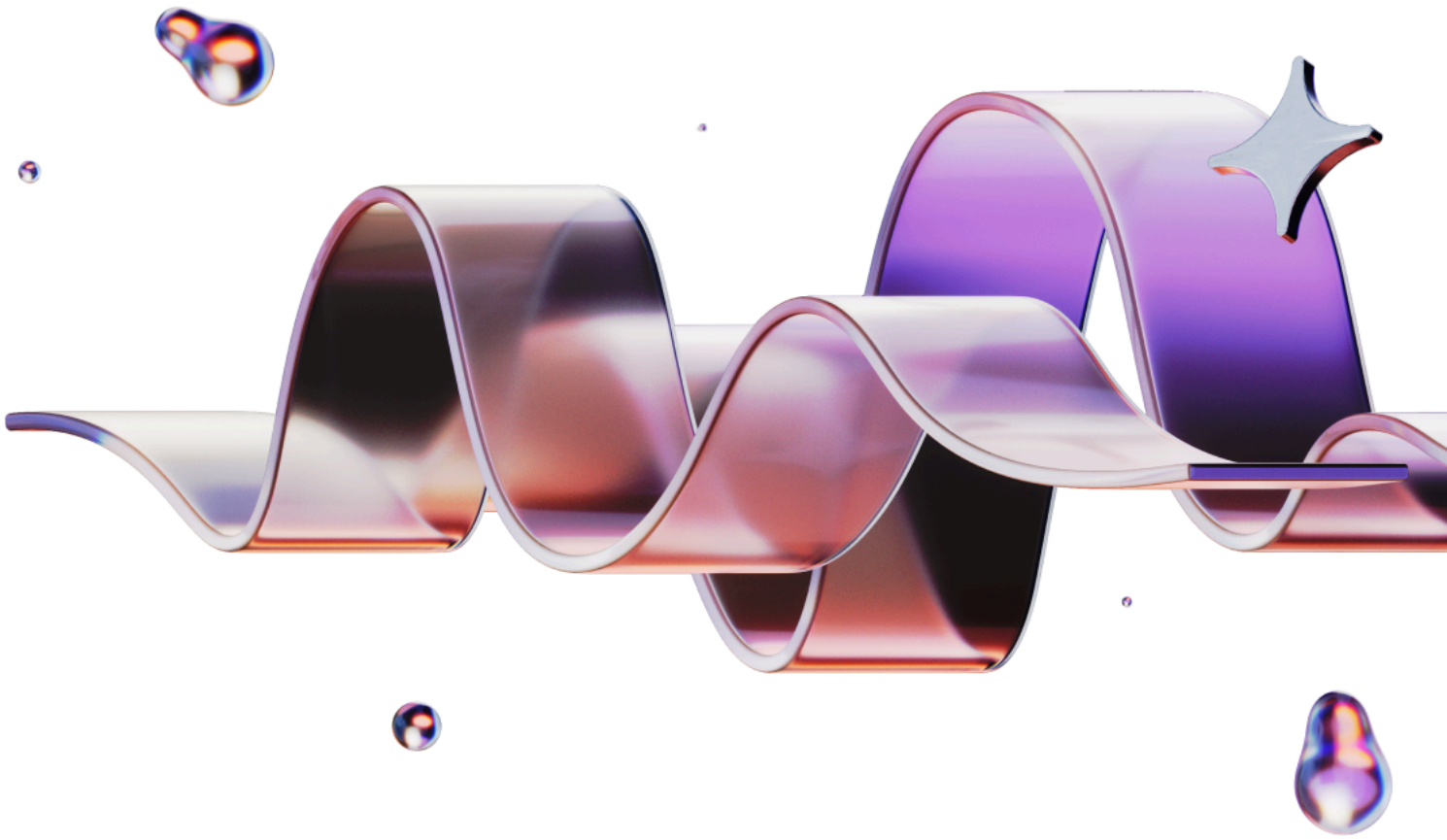
Enhancing stock markets with the power of blockchain



dclex

This is a preliminary version of the DCLEX's whitepaper and is subject to change.

The official whitepaper will be published at the same time as the launch of the platform.

Make sure to read the official version of the whitepaper before using the platform.

- Whitepaper -

Abstract:

DCLEX is a trading platform where transactions are settled in USDC and where users can withdraw their stocks in the form of cryptographic tokens on **Ethereum**.

Tokenized securities issued in this way are built upon the **ERC-20** standard but they are implemented in order to require permission to use them. This enables stocks to be tradable peer-to-peer and makes them compatible with other valid smart contracts. Permissions are managed with a non-transferable NFT and can be revoked by DCLEX, which can also force transfers of stocks from/to any Ethereum account.

These NFTs represent **digital identities** and their validity statuses, which are valid by default, represent permissions to use securities tokenized by DCLEX. Transfers can be forced for account recovery but nobody can burn them; DCLEX only controls the state of the NFTs. Digital identities are built upon the **ERC-721** standard and they can be re-used in other applications in many ways, from permissions in DeFi to digital twins in the metaverse.

To be able to interact with stocks on-chain the sender and the receiver of the transaction must have a valid digital identity.

Motivation:

Issuing tokenized stocks on blockchains so that they can be re-used by other applications while staying compliant with securities regulations.

Context:

Since their creation, cryptocurrencies have had bad times with regulators. This is mostly because Bitcoin aimed to be an alternative to the traditional banking system from its early beginning. Thus, people started to see it as a means to bypass authorities' oversight and it was rapidly used to facilitate illicit activities. It led to a lot of scandals where victims complained about the fact that criminals were using cryptocurrencies anonymously which precludes enforcement. Scandals were so frequent that it created a popular belief among communities saying that cryptocurrencies are transferred anonymously while it’s the total opposite; everything in a public blockchain is, by definition, publicly verifiable. In many cases, retrieving bad actors hasn't been possible because authorities weren’t monitoring transactions of cryptocurrencies properly.

Things are changing at lightspeed in this industry and financial authorities are now armed with sophisticated tools to perform a decent oversight over the crypto-economy. Cybercriminals can't cash out stolen funds without being identified as easily as before. It remains that it's still possible to use cryptocurrencies anonymously by using a new address for each transaction and moving funds continually. Some argue that this provides the same level of anonymization as physical cash so that cryptocurrencies should be regulated just as fiat currencies are. Others either think that cryptocurrencies aren't used as a means of payment as many pretend but as a financial instrument so that they should be regulated as such.

Over time, separations were made and stablecoins came out as being a separate category, as well as native cryptocurrencies like Bitcoin and Ether, but regulators have significantly caught up on that matter.

On the other hand, if all other cryptocurrencies are to be considered as securities it's not clear how the underlying projects should seek compliance. It's not clear if it's even possible for them to achieve compliance as things stand. Regulators require financial institutions to know the identity of each shareholder at any given time and the problem is that anyone can create an Ethereum account from thin air and acquire those securities anonymously.

In the meanwhile, intergovernmental agencies are quietly developing a Unified Ledger which is a kind of permissioned blockchain that aims to replace the entire crypto industry. It's true that it's an amazing project that solves critical issues but it doesn't solve the main problem decentralization is supposed to solve, which is the centralisation of power into the hands of human beings.

On their side, public blockchains promise to deliver the same technology but in a decentralized manner. It's true that there are some issues that remain to be solved regarding privacy, but problems are being solved at an incredible rate in this industry and we do believe that a community driven financial system will deliver a fairer economy in the long-run.

Following the principle "Same activities, same risks, same regulations", issuing securities on public blockchains must come with the same level of security as in our current stock markets. This is to ensure that investors are protected against fraudsters and cybercriminals. To be able to prosecute those criminals, authorities have to be able to know their identities. That's why they require financial institutions to identify their customers and to verify if they are eligible to be provided with their services (together, the KYC/AML requirements). But the notion of privacy is hard to tackle in the crypto world because the majority of blockchains allows the creation of new addresses anonymously. Actually, to create a new address you have to choose a random private key and then compute an address from that random key. This feature combined with the use of crypto-mixers is still allowing sanctioned entities to access the crypto-economy anonymously since sanctions screening is only applied at the applications layer and not at the smart contracts layer.

In the industry, there are two main ways of thinking about how to solve the identity problem; identifying users at the blockchain layer (layer 1) or at the protocol layer (layer 2). The first option is to verify the identity of users before giving them the permission to use the entire blockchain and the second option is to require the same verification process but in order to have permission only to use a certain set of smart contracts while the rest of the blockchain continues to be accessible anonymously. Both solutions have pros and cons: permissioned blockchains are a simple but drastic choice that put aside interoperability while permissioned tokens bring some challenges regarding sustainability. But the situation is even worse considering that the industry is taking the wrong path by doing the verification process at the application layer which is actually a solution that simply doesn’t solve the problem.

There are already a few security tokens that have been issued on a public blockchain but they haven't really caught on with many investors. This lack of interest is due to the disproportion that exists between the stock market well known to all and this emerging alternative solution that is the blockchain. Thus, the mass adoption of public blockchains is an old dream that may still take a long time to come true. It may take so long that the crypto industry might be completely gone before it happens. To get the crowd, web3 applications in general need to improve their user experience by keeping things simple when presented to the end-users. People must also feel like their funds are in a safe environment in order for them to be more comfortable with the idea of using a new way to invest. They need a measurable advantage over how they used to do it. Of course, nobody will completely change their ways from one day to another. This transition is more likely to happen step-by-step and our opinion is that tokenizing existing securities is the logical first step.

Introduction:

DCLEX's mission is to issue tokenized securities on Ethereum in a compliant way. Indeed, it's a centralized solution but it opens the doors that bring your favorite stocks in the DeFi ecosystem. As it wants to be a secure and user-friendly environment, the DCLEX platform (the platform) works like a trading platform with some new features. This architecture allows a frictionless redemption process and most importantly users are not lost when they come on the platform for the first time. It's intuitive for anyone who has already used a traditional trading application. The main difference is that users cannot only withdraw their liquidities but they can also withdraw their positions which are then represented as tokens on Ethereum. Each token is backed by a share of the underlying asset and they can always be deposited on DCLEX platform in order to sell them back for USDC[1]**.** Another important difference is that every transaction on the platform is settled in USDC instead of with the US dollar. Although the tokenized stocks are themselves a novel technology, the competitive edge of DCLEX comes from its innovative application of non-transferable NFTs to represent digital identities which are then used to achieve compliance.

Digital identities:

The digital transformation is defined as a fundamental shift in how businesses operate and interact with their customers, leveraging digital technologies to create new value and stay competitive. Apparently, in the future, the digital transformation will be so ubiquitous that we will not only shop online or work remotely but we will literally live in a digital world known as metaverse. To prevent this transformation to happen in an anarchic way where two parallel worlds would coexist but where only one is regulated, we need to have a universal regulatory framework. To be able to extend the law to the metaverse, authorities need to have a means to apply enforcements against cybercriminals in the physical world. This is where digital identities come into play. Digital identities are the missing part for institutions to use DeFi protocols but it can even be much more than that due to its reusability across the ecosystem.

What places DCLEX ahead of others is the way how it uses non-transferable NFTs to represent digital identities and then uses them as a tool to fulfill the KYC/AML requirements. As on any other trading platform, on DCLEX users have to pass through an identification and verification process before being provided with the brokerage service. Once this process is successfully completed, the platform works just as a traditional trading application except that USDC is used to settle trades; users can deposit and withdraw USDC and they are able to buy and sell stocks. At this point, to be able to leverage the full power of DCLEX, users have to claim their digital identity (a non-transferable NFT) which will allow them to deposit and withdraw stocks from/to their crypto-wallet and transfer them with others that also have a valid digital identity or with other valid smart contracts. When they are issued the validity status in the code of the NFT of digital identities is set to "valid" by default.

Digital identities are represented by non-transferable NFTs that are unique to each entity and nobody can have more than one of them.

[1] Buy/Sell orders sent on DCLEX's platform can only be executed within market hours.

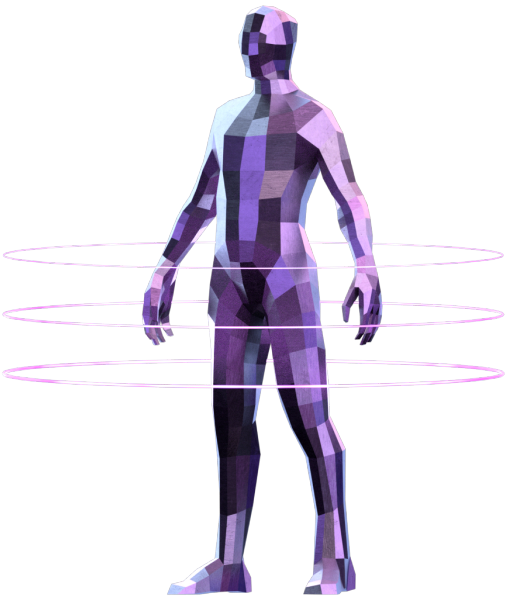
If someone tries to redo the identification/verification process with a newly created Ethereum account in order to have more than one digital identity, it will fail because there will be an identity match with an existing user populating the database. This behavior is also used to allow an efficient account recovery process in the case where someone loses his private key; users can thus re-identify themselves on the platform but this time the system is expecting an identity match. In that case, if there's an identity match users are then enabled to transfer their "non-transferable" NFT from the old address to a new address.

Digital identities can't be burned so they will exist even after their owners death.

Although users hold their digital identity in their crypto-wallet, **DCLEX keep the right to revoke the power to use stocks to any digital entity, and at its sole discretion.** This is a built-in function in the code of the digital identity's NFT. This being said, it's not likely to happen to you unless you are added to an international list of sanctioned persons.

We use a third-party identity provider to identify and verify the identity of our users. This provider allows sanctions screening over identities as well as over Ethereum accounts. It also allows ongoing monitoring to ensure that every user stays compliant over time. Our provider also takes care that users' personal information stays private. All of this occurs off-chain. To use their services DCLEX's users have to agree to the terms and conditions of our identity service provider.

If you believe your digital identity was invalidated unfairly or if you think you have been a victim of an identity thief, contact us at: info@dclex.com.



Accounts recovery:

Unlike Ethereum accounts' private keys, physical identities can't be lost. That is why DCLEX is able to offer a recovery process over digital identities as well as for tokenized securities. If a user loses his private key he has to come back on DCLEX platform and login to the platform with a newly created Ethereum address, then navigate to the *Digital identity* page and click on "*Recover my digital identity"* which redirect to our third-party identity provider to re-identify himself. Once his identity is confirmed the user is enabled with the power to exceptionally transfer a "non-transferable" NFT that is his digital identity. To recover tokenized securities to the new Ethereum account holding the digital identity we invite users to communicate with us at info@dclex.com.

For digital identities recoveries as well as for tokenized securities recoveries, users have to pay the network fees (gas fees) needed to call the functions on-chain. Network fees are paid with Ether so users need enough Ether in their new Ethereum account to be able to transfer digital identities or tokenized securities. Network fees vary over time and depend on the traffic on the network at the moment when the transfer function is called by users.

Smart contract identities:

DCLEX also offers valid digital identities' owners (proposers) the chance to propose smart contracts for verification. Smart contract identities follow the same logic as digital identities: permissions to transfer stocks are managed with a proprietary non-transferable NFT. The source code of these NFTs that represent smart contract identities is nearly the same as the one of the NFT that represents digital identities, but the issuance process is not the same and only smart contracts can hold them. Proposed smart contracts are treated on a case-by-case basis and must have passed through a security audit in order to have a chance to be approved as a valid smart contract. Once approved the proposer is enabled to mint a smart contract identity (a non-transferable NFT) directly to the address of the smart contract. As for digital identities, the validity status in the code of the NFT is set to "Valid" by default when they are issued.

If you want to propose a smart contract for verification we strongly recommend you to get in touch with us before doing so. For more details concerning what criterias smart contracts need to respect in order to be approved as valid, consult the *Appendix A* at the end of this document.

In the event that a smart contract in which you transferred stocks is invalidated by DCLEX your stocks will be blocked in it because the smart contract won't have the ability to transfer them back to you. In such a case, tokenized stocks will be recovered directly into DCLEX user accounts as a distribution.

Tokenizing securities:

The core concept of DCLEX aims to issue tokenized securities which are backed by shares of the underlying stocks. Tokenized stocks issued in this way are built upon the ERC-20 standard but with permissioned access thus they can only be transferred peer-to-peer between valid digital identities and/or by valid smart contracts. Stocks' source codes are implemented in order to check if the Ethereum accounts of the sender and the one of the receiver of a transfer have a non-transferable NFT that proves that both are either valid digital identities or valid smart contracts. **DCLEX can invalidate any digital identity which would disable its owner to use the tokenized stocks and can also force transfers of the assets to any Ethereum account holding a valid digital identity or a valid smart contract identity and can even burn them from any Ethereum account.** These functionalities allow tokenized stocks withdrawn from DCLEX to evolve in a regulated environment, which is essential to protect investors.

The tokenization process happens when a user withdraws a position from his DCLEX account to his Ethereum account. During a withdrawal, the specified number of shares to tokenize from the positions of the user are debited from his DCLEX account, then he is enabled to mint the corresponding amount of tokens directly in his Ethereum account.

Redemption of securities (de-tokenization):

It's a strange thing to develop a tokenized securities issuance platform that works like a trading platform but this is a creative architecture that makes the tokenization and redemption processes smoother than it ever has been in the world of tokenized securities. Any stock that has been withdrawn from DCLEX can always be deposited back to it, as long as the depositor has a valid digital identity. However, even if shares of stocks can be fractionated on-chain, users can only redeem whole numbers of shares on the platform or, if the value of the *multiplier* is smaller than 1, a multiple of the inverse of the *multiplier*.[2]

It's important to highlight that this redemption feature is actually what gives an intrinsic value to the tokenized asset; by being redeemable and then sellable on the stock market almost instantly[3], the tokenized assets are as liquid as the real assets. It constitutes the entire stabilization mechanism that aims to help tokenized securities to maintain the same price within the DeFi ecosystem and on the stock markets.

For tokenization as well as for de-tokenization, users have to pay network fees (gas fees) needed to call the mint/burn function on-chain. Network fees are paid with Ether so users need enough Ether in their Ethereum account to be able to mint/burn stocks to/from their wallet. Network fees vary over time and depend on the traffic on the network at the moment when the function is called by users.

[2]For more details regarding how the *multiplier* function works, see section **"Reflecting forward and reverse splits**".
[3]We require 20 confirmations (blocks) before crediting users with shares of the underlying stock.

Reflecting forward and reverse splits:

Splits and reverse splits' main purpose is to keep the price of an asset attractive for investors but they are not really meaningful when it comes to tokenized stocks since investors can purchase only a fraction of a token if they want. This is because tokens are not counted in integers but in numbers with 18 decimal places. However, since tokenized stocks are collateralized by shares which are effectively split (or reverse split), these events should be reflected in token's smart contract. Otherwise, someone may wonder why the price of a token is a multiple (or a fraction) of the price of the share it aims to represent.

Stocks' smart contracts come with a function named *multiplier*[4] which returns two values: the numerator and the denominator of the *multiplier*. This *multiplier* is multiplied with the quantity selected when users deposit the concerned tokenized stock on DCLEX. This means that the tokens are never split (or reverse split) but that the redemption right is affected when it comes to depositing them on DCLEX. For example, if someone buys a tokenized stock and then the stock goes through a 2:1 split, when the user (or another) comes on the platform and deposits tokens, for each token he will deposit he will be credited with two shares of the underlying stock in his DCLEX account. In the case of withdrawals, users need 2 shares of this stock to be able to withdraw one token. Inversely, if the stock would have either gone through a 1:3 reverse split, then when the user (or another) comes on the platform to deposit tokens, for each 3 tokens he deposits he will be credited with one share of the underlying stock in his DCLEX account. In such a case, it's important to note that a user can't deposit a third (⅓) of a share and would be forced to purchase 2 additional tokens of this stock to be able to perform a deposit. However, if that user would have held 1 share in his DCLEX account instead of 1 token in his Ethereum account when the reverse split happened, the share would have been automatically liquidated and the user would receive the equivalent value in USDC.[5]

Dividends distribution:

Owners of tokenized stocks have their right to dividends, just as if they were shareholders of the underlying asset. Cash and stocks dividends are always paid in USDC and are distributed directly into users' DCLEX account. To determine to which accounts dividends must be retributed, when the market closes **one business day before the ex-dividend date**, we take a snapshot of the tokens distribution on the blockchain and the shares distribution on DCLEX and the amount paid to DCLEX for the dividend is redistributed on a pro-rata[6] basis to the owners at the moment when the snapshot was taken.

<u>There may occur a delay between the official payable data of dividends and the moment when users' DCLEX accounts are credited with the corresponding amount denominated in USDC.</u>

It's important to remember that borrowers of tokenized stocks are obligated to remit their right to dividends to the lenders of the assets. It means that liquidity providers keep their right to

[4] Note that the built-in multiplier function aims to avoid confusion for users but smart contracts must not rely on it due to the lack of synchronization at the moment of the event.
[5] USDC distributions due to reverse splits may be delayed from the real event.
[6] It takes into account that token holder balances were <u>not</u> affected by forward and reverse splits of the underlying asset.

dividends from assets they lent. Thus, to become valid, proposed smart contracts pooling users' assets need to have a mechanism in place for us to know the Ethereum address of each lender such as a liquidity provider token (LP token). In such a case, the LP token holders are included in the snapshot like if they were shareholders of the underlying assets so that they will receive their part of dividends.

Custody of users assets:

DCLEX is a tokenization and de-tokenization platform for securities, but also for liquidities. To fund their account users deposit USDC in the Vault smart contract and they withdraw their fund from the same smart contract. It's important to understand that the Vault smart contract is only used as a unique end-point for users to (de-)tokenize the US dollar in order to fund their DCLEX account and that nearly all USDC deposited in the Vault are rapidly moved to a third-party qualified custodian, or to users' Ethereum accounts in the case of withdrawals.

Transferring USDC from/to the custodian takes time because of the (de-)tokenization process so a delay may occur between the moment when a user deposits USDC in the Vault and the moment when his DCLEX account is credited with these liquidities. Inversely, a delay may occur between the moment a user requests a withdrawal in USDC and the moment when the withdrawal becomes claimable. This is due to the fact that these transfers are actually multi-steps transfers behind the scenes and they rely on the traditional financial system which requires human interactions. Liquidities have to pass by an intermediary bank account owned by DCLEX before being transferred either to the DCLEX's Circle account then to the Vault if funds came from the DCLEX's brokerage account or to the brokerage account if the funds came from the Vault and were previously withdrawn to the DCLEX's Circle account and then sent to the DCLEX's bank account. To reduce this unfortunate delay and enhance the user experience, DCLEX injected some liquidities in the qualified custodian to fasten deposits and withdrawals of USDC. However, if there're too many deposits xor withdrawals requests at the same time the injected liquidities may not be enough to accelerate all requests thus users may have to wait until their liquidities effectively reach the destination.

It's important to note that the cumulative sum of platform fees are accumulated in the liquidities of the brokerage account held by a qualified custodian and are extracted from the system each time funds reach the DCLEX's bank account and the total sum of fees remaining in the system is transferred to another bank account also owned by DCLEX and the value of the cumulative sum of fees is resettled.

As to securities, they never quit the qualified custodian until a user sells them through their DCLEX account. This means that every tokenized stock that exists on the blockchain can always be deposited back on DCLEX to be credited with the corresponding amount of shares.

The reserve of assets is audited annually by an independent third-party audit firm and their reports are made available on our website.

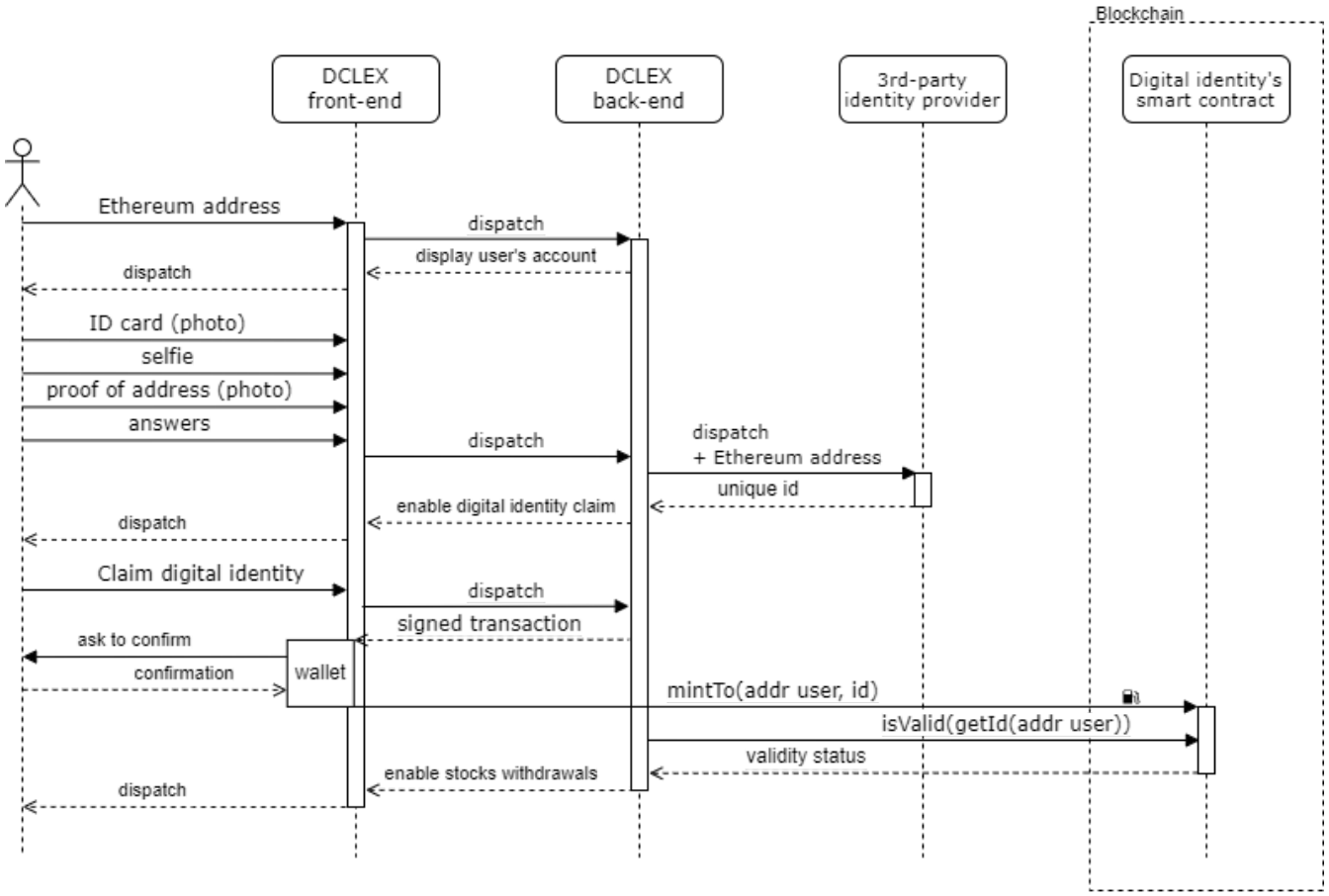
Interoperability:

As it stands, the public is not really able to create new financial products because of the need for third-party intermediaries. This poses a major obstacle to innovation, as it limits the number of people who can participate in the financial market. The economy is a subject that concerns everyone and we all have a unique perspective of it. However, if only a few individuals from the same social group have the ability to create financial instruments, the community as a whole is unable to benefit from its collective power. DCLEX wants to democratize finance by providing tokenized securities and digital identities that anyone can use to develop new applications. With programmability as a core feature, developers from all over the world can create innovative applications that utilize our tokenized securities and/or digital identities to solve real-world problems, improve financial inclusion, and promote economic growth. The possibilities are endless; developers can use digital identities to set permissions to call functions in their code, to access events in the physical world, or even as ID cards in the metaverse. They can also use tokenized securities as any other ERC-20 without having to verify identities, as this verification is made inside the tokens' contracts. This makes these tokens compatible with existing DeFi protocols which simply have to propose their smart contracts for verification on the DCLEX platform. Our goal is to make these tokens the building blocks of a new open and transparent financial system created by and in the best interest of the people. We believe that the power of the community is unmatched when it comes to finding solutions for the common good. By giving people the tools they need to create new financial products and participate in the financial system, we can unlock the full potential of a global economy. It's now possible to disintermediate the whole system using smart contracts to play the roles of third-party intermediaries. The DCLEX platform serves as a prime example of how these tokens can be used but the possibilities for their applications extend far beyond what we can imagine today.

Sustainability:

It's not an easy thing to develop a scalable project on a public blockchain because of the network fees that must be paid with its native cryptocurrency when performing transactions on-chain. Thus, to be financially viable DCLEX is built in order to retribute these network fees to its users as much as possible so that everyone pays their own fees. The only times DCLEX pays the network fees is to perform administrator functionalities. It's true that network fees can't be bypassed but it's still possible to make another Ethereum account pay for it. Even if it's more improving to implement, this is exactly what DCLEX did; it passes the network fees to end-users so that it doesn’t have to assume these charges for each user which would not be a sustainable business model. To do so, when comes the time to execute a transaction on-chain, instead of building, signing and sending the transaction on the network as it's usually done, DCLEX's back-end builds and signs the transaction and the signed transaction is then sent not to the network but to the user's wallet service provider in which the user can set parameters associated to network fees and then send the signed transaction on the network by himself so that he pays the network fees.

- **Digital identities issuance:**



1. As always, when a user comes on DCLEX platform he needs to login with his Ethereum using a wallet service provider to access his DCLEX account (There's no need to sign up). If it's the first time the user logins with this Ethereum account or if he hasn't passed through the verification process yet, he will be invited to do so in the header of each page.

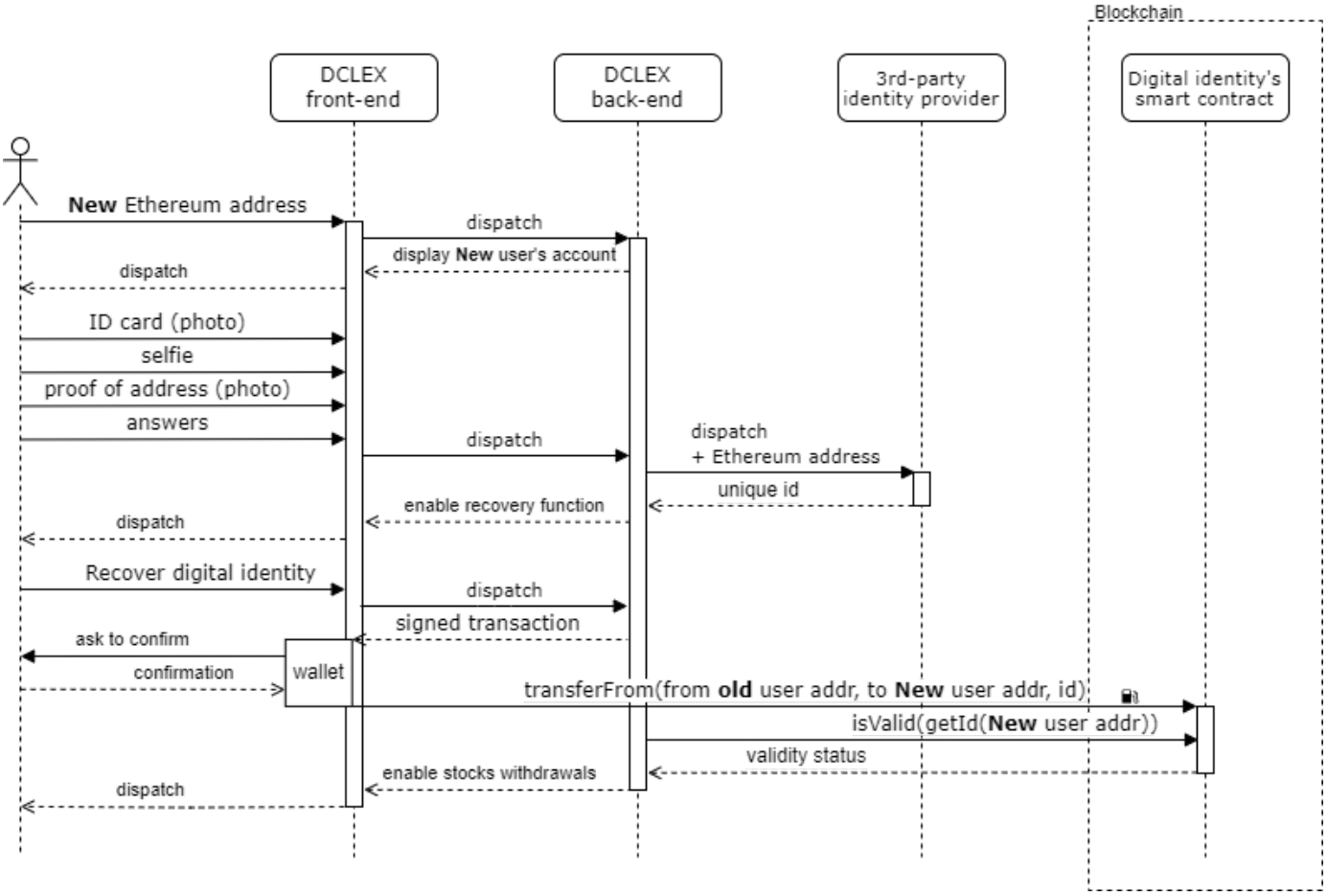
2. When the user starts the verification process, we will ask him to provide a photo of a valid identity card, a video of his face, a photo that proves his residential address and to answer a few questions. Then, along with the Ethereum address of the user, this information will be routed to a third-party service provider which will allow us to know if the user is eligible to be provided with DCLEX services. If yes, then he will be recognized as a verified user. At this point, the user is able to use all the functionalities of the platform except the ones for depositing or withdrawing tokenized stocks and the one for proposing a smart contract for verification. The user is not yet able to receive or send tokenized stocks on-chain.

3. To be able to interact with tokenized stocks on-chain, the user needs to claim his digital identity which he will be invited to do so in the header of each page.[7] By clicking on "Claim my digital identity", DCLEX back-end will build and sign the transaction and pass it to the user's wallet service provider.

4. The add-on of the wallet service provider pop-ups and the user is able to set up certain parameters related to network fees and to confirm the transaction. Once confirmed, the transaction is sent to the network and the user then owns a valid digital identity (sending a transaction to the network occurs at network fees). At this point, the user has access to all functionalities of the platform and is able to receive or send tokenized stocks on-chain.

[7] To be able to claim their digital identity users need to pay 20.00 USDC to the platform, which is debited from their DCLEX account.

- **Digital identities recovery:**



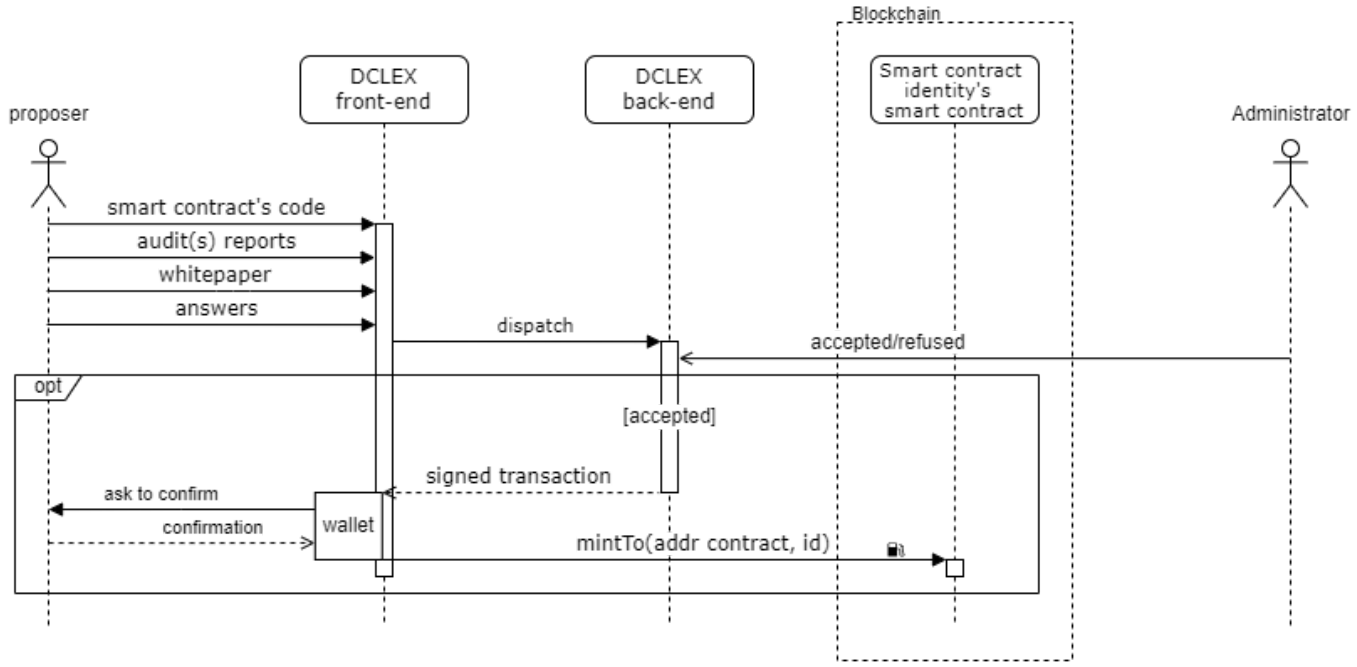
1. Even if a user loses access to his Ethereum account, it's still possible for him to recover his digital identity as well as tokenized stocks that have been withdrawn from DCLEX. To do so, the user has to generate a new Ethereum account and fund it with enough Ether to cover network fees (most wallet service providers offer the possibility to generate a new Ethereum account. To know how to proceed, please refer to the documentation of your wallet service provider). Then the user needs to login to DCLEX platform using this **new** Ethereum account.

2. On the Digital identity page, the user will then have to click on "Recover Digital Identity". Then, we will ask him to provide a photo of a valid identity card, a video of his face, a photo that proves his residential address and to answer a few questions. The information provided is then compared with other entities in the database of the third-party identity provider. If there's an identity match, DCLEX's back-end builds and signs a transaction to force the transfer of digital identity from the **old** Ethereum account to the **new** one. This signed transaction is then passed to the application of the wallet service provider of the user.

3. The add-on of the wallet service provider pop-ups and the user is able to set up certain parameters related to network fees and to confirm the transaction. Once confirmed, the transaction is sent to the network and the user's digital identity is transferred to the **new** Ethereum account (sending a transaction to the network occurs at network fees). At this point, the user has access to his initial DCLEX account on the platform and is able to receive or send tokenized stocks on-chain.

4. (Optional) - If the user also needs to recover tokenized stocks, it's possible to apply a similar process. To do so, we invite the users to communicate with us at: info@dclex.com

- **Smart contract identities issuance:**



★ **To be able to propose a smart contract for verification users must have their digital identity.**

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1. On the *Digital Identity* page, the user needs to click on "*Propose a smart contract*". Then he needs to provide links to the smart contract's source code, the audit report(s) and to the whitepaper and to answer a few questions.

2. Smart contract verification is treated on a case-by-case basis. **We strongly recommend you to get in touch with us prior to proposing a smart contract.** info@dclex.com

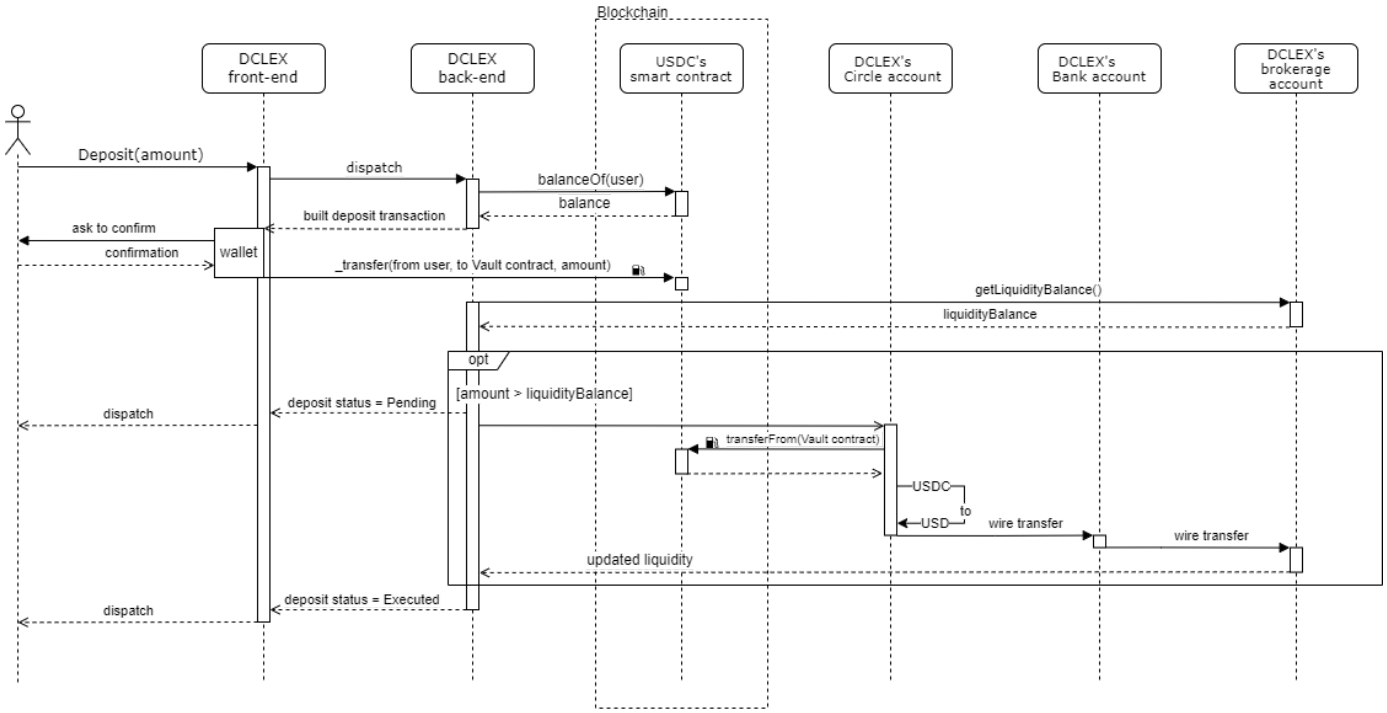
3. Once the smart contract is accepted by DCLEX, the user is provided with a built and signed transaction to issue a valid smart contract identity to the smart contract address. To send this transaction on the network the user will need to click on "*Claim smart contract identity*" placed near the smart contract address in the *Digital Identity* page.

4. The add-on of the wallet service provider pop-ups and the user is able to set up certain parameters related to network fees and to confirm the transaction. Once confirmed, the transaction is sent to the network and the smart contract identity is issued to the Ethereum account of the smart contract (sending a transaction to the network occurs at network fees). At this point, the smart contract is able to interact with tokenized stocks.

For more details on the acceptance criteria that smart contracts must meet to be valid, see Appendix A.

- **Deposit:**

Deposit USDC:



★ **This process should not take more than 4 business days.**

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1. The user comes on the platform and deposits some USDC. If the user has enough USDC in his Ethereum account, DCLEX's back-end builds the deposit transaction (which is simply a call to the *transfer()* function) and sends it to the application of the wallet service provider of the user.

2. The add-on of the wallet service provider pop-ups and the user is able to set up certain parameters related to network fees and to confirm the transaction. Once confirmed, the transaction is sent to the network (sending a transaction to the network occurs at network fees).

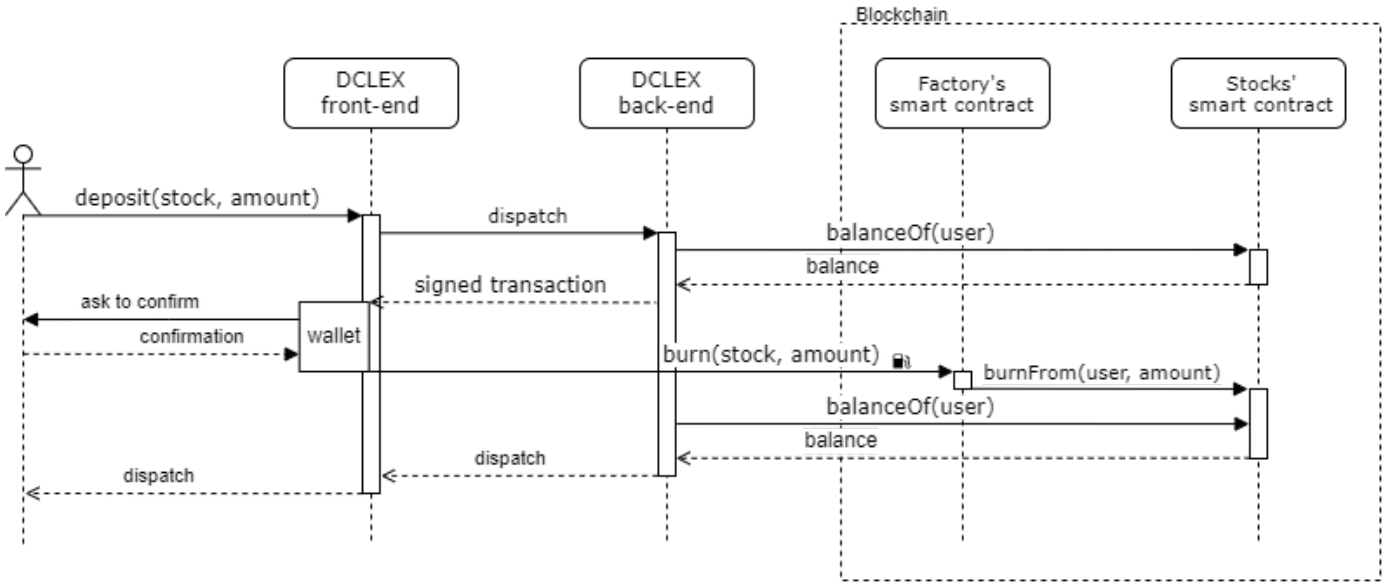
3. Once the transaction is successfully executed on-chain, the back-end will compare the amount of the deposit and the liquidities available for users' deposits in DCLEX's brokerage account:

    - If the amount of the deposit is **smaller or equal** to the amount of liquidities available to cover users' deposits in DCLEX's brokerage account, then the user usually has access to his funds in his DCLEX account after 20 confirmations[8] from the blockchain.

    - On the other hand, if the amount of the deposit is **greater than** the amount of liquidities available to cover users' deposits in DCLEX's brokerage account, the user needs to wait for his funds to be de-tokenized in DCLEX's Circle account and then to be sent to DCLEX's bank account prior to be sent to DCLEX's brokerage account.

[8] On Ethereum, the average confirmation/block time is approximately 12 seconds/block (see https://etherscan.io/chart/blocktime).

Deposit tokenized stocks:



★ **Users can only deposit whole numbers of shares.**

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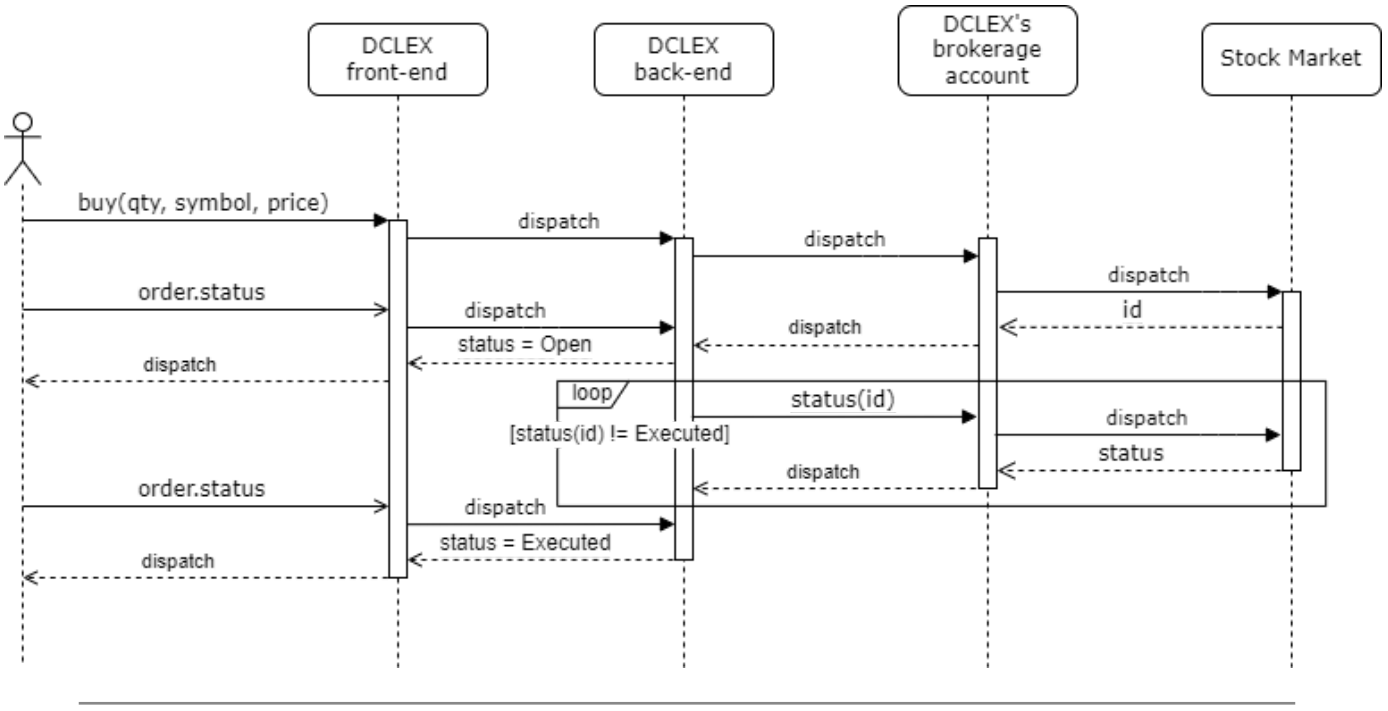
1. The user comes on the platform and deposits a tokenized stock. If the user has enough of this tokenized stock in his Ethereum account, DCLEX back-end builds the deposit transaction and sends it to the wallet service provider of the user.

2. The add-on of the wallet service provider pop-ups and the user is able to set up certain parameters related to network fees and to confirm the transaction. Once confirmed, the transaction is sent to the network (sending a transaction to the network occurs at network fees).

3. Once the transaction is successfully executed on-chain, the tokenized stocks are destroyed (*burned*) then, after 20 confirmations[8] from the blockchain, the user's position in his DCLEX account is credited with the corresponding amount of shares.[9]

[9] For more details regarding the *multiplier*, see section **Reflecting forward and reverse stocks splits.**

- **Buy:**

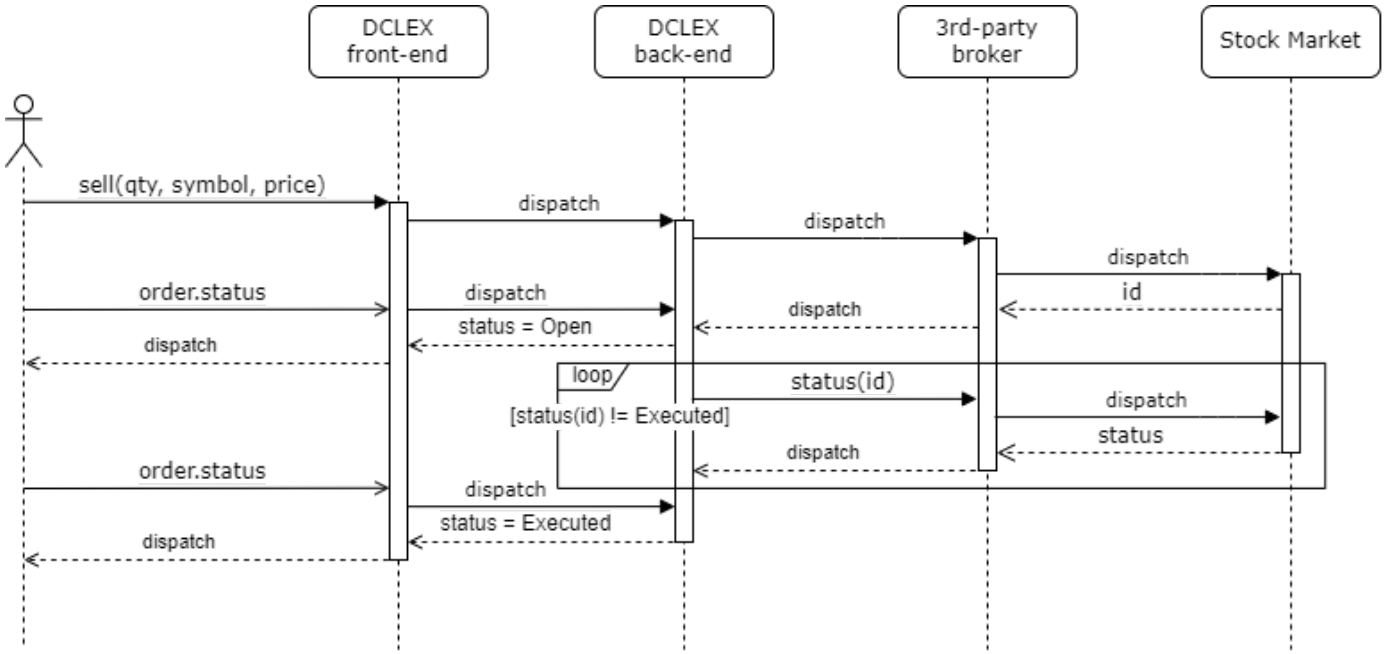


1. The user comes on the platform and places an order to buy some shares of a stock. If he has enough buying power in his DCLEX account, the system routes the user's order to the stock market.

2. Immediately after the order is sent to the market, its status is "*Pending*". Then, the DCLEX back-end constantly verifies the status of the user's order until it is filled on the stock market (since all orders on DCLEX platform are of type "*All-or-None*", orders can't be partly filled). When the order is executed on the market, the user's balances in DCLEX are updated.

DCLEX charges 1% of the value of each buy order to users. This charge is applied when the order is "Executed" on the stock market.

- **Sell:**



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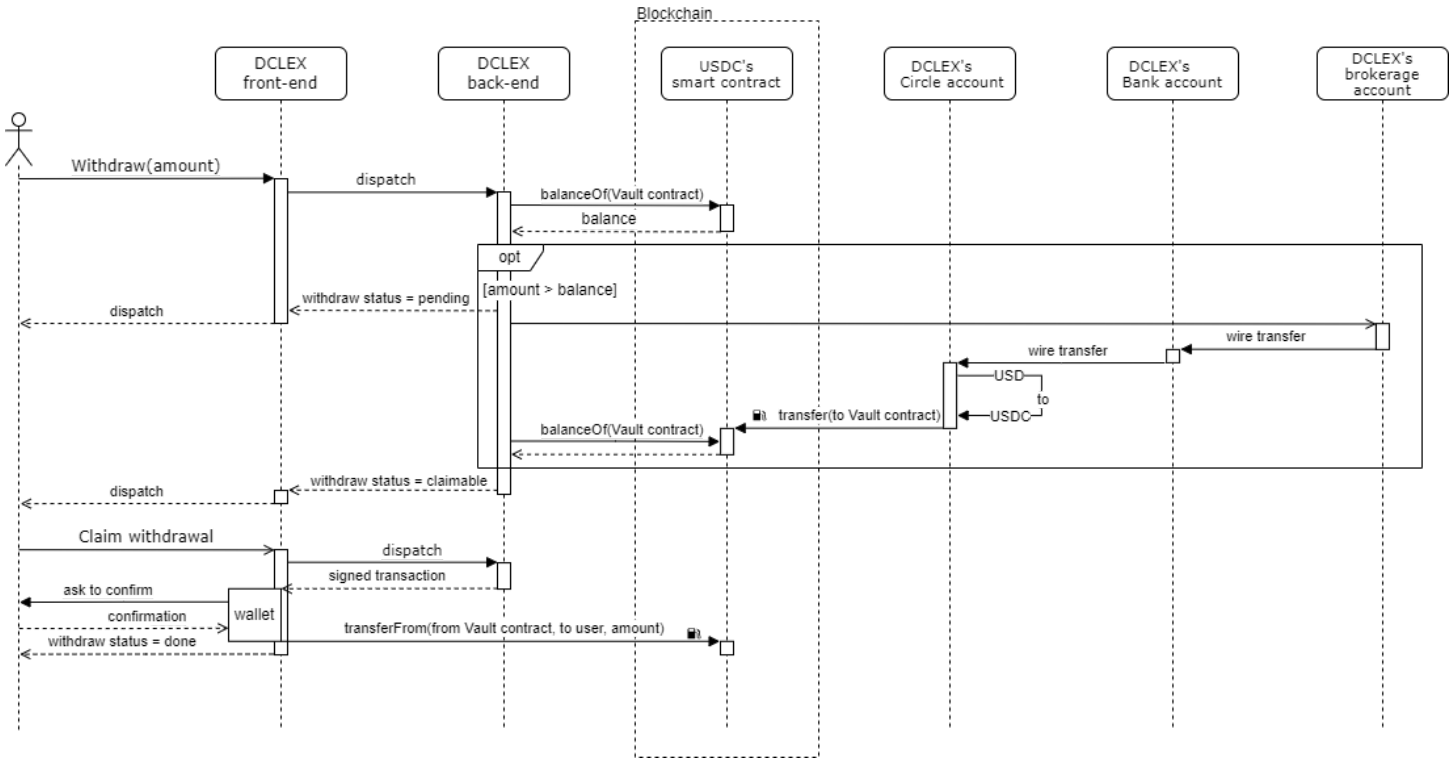
1. The user comes on the platform and places an order to sell some shares of a stock. If he has enough shares of this stock in his DCLEX account, the system routes the user's order to the stock market.

2. Immediately after the order is sent to the market, its status is "*Pending*". Then, the DCLEX back-end constantly verifies the status of the user's order until it is filled on the stock market (since all orders on DCLEX platform are of type "*All-or-None*", orders can't be partly filled). When the order is executed on the market, the user's balances in DCLEX are updated.

DCLEX charges 1% of the value of each sell order to users. This charge is applied when the order is executed on the stock market.

- **Withdrawal:**

Withdraw USDC:



★ Withdrawals in USDC happen in **TWO STEPS**: 1st STEP : Request a withdrawal
2nd STEP : Claim the withdrawal

---

1. The user comes on the platform and requests to withdraw a certain amount of USDC from his DCLEX account. The same amount is debited from the liquidities available in the DCLEX account of the user.

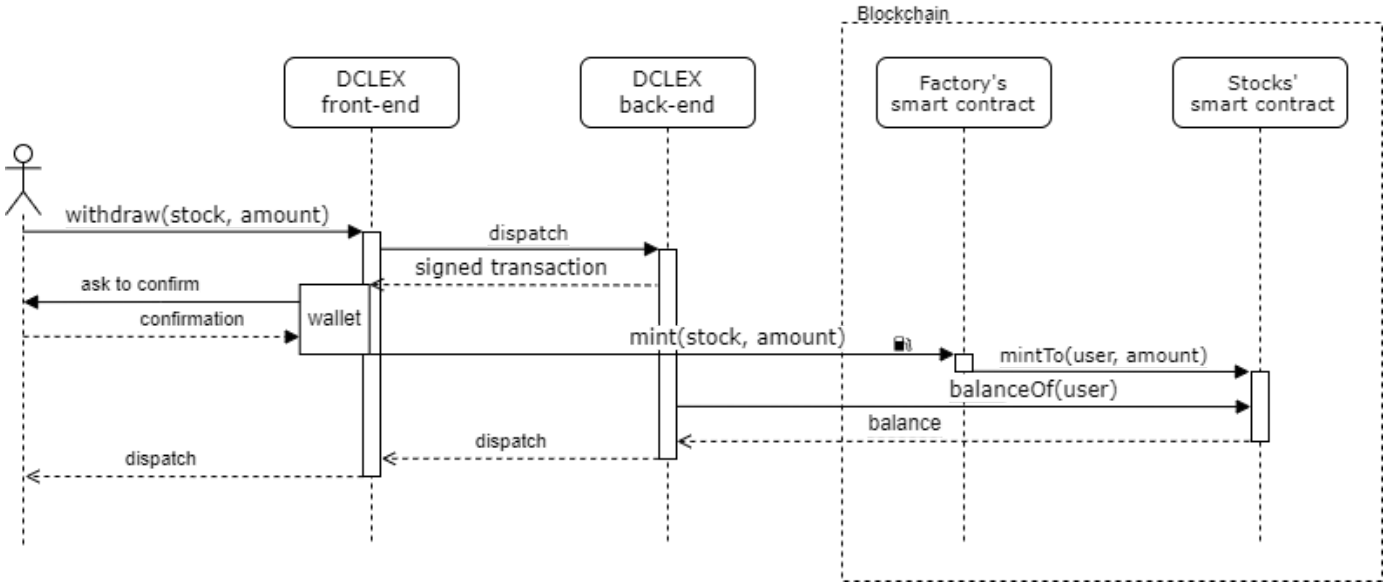
    - If there's **enough** USDC available to cover the withdrawal from the Vault smart contract, the system builds the withdrawal transaction and the withdrawal becomes claimable immediately.

    - On the other hand, if there's **not enough** USDC available to cover the withdrawal in the Vault smart contract, the user has to wait until DCLEX bails out the Vault contract with liquidities from the DCLEX's brokerage account before being able to claim the withdrawal.
      This process should not take more than 4 business days.

2. Once the withdrawal is claimable, the user will be able to click on "*Claim USDC*" beside the corresponding deposit in the *History* page.

3. The add-on of the wallet service provider pop-ups and the user is able to set up certain parameters related to network fees and to confirm the transaction. Once confirmed, the transaction is sent to the network and the corresponding amount of USDC is transferred from the Vault contract to the Ethereum account of the user.

Withdraw stocks:



★ **To be able to withdraw tokenized stocks, users must have their digital identity.**

---

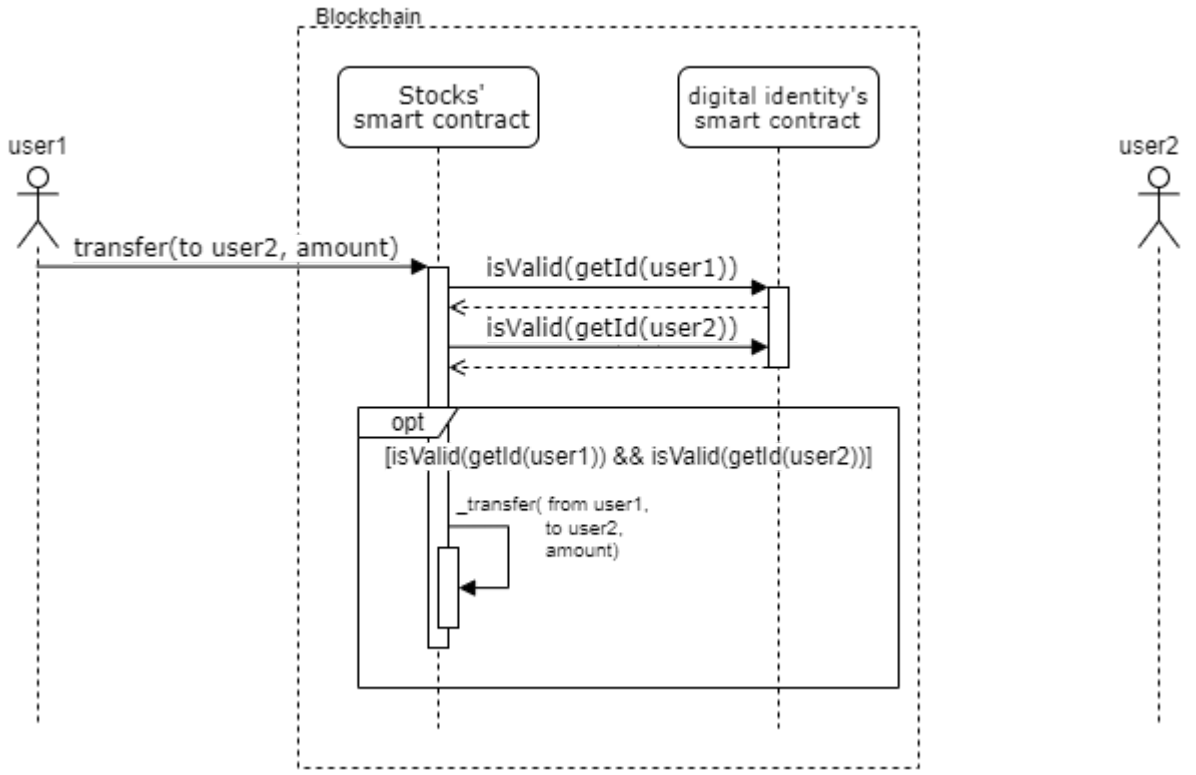
1. The user comes on the platform and withdraws/tokenizes shares of a stock. If the user has enough shares of this stock in his positions in his DCLEX account, the system builds the withdrawal transaction and sends it to the application of the wallet service provider of the user.

2. The add-on of the wallet service provider pop-ups and the user is able to set up certain parameters related to network fees and to confirm the transaction. Once confirmed, the transaction is sent to the network (sending a transaction to the network occurs at network fees).

3. Once the transaction is successfully executed on-chain, tokenized stocks are created (*minted*) in the Ethereum account of the user while in his DCLEX account, the positions are immediately debited with the corresponding amount of shares.[10]

[10]For more details regarding the *multiplier*, see section **Reflecting forward and reverse stocks splits.**

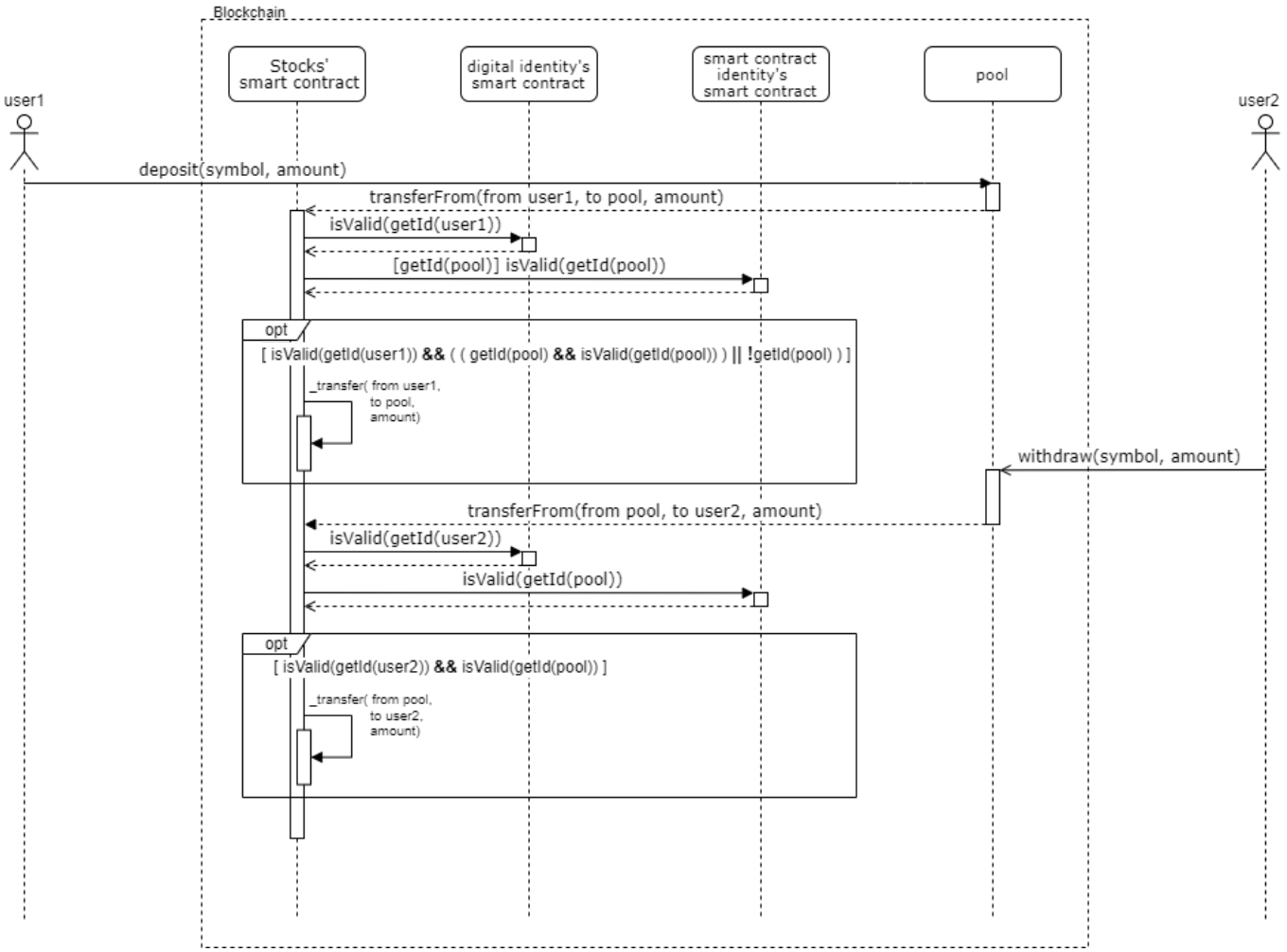
- **Peer-to-peer transfer (P2P):**



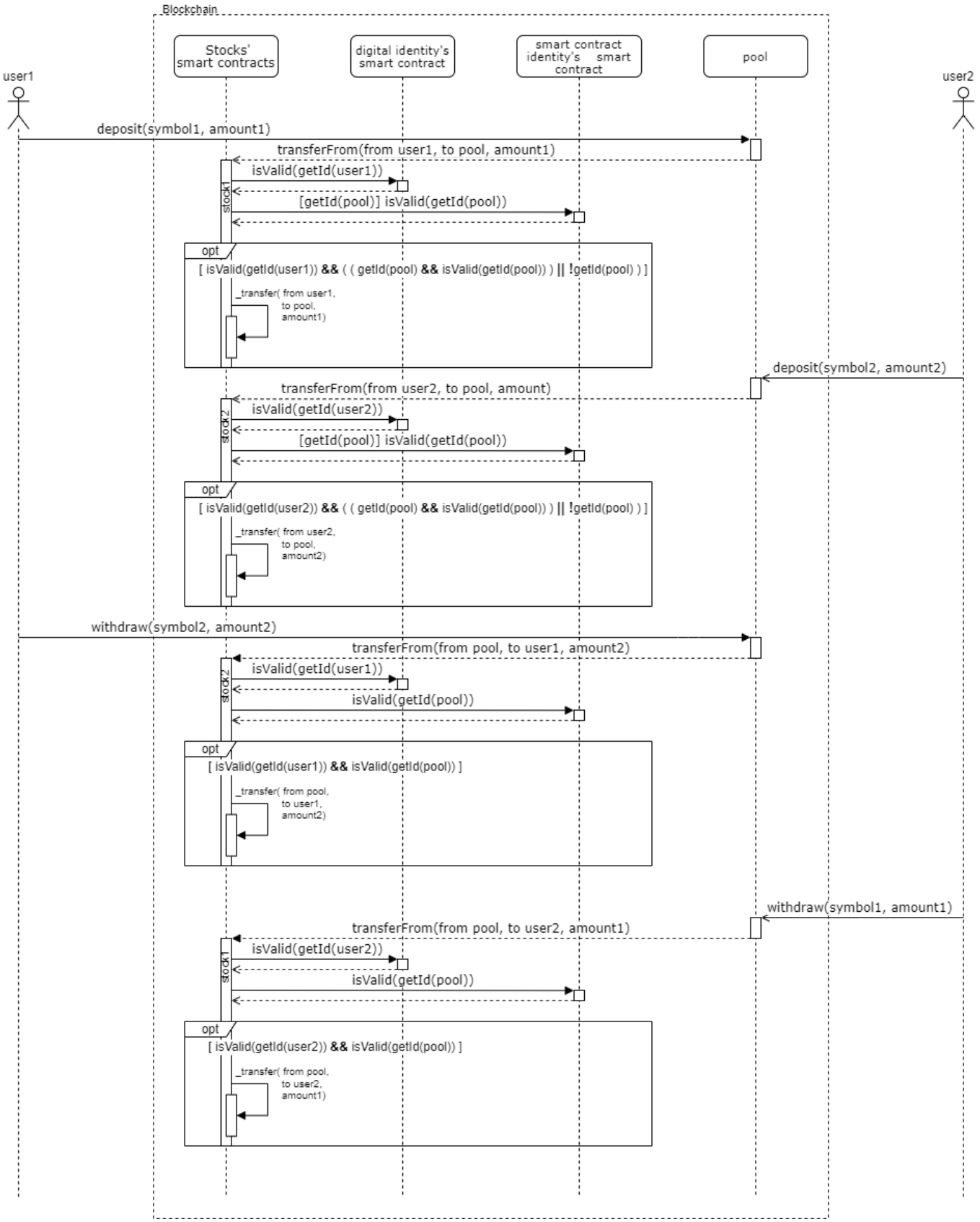
This diagram shows the internal interactions that happen between the smart contract of a tokenized stock and the one of digital identities when the stock's transfer function is called. The transfer function of stocks' smart contract calls the digital identity's smart contract to verify if the sender and the receiver of the transaction both hold a valid digital identity. If so, the transfer happens, otherwise the transaction reverts.

Actually, the stocks' smart contract is only an example of how digital identities can be used but it can also be useful in many other applications. Developers can either choose to use them as a tool to identify market participants via a Zero-Knowledge Proof of identity just like it's done in the stocks' smart contract or they can choose to use digital identities for a completely different purpose.

- **Peer-to-pool-to-peer model:**



- **Trustless third-party model:**



Fees structure:

Digital identities:

- **Platform fees**: 20.00 USDC – Paid with users' DCLEX account.
- **Network fees**: Paid with Ether from the Ethereum account of the receiver of the NFT.

Digital identities recovery:

- **Platform fees**: Free.
- **Network fees**: Paid with Ether from the new Ethereum account of the receiver.

Smart contract identities:

- **Platform fees**: Free.
- **Network fees**: Paid with Ether from the Ethereum account of the proposer.

Tokenized securities:

Deposit:

- **Platform fees**: 0%
- **Network fees**: Paid with Ether from the Ethereum account of the sender.

Buy:

- **Platform fees:** 1% of the value of the executed order.
- **Network fees**: 0%

Sell:

- **Platform fees:** 1% of the value of the executed order.
- **Network fees**: 0%

Withdrawal:

- **Platform fees**: 0%
- **Network fees**: Paid with Ether from the Ethereum account of the receiver.

Transfert (P2P):

- **Platform fees**: 0%
- **Network fees**: Paid with Ether from the Ethereum account of the sender.

Funds recovery:

- **Platform fees**: 0%
- **Network fees**: Paid with Ether from the Ethereum account of the receiver.

Administrator functionalities:

We recognize that DCLEX operates within an emerging financial system and relies on new technologies which are continually evolving and that this comes with some uncertainties. However there are many safeguard functionalities implemented directly in the code of the smart contract of tokenized securities as well as in the code of the smart contract of digital identities and in the one of smart contract identities. These functions can only be called by the administrators of the system. There are two types of administrators: standard administrator (admin) and master administrator (master admin). The admin role is held by the back-end and it has the permission to call everyday's functions that are needed to respond to customers requests while the master admin role has not only the power to grant and revoke admin roles to/from any Ethereum addresses but it also has the permission to call special functionalities which are implemented in order to provide an additional security layer since the private key of the master admin are held in a cold wallet. Thus, in the improbable case where a hacker would introduce into our system and steal the private key of the Ethereum account of an admin, we are still able to revoke his role using the master admin account and then we would recover tokenized securities and digital identities that would have been transferred by the hacker and we would finally return the assets to the DCLEX accounts of the victims.

Tokenized securities recovery:

The master admin role has the power to destroy (burn) and create (mint) tokenized securities from/to any Ethereum account. These functions enable funds recovery in the event where a user lost access to his Ethereum account or to recover assets from victims of frauds or from sanctioned smart contracts, or even if we are forced to do so because we received an order from the court saying to do so.

Setting validity statuses:

The admin role is enabled to modify the validity status of any digital identities or smart contract identities. This variable, which is set to "Valid" by default, is actually a boolean. When the value of this variable is equal to 1 ("True") it means that the identity is "Valid" and inversely when its value is equal to 0 ("False") it means that the identity is "Invalid". This function is essential for the purpose of performing an efficient ongoing monitoring over our customers.[11]

Off-boarding mode:

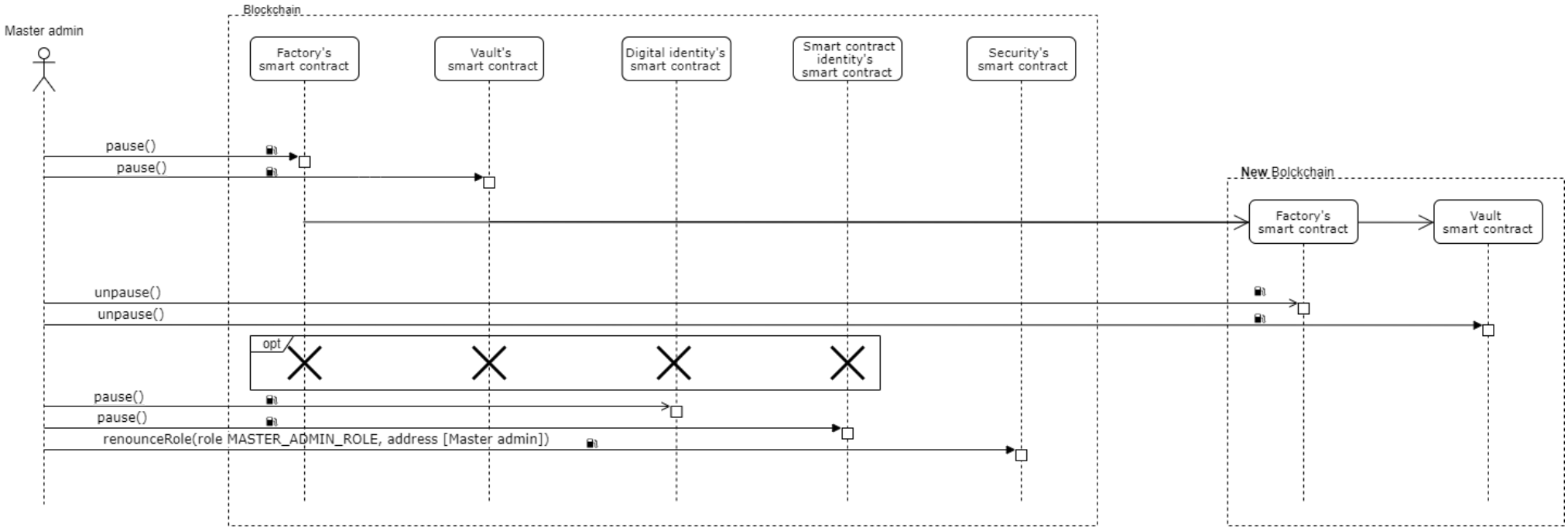
The master admin role has the permission to turn on and off an off-boarding mode for each tokenized securities. This mode disables all functionalities for every user except the functionality to redeem shares of the tokenized security concerned on DCLEX platform. With this feature we can manage stocks delisting of the underlying asset on the stock exchange. If a security that DCLEX uses to tokenize is delisted and all shares are redeemed at a specific price, tokenized securities holders will still be able to deposit their tokens on the platform and then sell them at this specific price.

[11] In the event where a valid smart contract of a liquidity pool is invalidated while users' assets are still held in it, we will recover all tokenized stocks from the Ethereum account of the invalid smart contract to the DCLEX accounts of the respective beneficiaries which usually refer to the holders of the liquidity provider tokens, if such a mechanism is used to record creditors' right to the pooled assets.

Managing hard forks:

We often hear that it's more complex to develop things in a decentralized way and it especially becomes true when it's time to tackle the question of hard forks in the context of issuing real world assets on a public blockchain. Decentralized ledger technologies are evolving and sometimes modifications are made to the code of blockchains themselves and hard forks are the processes through which such upgrades are made. The thing is that with consensus mechanisms there isn't a unique instance of the blockchain, each node runs his instance and a consensus is made among nodes to determine which block will be added to the blockchain. This means that to update the code, every node must agree on the brought modifications and the time of the update. Hopefully, this is what usually happens. In a case like this, where the consensus is unanimous, things go well and every node starts to run the new version of the code specifically at the same moment. At the very beginning of the fork it's not all nodes that have updated their code and it leads the blockchain to be split into two different chains since nodes continue to add blocks according to their version. Usually, every node updates their code rapidly and the old blockchain becomes deprecated but it's not always as smooth as this. In some rare cases and for different reasons it's not every node that want to bring the modifications to the blockchain's code and if this disagreement is shared among many nodes it can create a resistance movement so that sometimes we can end up with two different chains that have the same history before the hard fork but not the same future. This is actually how the Ethereum Classic blockchain has been created. In such a case users' assets are literally duplicated and people can access their accounts on both chains with the same private keys. This is a phenomenon that can be problematic when it comes to tokenized real world assets. The problem is that the underlying real world assets are not duplicated so it must absolutely be clear which blockchain really represents its ownership at any given time. We recognize that this is extremely hard to deal with and we take this matter very seriously. That's why we established a very cautious plan to manage the advent of a hard fork.

Sequence of the procedure to manage a blockchain's hard fork:



Guideline for developers seeking to request smart contract identities

This guidance aims to provide clarity regarding which smart contracts can be approved to have their valid Smart Contract Identities (SCIDs), which are non-transferable NFTs. Smart contracts with a valid SCID can then hold and transfer tokenized stocks like any other entity holding a valid digital identity.

Smart contracts themselves are what empower the revolution of DeFi and the real revolution is not supposed to happen on the DCLEX platform but on the blockchain. The first layer of DeFi is the asset layer and by implementing compliance at the asset layer DCLEX establishes a strong base upon which a new financial system can be built. However, to ensure its robustness, we need to provide at least a categorization of smart contracts and some requirements regarding each category. It's specifically the scope of this guideline.

- All protocols must comply with all securities laws of the jurisdictions where their customers live and must implement a strict and efficient entitlement system that restricts their use to customers from jurisdictions where protocols are compliant, otherwise they should comply with all applicable laws.
- Custodian protocols pooling users' tokenized stocks into a smart contract must distribute liquidity provider tokens which represent shares of the pooled assets allowing us to know the identity of the beneficiaries of the underlying tokenized stocks so that we have a means to distribute dividends properly.
- Decentralized exchange protocols are exempted from the KYC/AML requirements when facilitating trades of tokenized stocks withdrawn from DCLEX since this verification is already made inside the token contract.[12]
- Lending protocols must implement a mechanism to automatically liquidate the collaterals before borrowers' positions become under-collateralized.
- Oracle's services can’t be used to determine the value of the tokenized stocks. However such services can be used to retrieve data from outside of the blockchain and are likely to play a huge role in developing new financial instruments.
- Account abstraction protocols wishing to propose private smart contracts must be differentiable from public smart contracts and the source code of each private smart contract must be identical to each other and must have a unique beneficiary.
- Privacy enhancing protocols may be allowed to hold a smart contract identity in certain circumstances where end-users’ privacy would be enhanced but where DCLEX would be able to know the identity of the token holders at any moment. Innovations in this field are welcomed.
- Upgradable (proxy) protocols are not allowed to hold a smart contract identity.
- Bridge protocols are not allowed to hold a smart contract identity.

[12] However, for other unregulated tokens to be traded on such trading facilities, we recommend to do this verification at the protocol layer and not at the application layer, otherwise sanctions can't be efficiently applied.

Appendix A

This is a non-exhaustive list of different categories of DeFi protocols/services:

Category
Custodian protocol
Decentralized exchange protocol
Lending protocol
Oracle
Account abstraction protocol
Privacy enhancing protocol
~~Upgradable (proxy) protocol~~
~~Bridge protocol~~
Crowdfunding protocol
Payment protocol
Insurance protocol
Aggregator protocol
Wrapping protocol
Token protocol
Automatic tax reporter protocol