enter into a conflict of interest situations with our advisory and educational revenue streams. For each of the identified verticals, the for-profit can fund the initial set-up and solution development; however, the vertical dapp will be carved out as a separate business unit with its management, operations and development team.

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9.3 Competitive landscape

The non-fungible token space is just the beginning. The ERC-721 standard has shown us that the immense capabilities of the blockchain technology lie in front of us and have not really been tapped into. Placing unique assets on the blockchain will spur a whole new plethora of ideas, projects, and companies leveraging situations previously impossible and unimaginable.

0xcert is dealing primarily with the application layer of things: giving developers tools to build applications more effectively on top of this new standard. Developers can build dapps based on the protocol, while end users can use their solutions to prove authenticity, authorship or ownership of their assets (such as collectibles, university degrees, identity/KYC, in-game items or a house), making them secure and available while they are certified on the blockchain.

At the moment of writing this Whitepaper, we were unable to identify a competitor that would be focusing on developing a unifying developer framework with conventions on top of ERC-721. However, there are competitors in various niches where the 0xcert protocol and higher-level dapps built with the 0xcert protocol can be used. These span from art, collectibles, education credentials, identity, and more, all the way to real estate and car ownership.

The 0xcert protocol is a building block for everyone to use. In that light, most of the companies that on first glance may appear as competitors, we rather see as potential partners and protocol adopters. Using unique digital assets in many cases is a superior solution, hence we expect to see their wider adoption in the future. 0xcert is merely going to provide the underlying infrastructure for all these projects to use and build upon.

The purpose of the 0xcert organization, as well as the core team behind the 0xcert protocol, is to provide a foundation for trustless, certified, non-fungible tokens on the blockchain and unify the community to the fullest. We intend to bring value to the open-source community engaged with the 0xcert protocol, to connect individuals and groups working in the area of non-fungibility or certification and to provide resources and support for the related community-driven incentives.

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10. Timeline

The inception of 0xcert was in 2017. After the first MVPs were created and tested, a more rigorous and detailed development roadmap was laid out. Although we are on track, there is still a long way to go. Below is a detailed roadmap, which is followed by milestones[14].

10.1 Development roadmap

Q3 2017	- First proposal of the blockchain certification technology - First MVP for deployment and verification of certificates
Q4 2017	- Shift towards open-source - Explore wider adoption and a protocol approach - Xcert smart contract draft - Technical paper draft
Q1 2018	- Pivot towards ERC-721 for assets on the blockchain - Proof of protocol concept - DEX draft implementation
Q2 2018	- Joining forces with ERC-721 standard lead author, William Entriken - ERC-721 complete implementation with bounty program - Xcert complete implementation with bounty program - DEX alpha implementation - Xcert minter alpha implementation - 0xcert scanner alpha dapp - Technical paper 1.0
Q3 2018	- Whitelist/KYC certificate dapp (another PoC for crowdsale) - Crowdsale PoC certificates used - Protocol draft on Ethereum mainnet (limited) - DEX alpha dapp
Q4 2018	- Protocol 1.0 (Ethereum) - Odin - Framework 1.0 (protocol features, application layer) - DEX 1.0 dapp - Minter 1.0 dapp
2019 Q1+Q2	- Protocol 2.0 (Ethereum, second chain) - Aragorn
2019 Q3+Q4	- Framework 2.0 (notification system, community-requested features) - Pilot dapp for selected vertical 1 - Pilot dapp for selected vertical 2 - Curated registry

[14] The timeline and milestones may be susceptible to change due to unforeseen events, complications and interruptions.

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10.2 Milestones

	MVP	Alpha	Beta	Odin (protocol v1)	Aragorn (protocol v2)
Protocol					
Xcert	X (proof of protocol concept)	✔	✔	✔	
Conventions		✔	✔	✔	
Framework					
Devkit (SDK)		✔	✔	✔	
DEX implementation		✔		✔	✔
DXM implementation	✔	✔		✔	
0xcert Labs					
ERC-721 implementation	✔	✔	✔	✔	✔
Scanner dapp	✔	✔	✔		
Identity dapp			X		
DEX dapp				✔	
DXM dapp				✔	
IVR				X	

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11. Token distribution event

The 0xcert Token Distribution Event has taken place during the months of June and July in 2018. In this section, we present the information about the 0xcert token, crowdsale, token distribution, and funds allocation.

11.1 Token and crowdsale info

Token name: ZXC (ERC-20)

Price of token: 0.0001 ETH, 1 ETH = 10,000 ZXC

Max presale bonus: 20%

Hard cap: ~20,000 ETH (estimated based on bonus distribution)

Soft cap: 5,000 ETH

Token Supply: 500,000,000 (fixed, no future minting)

Circulating supply: 250,000,000

Percentage of tokens going to contributors in all token sale stages: 50%, 250 Mio ZXC tokens.

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The 0xcert token sale consisted of four stages: Pre-ICO (early buyers), Private Presale (larger buyers), Public Presale (10% discount) and a Public Crowdsale. Details about each stage can be found in the table below. In case the allocated number of tokens for each stage would not have been sold in the allocated stage, it would have been rolled to the next stage. If there had been tokens planned for sale left after the final stage, they would have been burnt.

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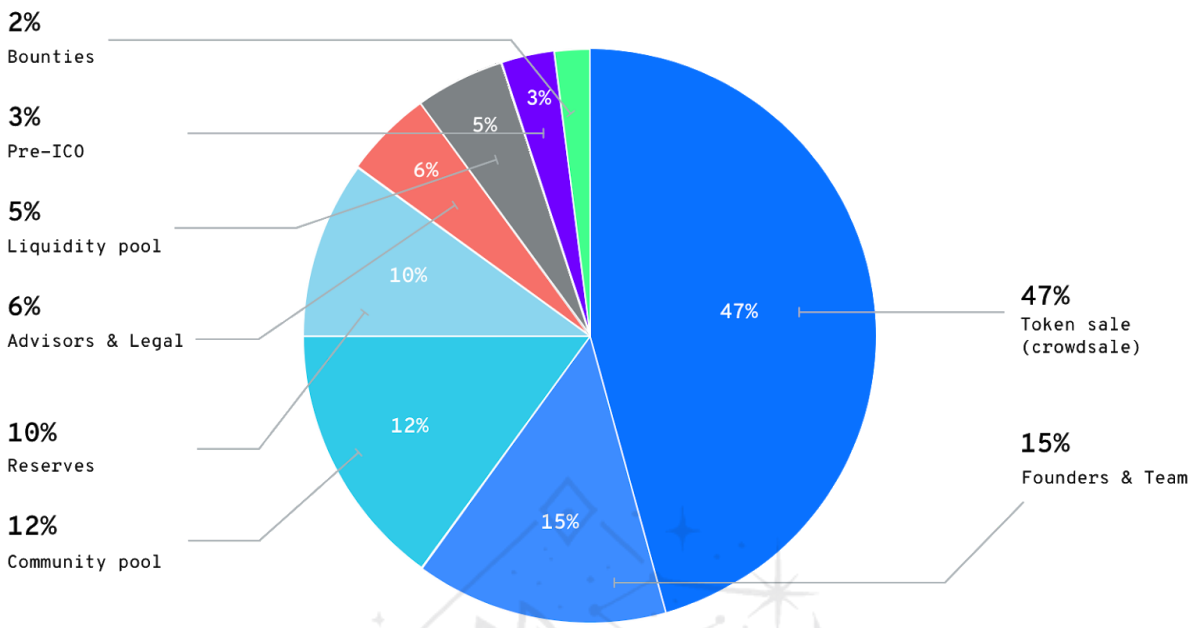
Stage	Date	Tokens Allocation	Max bonus	% Total tokens
Pre-ICO	Closed	15,000,000	40%	3%
Private Presale Min. participation 200 ETH	Until June 20th, 2018	120,000,000	15-20%	24%
Public Presale Min. participation 1 ETH	July 2 - July 4, 2018	71,157,402	10%	14%
Crowdsale	July 4 - July 18, 2018	43,842,597	5% (first 24 hrs)	9%

11.2 Token distribution

The 0xcert token distribution is found in the table below. 50% of all tokens were reserved to be sold in different stages of the crowdsale. The remaining was reserved for the team, current and future stakeholders, and future reserves.

Token distribution	% total tokens	Purpose
Pre-ICO	3.00%	Token sale
Token sale (crowdsale)	47.00%	Token sale
Founders and team	15.00%	Incentives alignment
Advisors (& legal)	6.00%	Incentives alignment
Liquidity pool	5.00%	Supporting token liquidity
Community pool	12.00%	Supporting the development of protocol community, allocated to Foundation
Bounties	2.00%	Bug bounties, allocated to Foundation
Reserves	10.00%	Future development fund

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Distributed tokens differed in their lock-up period. The Founders, Team, and Advisors have tokens locked-up in different periods. The buyers do not have tokens locked-up.

Lock-Up for Buyers: None

Lock-up for Founders: Locked for 6 months then 12.5% and 12.5% every three months.

Lock-up for Team: 20% released at ICO and 15% every three months after ICO.

Lock-up for Advisors: 20% at ICO, 40% in three months, 40% in six months

Lock-up for Reserves: 2 years

11.3 Distribution schedule

The distribution of tokens has been done via the crowdsale smart contract, with the following design:

a) The Pre-ICO and Private Presale buyers received their purchased ZXC tokens to the ETH wallet address they have provided to 0xcert.
b) The Public Presale and the Crowdsale buyers received their purchased ZXC tokens to the originating ETH wallet address from where the ETH funds to purchase ZXC token have been sent.
c) All token buyers received their ZXC token the latest 7 days after the final date of the public crowdsale.

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d) The unsold tokens allocated to the token sale were burnt within 7 days after the final end date of the public crowdsale.
e) The remaining 50% of tokens (not allocated to token sale) were distributed to their respective ETH wallet addresses within 7 days after the final end date of the public crowdsale.

All the distributed tokens were locked up until 7 days after the final end date of the public crowdsale. Once the tokens had been unlocked, the buyers were able to move them. This timeline was based on the Ethereum network functioning normally and provided there were no lags.

11.4 Participation in the token sale

The participation in the token sale event required buyers to:

a) Have ETH (Ethereum) cryptocurrency
b) Have an ETH wallet address
c) Do a KYC required for the purchasing of the token
d) Be a citizen of countries that are eligible for their citizens to participate in the token sale (more details in the Token Sale Terms and Conditions).

In addition to the conditions above:

e) In order to participate in the private presale, there was a minimum of 200 ETH of the purchase amount.
f) Only whitelisted buyers could participate in Public Presale. The public presale whitelist was closed before the beginning of the public presale. In the public presale, 1 ETH was the minimum purchase amount.
g) During the public crowdsale, the token sale was open to all (respecting condition a) to d)). There was no minimum purchase amount in the public crowdsale.

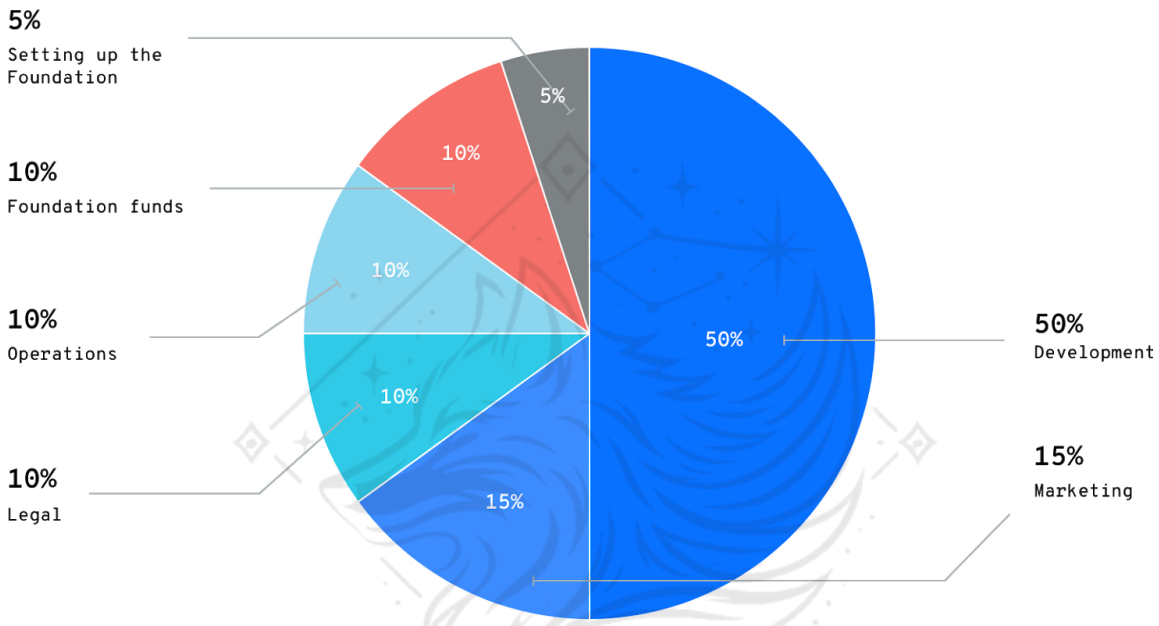
11.5 Funds allocation

The funds collected in the token sale were allocated as follows:

Funds allocation	% of all funds
Development	50.00%
Marketing	15.00%

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Legal	10.00%
Operations	10.00%
Setting up the Foundation	5.00%
Foundation funds	10.00%



The last two allocation areas are aimed at setting up the 0xcert foundation as a separate legal entity as well as at transferring a part of funds to the Foundation to enable the immediate start of foundation operations.

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12. Team

The 0xcert team is a fully dedicated group of highly skilled individuals. At the moment, the team consists of 9 members that operate in all crucial areas to support both the long-term strategy as well as the short-term execution. In contrast to many other projects and companies, the vast majority of resources are in-house.

12.1 Team

Operations
Kristijan Sedlak, CEO
Urban Osvald, CSO
Tomaž Erjavec, Co-founder
Jure Pučko, Co-founder
Anja Pukl, CFO

Development
Tadej Vengust, Lead Blockchain Developer
David Ličen, Lead Front-end Engineer
Leon Panjtar, Full-stack Developer
Anže Mur, Full-stack Developer

Marketing
Lenka Tušar, Head of content

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12.2 Advisors

William Entriken, ERC-721 main author
www.linkedin.com/in/fulldecent/, https://github.com/fulldecent, https://phor.net/

William Entriken is the lead author of the ERC-721 standard. He is an active computer science researcher who has contributed tremendous amounts of open-source projects to the community. In his non-blockchain life, Will is the General manager of Pacific Medical Training, a company that creates interactive medical training courses.

Moe Levin, Blockchain pioneer
www.linkedin.com/in/moelevin/

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Moe Levin is a blockchain evangelist and pioneer. He is the CEO of Keynote, a company focusing on creating blockchain events all over the world. Moe is also an Executive committee member of the Global Blockchain Council and the founder of the North American Bitcoin Conference.

Mark Pui, MW Partners advisor
https://www.linkedin.com/in/mark-pui-b9ab3046/

Mark Pui has up to recently been the Executive Director at PwC in Kuala Lumpur, Malaysia. He draws his skills and experience from a long and successful career in management consulting, corporate finance, consulting, and advising. Mark is also a seed investor in early-stage companies like 0x, Bancor, EOS, QTUM, Tezos, and many others. Within the blockchain space, his focus lies in blockchain interoperability, tokenization of financial and non-financial assets, privacy protocols, stablecoins, and Enterprise-oriented use cases.

Dr. Draško Veselinović, multi CEO experience
www.linkedin.com/in/draskoveselinovic/

Assoc. Prof. Dr. Draško Veselinović is the President and CEO of SEBRA - Slovenian Business and Research Association. In his career, he held many top executive positions and has more notably co-founded the Yugoslavian Stock Exchange as well as the Slovenian Stock Exchange. To this day, he remains a well-respected authority in the field of business, finance, and education.

Simon Belak, tech entrepreneur
www.linkedin.com/in/simonbelak/

Simon is a tech entrepreneur, highly proficient in data analytics, and currently working as a Mad scientist with Metabase. He is able to juxtapose philosophical views and concepts with advanced science and technology - a unique perspective rarely found.

Dr. Daithí Ó Murchú, President RCEEDAO Ireland
https://www.linkedin.com/in/dr-daith%C3%AD-%C3%B3-murch%C3%BA-57228624/

Dr. Daithí Ó Murchú is the President of RCEEDAO Ireland and is under EU parliament and Commission Appointment. He is also a founding member at the International Fellow Academy of Ubiquitous Communication Educators International. He has vast

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experience from the education segment as well as in technology, innovation, business, and management.

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Disclaimer

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RISK FACTORS

THIS SECTION ON RISK FACTORS IS NOT AND DOES NOT PURPORT TO BE A COMPLETE ENUMERATION OR EXPLANATION OF THE RISKS INVOLVED WITH THE PURCHASE OF ZXC Token. THERE MAY BE ADDITIONAL MATERIAL RISKS THAT THE DIRECTORS DO NOT CURRENTLY CONSIDER TO BE MATERIAL OR OF WHICH THE DIRECTORS ARE NOT AWARE. THE FOLLOWING THEREFORE HIGHLIGHTS CERTAIN RISKS TO WHICH THE COMPANY IS SUBJECT TO AND WHICH THE COMPANY WISHES TO ENCOURAGE PURCHASER TO DISCUSS WITH THEIR OWN PROFESSIONAL ADVISORS.

Prospective ZXC Token purchasers should conduct such independent investigation and analysis regarding this Company, the ZXC Token, and all other relevant market and economic factors as they deem appropriate to fully evaluate the merits and risk of their purchase.

The Company and its Directors disclaim any responsibility to advise purchasers of ZXC Token of the risk and considerations associated with the purchase of ZXC Token as they exist at the date hereof or from time to time hereinafter.

Each prospective purchaser of any ZXC Token must determine, based on his/her own independent review and such professional advice (including, without limitation, tax, accounting, credit, legal and regulatory advice) as it deems appropriate, that the purchase of ZXC Token is appropriate and suitable for it, notwithstanding the clear and substantial risks inherent with the purchase of ZXC Token.

You should consult with your own legal, regulatory, tax, business, investment, financial and accounting professional advisors to the extent that you deem it necessary, and make your own decisions including decisions regarding the suitability of this purchase based upon your own judgement and upon advice from such professional advisors as you deem necessary and not upon any view expressed by any party mentioned in this Whitepaper.

The purchaser of a ZXC Token should be capable of evaluating the merits and risks of such a purchase and should have sufficient resources to be able to bear any losses (which may be equal to the whole

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purchased amount) that may result from such a purchase. Prospective purchasers of ZXC Token should be aware that the value of ZXC Token may go down as well as up and that they may not be able to realise their purchase amount on the secondary market (if there is any).

Forward-looking statements

Certain statements in this Whitepaper constitute "forward-looking statements" that are used on the beliefs of the Directors and reflect their current expectations. When used in this Whitepaper or in any of the Company's material, the words "estimate", "project", "believe", "anticipate", "intend", "expect", "plan", "predict", "may", "might", "could", "should", "would", "will", the negative of these words or such other variations thereon or comparable terminology are intended to identify forward-looking statements. Such statements reflect the views of the Directors at the time the statements are made with respect to future events based on information available at that time and are subject to risks and uncertainties that could cause actual results to differ materially from those contemplated in those forward-looking statements. The Directors assume no obligation to update or revise these statements to reflect current information, events, or circumstances, including changes in any risks or uncertainties that may impact them.

Management Risk

If any of the directors or officers of the Company cease to participate in the operation of the Company, the operations, objectives, and activities of the Company may be adversely affected.

Liquidity of ZXC Token

As of the date of this Whitepaper, there is no active secondary market for the ZXC Token. Whilst the Directors hope that the success of the Company will lead to a secondary market developing, there is no guarantee or assurance that a public market will ever develop. There is often no assurance that a purchaser of the ZXC Token will be able to sell or dispose of the ZXC Token.

Changes in Applicable Law and Regulation

The Directors believe that it is possible that emergency intervention by certain Governments may take place in the future in respect of ICOs. Such intervention may be implemented on an "emergency" basis, subjecting market participants without notice to a set of regulations which in some cases may be unclear in scope and in application.

Should any relevant laws or regulations change, the legal requirements to which the Company and the ZXC Token may be subject could differ materially from current requirements. No assurance can be given that future legislation, administrative rulings, or court decisions will not adversely affect the Company and the ZXC Token.

The Company may be subject to a number of unusual risks, including contradictory legislation, incomplete, unclear and changing laws, ignorance or breaches of regulations on the part of other market participants, lack of established or effective avenues for legal redress, lack of standard practices and confidentiality customs characteristic of developed markets and lack of enforcement of existing regulations.

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Early-Stage Companies

The Company is a start-up and has no operating history against which purchasers of the ZXC Token may consider the appropriateness of purchasing the ZXC Token.

Many risks and uncertainties affect start-up and early-stage companies, which often have a very limited operating history, profits, or cash flow. There can be no assurance of the success of such enterprises. Their potential must be considered in light of the problems, expenses, difficulties, complications, and delays frequently encountered in connection with new or developing businesses, including technology risks, unproven business models, untested plans, uncertain market acceptance, competition and lack of revenues and financing.

The technological fields and markets that many start-up and early stage companies address have undergone and are expected to continue to undergo rapid and significant change. Rapid technological developments may result in the technology of companies becoming obsolete, uneconomical, or uncompetitive before any commercial success or financial return can be achieved. Numerous other risks may affect developing companies and ventures, including risks that products or services will be found to be ineffective, unreliable, unsafe or uncompetitive and risks that such companies' technologies, products or service will not achieve market acceptance or penetration. Market acceptance of new products, services, or technologies depends on many factors and uncertainties and cannot be assured.

Start-up and early-stage companies may compete with entities that have established businesses, relationships and positions in the market and that have much more substantial financial, business, technological, marketing and distribution assets, operations and resources. There can be no assurance that any developing company will be able to compete successfully with more established companies.

These companies may be overly dependent on the vision, skill, and leadership of a single or limited number of executives. In a start-up business, the loss or disability of a key person(s) can result in significant financial hardship, in some cases, the failure of the company.

Any projections, forecasts, plans or other forward-looking statements are subject to numerous risks, uncertainties, changing circumstances and other factors that could cause actual results, performance, plans, prospects, operations, and opportunities to differ materially from any forward-looking statements, including competition, inability to identify and do business with appropriate customers, existing and future law and regulations, liabilities under the securities laws, inability to hire, retain or qualify sufficient management and staff, general economic conditions, rapid technological change, cost overruns, delays in bringing products or services to market, marketing failures, difficulty in penetrating markets, delays or failures in developing anticipated capabilities, products or services, failure to obtain necessary regulatory approvals, insufficient funding, lack of availability of capital, rates of economic growth, levels of consumer and business spending, conditions in the technology and financial industries, dependence on strategic partners and business relationships, unproven business models, adverse developments affecting customers and end-users, fluctuations in securities markets and valuations, limited marketing, expansion risks, losses and costs, uncertain revenues and profitability, conditions in particular industries, accounting problems, costs, delays and liabilities arising from legal proceedings, failure to obtain and maintain intellectual property or proprietary rights and management failures.

Banking and custody arrangements

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The Company's cash will be held by a bank. The Company acknowledges that any such deposits are not guaranteed by the bank and are exposed to losses incurred in the event of the insolvency or failure of the bank. The Company will take credit risk against any party, which is holding its cash. The Company will, therefore, rank as a general unsecured creditor in the event of the insolvency or failure of the bank with which deposits or instruments have been placed.

Regulatory Supervision

The Company and the ZXC Token are not regulated by the EU or Slovenian Financial Services Commission or any other regulatory or supervisory authority. The EU or Slovenian Financial Services Commission does not vouch for the financial soundness of the Company, the ZXC Token or for the correctness of any statements made, or opinions expressed with regards to it.

Cybersecurity

Cybersecurity threats are present within the realms of cryptocurrencies. There is a risk of loss of funds, including a total loss, should an unauthorised intrusion or theft occur.

Whilst the Company has considered its cybersecurity, risks related to software weakness, human error, external attacks, and others, continue to exist and pose a material risk to the Company and the value of the ZXC Token.

Advances in cryptography, or technical advances such as the development of quantum computers, may present risks for crypto-currencies, which could result in the theft or loss of ZXC.

Hackers or other malicious or criminal groups or organizations may attempt to interfere with the Token Sale, the ecosystem or the availability of ZXC in several ways including, but not limited to, denial of service attacks, Sybil attacks, mystification, phishing, attacks, smurfing, malware attacks, or consensus-based attacks.

Ethereum Network

The ZXC Token is a part of the Ethereum network. If problems related to the Ethereum network normal functionality arise, this may affect the ZXC Token functionality and may adversely affect the Company and the value of the ZXC Token. Therefore, any malfunction, unplanned function, or unexpected operation of the Ethereum protocol may cause the ZXC ecosystem or ZXC to malfunction or operate in a way that is not expected. Ether, the native Ethereum Protocol account unit may itself lose value in a similar way to ZXC, and also in other ways. For more information on the Ethereum protocol, see http://www.ethereum.org. Any error in the smart contract may lead to the loss.

As with other decentralized cryptographic tokens and crypto-currencies, the Ethereum blockchain used for the ecosystem is vulnerable to mining attacks, including but not limited to, dual-expense attacks, powerful mining attacks, selfish mining attacks, and critical competition attacks. Any successful attack poses a risk to the software and the expected performance and sequencing of Ethereum contract calculations. Despite the best efforts of the team, the risk of known or new mining attacks exists.

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Crypto-currencies and cryptographic tokens represent a cutting-edge, untested technology. In addition to the risks stipulated above, there are other risks that the 0xcert team cannot predict. Risks may also occur as unanticipated combinations or as changes in the risks stipulated herein.

THE FOREGOING RISK FACTORS DO NOT PURPORT TO BE A COMPLETE EXPLANATION OF THE RISKS INVOLVED WITH THE COMPANY AND THE ZXC TOKEN.

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