

GetLine

disrupting a \$1 trillion market with blockchain technology

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Abstract

The GetLine Network is a peer-to-peer lending market on the Ethereum blockchain. The platform will allow for instant and direct lending in cryptocurrencies. GetLine will initiate a unique architecture for a credit risk prediction market to make lending safer for lenders and more accessible for borrowers. We aim to revolutionize the peer-to-peer lending market and fully decentralize it, making it easily accessible, safe, and compliant to serve as an infrastructure for a new kind of global financial system.

Contents

1	Introduction	5
2	Aim	7
3	The idea	8
3.1	History of GetLine.in	8
3.2	The problem we aim to solve	8
3.3	Reverse ICO	9
4	Credit risk management	10
4.1	Introduction	10
4.2	Collateral	10
4.3	The risk assessment mechanism. Credit scoring market	11
4.4	Credit scoring process	11
4.5	Metascoring information flow	13
4.6	Risk analysis market	13
4.7	Calculating metascore	14
4.8	Mitigating risks on ARA prediction market	15
4.8.1	Aligning ARAs' interests with lenders – the reserve system	15
4.8.2	Preventing ARAs' attacks against each other	16
4.8.3	Preventing ARAs' attacks against lenders	17
4.8.4	Preventing ARAs' manipulation of their own metascore	17
4.9	Preventing strategic defaults	17
5	Loan lifecycle	19

6	Competition	21
6.1	Legacy <i>fiat</i> currency credit system	21
6.2	Legacy credit bureaus and credit scoring agencies	22
6.3	P2P lending marketplaces	23
6.4	Decentralized cryptocurrency P2P lending platforms – experiments	24
6.4.1	WeTrust	24
6.4.2	Dharma.io	24
7	Challenges	26
7.1	Identity fraud	26
7.2	Cryptocurrency value change	27
7.3	Legal compliance and mitigation of regulatory risk	27
8	GET tokens	29
8.1	Introduction	29
8.2	GET token functions	29
8.2.1	Loans’ collateralization in GET	29
8.2.2	ARAs’ reserve	29
8.2.3	Network Trust Fee	29
8.2.4	Network value capturing	30
9	GET tokens distribution and crowdsale	31
9.1	GET tokens distribution	31
9.2	GET crowdsale	31
9.3	Crowdsale proceedings distribution	32
9.3.1	Reverse ICO	32

9.4 Allocation of GetLine Company’s funds	33
10 Roadmap	35
10.1 GetLine Red	35
10.2 GetLine Yellow	36
10.3 GetLine Green	36
10.4 Additional features	37
10.4.1 Improved collection of defaulted loans	37
10.4.2 Extended securitization and collateralization	37
10.4.3 Additional loan contracts’ features	38
10.5 Our vision for long-term development	38
11 Loan contract design	39
11.1 Modularization	39
11.2 Attestation interface	41
11.3 Loan contract	41
11.4 Investment split	46

1 Introduction

Following the 2008 economic crisis, banks and financial institutions were forced to tighten their lending policies. In effect, many potential borrowers, even with high credit scores, were refused credit and turned away from banks. The market reacted with the emergence of the new peer-to-peer (P2P) lending model, where an online platform directly matches individual borrowers with investors, as opposed to banks that serve as financial intermediaries.

In 2011, 50 percent of all new mortgage money was loaned by the three biggest banks in the United States: JPMorgan Chase, Bank of America and Wells Fargo. But by September 2016, the share of loans by these three big banks dropped to 21 percent.

[The Washington Post](#)

P2P lending platforms offer loans to borrowers with slightly worse credit scores than most banks' clients, yet manage to offset the default risk with increased interest rates. In effect, investors in the Lending Club, the world's largest peer-to-peer lending platform, yielded adjusted net annualized returns of 5-7% (after fees and writing off losses from bad debts), compared to around a 1.1% average for a U.S. 5-year bond yield.

The P2P lending market was valued at more than \$26 billion in 2015, as compared to less than \$100 million in 2006. Morgan Stanley estimates that globally the marketplace lenders will originate \$150 to \$490 billion worth of loans annually by 2020. In the next 10 years the value of the sector could easily surpass the \$1 trillion mark.

P2P lenders have leveraged low operating costs, minimal regulations, Big Data and technology streamlined for a mobile generation to mediate terms between everyday borrowers who want quick access to cash and the lender-next-door starved for yield.

[Morgan Stanley Research](#)

Although the P2P loan market vastly disrupted the lending market, it has encountered problems of its own. The biggest player on the field manipulated its lending statistics, and just a few years later deliberately misled one of its key clients. Other lending platforms just disappeared from the market, stealing investors' cash. On another occasion one of the industry leaders had to contact tens of thousands of its lenders as it had been miscalculating their returns, and concerns have been raised over other platforms masking of their loans' true performances.

All of these problems emerged from the fact that although the loans are funded in a peer-to-peer manner, the process is centralized and controlled by a trusted third party. P2P

lending platforms serve as intermediaries, not only scoring borrowers' trustworthiness, but also collecting and redistributing loans and repayments. On top of that, these platforms do not have their skin in the game, as the only thing they risk when their loan performance drops is their reputation. This does not stop them from charging hefty fees ranging from 3% to 6% of a loan's value.

Even more importantly, today's P2P lending platforms are based on legacy financial systems, which prevents them from scaling worldwide and from seeking interest rate arbitration. They are also not capable of serving **2.5 billion** of the world's adults who do not use banks nor microfinance institutions to save or borrow money.

Hence the first player in the game to offer a truly decentralized, transparent, and trusted solution to today's P2P platforms' problems might become the leader in a multi-billion dollar emerging market.

2 Aim

GetLine aims to disrupt the P2P lending market using blockchain technology to foster safe, disintermediated, global, and truly peer-to-peer lending. How? (1) Cryptocurrencies easily move across borders and could help to scale the market and achieve enormous network effect. (2) Smart Contracts ensure secure, self-enforceable agreements and move money without intermediaries. (3) Blockchain networks can host robust, transparent, and competitive prediction markets that in turn have the potential to assign borrowers' credit scores much more accurately than today's credit score agencies.

We propose to create the GetLine Network, a powerful lending system based on the Ethereum blockchain that will unlock funds for borrowers with worse credit scores, and on the other hand, bring healthy returns to loan funders, well above the rates offered by banks' saving accounts or bonds.

The GetLine Network will comprise of:

- A smart contract layer, where the entire lending contract will be safely performed and settled – see [smart contract section](#);
- A credit risk scoring network, made up of entities called Attestors of Risk Analysis (ARAs) providing evaluation of borrowers' creditworthiness and effectively forming a prediction market, but also serving as compliance agents, ensuring the viability of each lending contract according to applicable jurisdictions – see [ARA section](#);
- A metascoring system providing information on each individual ARA's past accuracy to foster competition and allow lenders to evaluate each credit score's trustworthiness, based on ARA's previous performance – see [metascore section](#);
- A user-friendly GetLine Browser, allowing for future borrowers to easily apply for credit scores and later for loans, and for investors to fund loans – see [roadmap section](#);
- A GET token contract with Network Trust Fees – see [GET token section](#).

All these elements will allow for a P2P credit network providing lenders to rationally allocate their funds based on accurate prediction data and to gain healthy interest rates, and for borrowers to tap into a global financial market.

We want GetLine to be *the killer blockchain app*, tapping into two globally important trends – the rise of P2P lending and the dawn of the widespread adoption of cryptocurrencies.

3 The idea

3.1 History of GetLine.in

The development team of the GetLine Network worked previously on GetLine.in – a P2P Bitcoin lending platform. GetLine.in was functioning similar to *fiat* currency lending P2P platforms, it was centralized in the sense that GetLine.in was the only identity verifier and credit risk scoring entity and was also serving as a “trusted third party”, intermediating all the Bitcoin transfers between lenders and borrowers. After two years of running the platform we found it was increasingly hard for us to scale, as more and more people from all around the world decided to join the platform as borrowers. In effect, it became difficult for us to verify and score hundreds of new customers, often from other sides of the globe.

Many of these newcomers from far away turned out to be fraudsters, and others’ creditworthiness was just impossible to get sufficiently assessed. We did not want to close our service to people from outside of Europe, yet we realized very quickly that we are just not able to serve them. Indeed, most of today’s P2P lending platforms, such as Zopa or Lending Club, accept only borrowers from their country, yet our aspirations were global.

But what if all the institutions that assess creditworthiness in their own countries could join forces and form a network? Such a network could transmit creditworthiness, just as blockchain today transfers value. We could then serve all of the world indiscriminately.

We envisioned a network of credit score verifiers, each specialized geographically and assessing borrowers’ risk profiles of their choice.

By connecting many P2P lending marketplaces and credit scoring entities we can create a global, borderless, open, and decentralized P2P lending network built on blockchain. A network that could shake the foundations of legacy financial institutions. The idea of establishing the GetLine Network, instead of a centralized P2P lending platform, has been inspiring us since ever since conceiving the idea. Implementing became feasible only very recently, as Ethereum gained traction among the blockchain community, and a huge amount of capital flew into the blockchain space, following increased interest in the technology.

3.2 The problem we aim to solve

P2P lending platforms have to face multiple challenges to create service that is safe for the lenders and allows them to achieve satisfactory profits, but also, on the other hand, friendly and accessible for the borrowers. The biggest problems are: firstly,

those of raising capital and inducing investors to lend, and secondly, of assessing the creditworthiness of the borrowers well enough to keep the profits of investors satisfactory and the platform sustainable.

In our vision, every person or organization in the world is able to get their creditworthiness assessed and obtain a loan from a huge pool of potential lenders from all around the world. Blockchain already allows for value transfers, which is needed in order to move money across the globe. However, until recently, there was no solution for transferring creditworthiness. Without a way to transfer trust between lending marketplace participants in a decentralized way, there cannot be a decentralized lending platform.

The GetLine Network aims to create a layer on the Ethereum blockchain, allowing for transmission of information of one's creditworthiness, just as the Bitcoin blockchain allows for transferring value between its participants. On top of it we want to construct an easy to use P2P cryptocurrency lending platform, truly decentralized and global by design.

3.3 Reverse ICO

GetLine.in is currently a lending company of insignificant size compared to legacy financial institutions and fiat-based P2P lending marketplaces. We have to develop quickly in order to be able to compete. By holding an ICO and decentralizing our platform, we aim to provide a proof of concept for a reverse ICO, where an already established company dissolves its operations, and reestablishes itself on blockchain, in a decentralized formula. This white paper presents our plan for reinventing GetLine. While customers of our platform have enjoyed lower prices and better user experience compared to e.g. legacy financial institutions, we were still more costly than they would be without a for-profit third-party extracting fees, like today's GetLine.in. We want to tokenize and decentralize our platform and become much more effective and cheaper for all future participants than we are now as a centralized for-profit entity.

4 Credit risk management

4.1 Introduction

Loan activity creates an inherent risk of capital loss due to defaults. Defaults most often result from either the inability of the borrower to pay back the loan or his decision to fail to pay back the loan based on economic calculations (a strategic default). Typically, the risk of borrowers not paying back their loans is offset by interest rates (default premiums), collateral, or a combination of both. The level of the necessary default premium and/or collateral is typically determined based on the borrowers credit score, representing their creditworthiness. The credit score itself, along with collateral, represent the mechanism deterring borrowers from strategically defaulting on their loans, as defaulting on a loan negatively affects their credit score. A good credit score represents value to the borrower, as it allows them to borrow more easily, with lower interest rates and less collateral.

The GetLine protocol is designed to minimize fraud risks and protect lenders from excessive default rates. It is designed to leverage all of these mechanisms in a decentralized and trustless manner, using blockchain technology and the Ethereum network. This chapter lays out the key elements that cover the credit risk management in the GetLine Network:

- The risk assessment mechanism,
- The credit score information flow,
- The collateral design,
- Risk of the premium market,
- Out-of-blockchain debt collection.

4.2 Collateral

Every GetLine loan will be collateralized in GET tokens. Collateral has been used for millenia to mitigate the risk of payment default. The GetLine Network will use collateral to assure lenders that they will not lose all of their money and to ensure lower interest rates for the borrowers. Collateralization will be crucial in the phase of bootstrapping and later expanding the GetLine Network as new borrowers with no track-record of previous loans in the system may need to collateralize as much as 80%, 90%, or even 100% of their first loans. Later, after building sufficient credit history and proving their creditworthiness, they might get loans secured by fewer GET tokens, yet no less than 5% of a loan's value.

4.3 The risk assessment mechanism. Credit scoring market

In the GetLine Network, the risk assessment process will be entrusted to for-profit, third-party entities – Attestors of Risk Analysis (ARAs), who will effectively be serving as credit rating agencies. The ARAs' role will be to cryptographically sign a given loan request with a projected default rate, based on risk examination. The GetLine Company will provide an automatic scoring mechanism assessing the historical effectiveness of every given ARA, basing on information openly accessible in the blockchain. Overall scoring expressing the accuracy of the given ARAs predictions will be available to every potential lender and borrower through the application layer of the system.

This will create an open prediction market, where ARAs will compete in areas of price and accuracy of borrowers' default rate predictions. The market mechanism will hold ARAs accountable for their predictions and stimulate innovation.

Automated and transparent scoring of credit rating agencies, based on openly accessible on-chain data, is a unique feature of the GetLine Network. Today's long established rating agencies lack transparency, as their performance is seldom audited or scored. This gives the GetLine Network a critical advantage over the traditional credit risk prediction markets, and in effect provides an opportunity for vast disruption of the financial market.

4.4 Credit scoring process

In order to obtain a loan, a potential borrower chooses an ARA based on its price and accuracy score. Then they have to provide documentation required by the ARA of their choice in order to confirm their identity, determine the purpose of the loan, attain credit history, and other factors indicating their creditworthiness. Ultimately, besides the most basic identification information, it is up to an ARA to choose what information it would seek from a potential borrower. It is in ARAs' interest to calculate the default rate as accurately as possible, to retain a good accuracy score in the network. ARAs are likely to collect information typically obtained by today's banks and other lending institutions, such as:

- The borrowers' FICO® score or equivalent,
- Information about credit history and outstanding loans obtained from on-chain and off-chain financial institutions,
- Income statements,
- Confirmation of equity ownership.

but some might request other types of data that prove to be increasingly useful in credit scoring, such as:

- Machine-readable data about financial behaviors (e.g. leveraging EU's PSD2 regulation),
- Data from broadband/network providers regarding browsing habits,
- Behavioral data from social media,
- Verification from biometric identification systems (e.g. Indian Aadhaar).

Obviously, it is the borrowers' decision which ARA to choose and consequently what information he or she is ready to reveal to an ARA. It is worth noting that an ARA must comply with applicable privacy laws and regulations, as in certain jurisdictions it might be prohibited to use such information to calculate creditworthiness. The GetLine Network, however, remains skeptical of this issue, as the credit assessment phase is conducted off-chain and abstracted from the protocol.

Having processed obtained information, an ARA issues two values for the potential borrower: the absolute probability of default for a given loan and the expected value of the investors' capital at the end of the loan term. The default rate determination is based on the creditworthiness of the borrower and it is expressed in a percentage. The expected value of the investors' capital at the end of a loan term will account for the default rate, interest rate, and the expected currency price changes if a loan is denominated in a currency different than the currency of such a loan.

With the predicted default rate issued, a potential borrower may issue a loan request to the network, specifying the amount, a maximum acceptable interest rate, and the time of the request's termination. The request is immediately visible to potential lenders in the loans browser, where they are able to request further information or attestation from another ARA.

After this stage, a potential lender may access all of the credit risk indicators in the GetLine browser:

- From borrower: basic personal data, loan goal, repayment plan, answers to extra questions;
- From ARAs: predicted default rate, additional information about the borrower's credibility, and the subsequent ARA verification results;
- From GetLine: ARAs metascore and certification issued by GetLine.

Based on this knowledge, potential lenders may decide whether they intend to enter a bid for a proposed interest rate in the auction. After the termination time passes and the lenders have committed their funds towards the loan, the contract is considered concluded.

4.5 Metascoring information flow

Information about each funded loan is issued to the blockchain and will be available for further audit. After a loan matures, data about either its default or repayment is gathered by GetLine in order to calculate an ARA's metascoring (see [metascoring section](#) below). Also during this phase, the current certification of a given ARA would be reviewed by GetLine. Information about the ARA's current metascoring and certification will be public.

4.6 Risk analysis market

The GetLine Network creates added value by connecting investors from all over the world with potential borrowers already scored by their creditworthiness, as well as by the expected return from the investment. By abstracting and decentralizing the risk assessment processes, GetLine's protocol creates a competitive edge compared to centralized lending markets that by design can not scale easily beyond their primary jurisdictions. The GetLine Network enables, for example, a Chinese investor to fund a loan for a Nicaraguan borrower, thanks to ARAs that are able to operate locally, but are scored in comparison to their global competition.

Lenders in the GetLine Network decide on their capital allocation basing on:

- The absolute probability of default for a given loan,
- The value of an investors' capital at the end of the loan term,
- The attesting ARA's metascoring.

The last value, the metascoring, is the measure of an ARA's performance and it indicates its professionalism and trustworthiness. The metascoring is represented by a value between 0 and 1. The better an ARA's accuracy, the higher their metascoring value. The metascoring will be displayed in the GetLine Browser along with other loan details. Metascoring will allow lenders to assess trustworthiness of a given loan's predicted performance and to offset uncertainty of an ARA's estimates.

ARAs will be incentivized to achieve the highest possible metascoring, because of lenders' preference to fund loans scored by trustworthy ARAs. In effect, borrowers would look

for ARAs with good metascores that offer good prices. The price of an ARA's services will be predetermined and calculated as a percentage of paid back capital and interest.

4.7 Calculating metascore

Although calculating metascores resembles some well known machine-learning problems¹, a handful of key differences between metascoreing and typical binary classification problems make existing solutions, such as an F1 score or ROC AUC, sub-optimal for a direct application in the GetLine Network. Thus, we are currently working on a tailored solution to the problem. We aim to publish our work in the upcoming iteration of this paper.

The future metascores have to take into account a few specific requirements:

- A second credit scoring mechanism – the expected value of loan to investor;
- Data skewness – unbalanced classes (the number of repayments will be much greater than defaults);
- A small number of data points – number of P2P loans \ll size of data in ML problems;
- The higher importance of last data points – last defaults and paybacks should be more important to incentivize innovations;
- ARAs' bootstrapping phase – a few lucky results could dominate the metascores and create an unfair competitive advantage;
- ARAs' specialization;
- The metascore has to be a **proper scoring function**.

To familiarize the reader with the metascore concept, here is a simple, exemplary equation for calculating the metascore of an ARA, given its loan portfolio:

$$M = 1 - \frac{\sum_x C_x (S_x - P_x)^2}{\sum_x C_x} \quad (1)$$

Where:

x – consecutive loans in the ARA's portfolio,

¹Scoring performance of logistic regression classifiers and scoring predictors in prediction markets using e.g. Brier score.

C_x – loan principal,

S_x – 0 in case of default or 1 in case of successful repayment,

P_x – probability of a defaulting loan assessed by the ARA.

The metascore will be calculated outside of the blockchain by the GetLine Browser application layer. The GetLine Browser will display the metascore, along with other loan characteristics such as credibility and competence rates of the ARAs' systems. GetLine would provide easy access to historical data of ARAs' ratings and ARAs' scoring inside the GetLine Browser.

Transparent, automatically calculated, and easily available scoring of ARAs will lead to a vibrant, competitive, and ever improving credit risk predictions market. We expect that the market will eventually experience regional and vertical specialization, as some ARAs might concentrate on certain regions of the world, e.g. focus on the EU countries or India, and specialize in various market segments, like loans offered to individuals or micro-businesses.

The GetLine Organization is planning to establish a GetLine ARA as the first ARA in the network, in order to bootstrap the GetLine Network. GetLine is also going to invite other institutions to join the GetLine Network as ARAs and to help create a competitive predictions market from the very first day.

4.8 Mitigating risks on ARA prediction market

Creditworthiness scoring is the key element of the GetLine Network as its quality is critical for the creation of trust between market participants. A decentralized lending market that allows for pseudonymous participants creates new risks and potential loopholes unknown to traditional financial markets. In this section we introduce a number of protocol solutions aimed at protecting the integrity and accuracy of the ARA prediction market.

4.8.1 Aligning ARAs' interests with lenders – the reserve system

ARAs will also be required to stack up GET tokens as provisions for potential failed prediction payouts. ARAs are going to put their skin in the game, risking a percentage of their own GET provisions to be paid to the lender if the borrower defaults on his loan.

For readers' convenience we present provision equations below, in the preliminary form, which will be updated after the feedback phase.

For every loan x , ARA has to keep the following provisions:

$$\max(EV_x - LC_x, 0) \cdot \frac{k_p}{DR_x} = RV_x \quad (2)$$

EV_x – expected value for investors issued by ARA for loan x ,

DR_x – default rate of loan x issued by ARA,

LC_x – principal value of loan x ,

k_R – responsibility coefficient (around 0.2), set by the GetLine Company,

RV_x – responsibility value, determining value of ARA’s reimbursement to a lender for borrower default of loan x .

$$(1 - M) \cdot \sum_x RV_x = PR \quad (3)$$

M – given ARA’s metascore,

PR – provisions amount, value of required provisions to be kept in GET by the given ARA.

ARAs will be required to maintain their provisions ratio in order for loans scored by it to be presented in the GetLine Browser. Failure to keep required provisions will result in their delisting.

Similar to the borrower’s good reputation giving them the ability to borrow more with the same collateral, a higher metascore allows for lower provisions and a bigger value of outstanding loans.

4.8.2 Preventing ARAs’ attacks against each other

The way ARAs are scored and ranked against each other may encourage some of them to attack others by using fake or otherwise fraudulent identities to obtain good scores from competing ARAs and subsequently defaulting on a loan scored positively by such a competitor in order to lower its metascore. Such an activity involving unlawful methods would expose perpetrators to criminal liability. Besides, ARAs are likely to leverage various identity verification techniques in order to avoid scoring positively fraudulent identities. The on-chain solution to this problem involves ARAs’ usage of external trusted identity management systems. The GetLine ARA plans to use Boson Identity Management to identify and verify persons seeking scoring, as well as to exchange information with other entities using Boson – see [identity fraud section](#).

4.8.3 Preventing ARAs' attacks against lenders

ARAs could possibly use their position to issue high credit scores to identities under their control and later use them to obtain loans and default on them. However, this behavior would not pay off as each default would lower the ARA's metascore, and in effect lenders' trust in credit scores issued by them. Every established ARA would in effect lose its market position, making this type of fraud economically non-viable. The only ARAs that could profit from such a fraud would be new, unestablished, ARAs. However, the GetLine Network is going to require new ARAs to collateralize part of each positively scored loan with GET tokens. The required collateral will be reduced with a sufficient metascore and the number of verifiable credit scores issued by an ARA.

4.8.4 Preventing ARAs' manipulation of their own metascore

Finally ARAs might try to trick the metascore system by creating false identities, scoring them with high scores, obtaining credit from other accounts under its control and paying them back. This would increase an ARA's metascore and trick potential lenders and borrowers into believing that it is trustworthy. We are exploring various ways to prevent such an attack, including analyzing token flows to detect such frauds. In case of detecting such fraud, the GetLine organization would evict such a fraudulent ARA from the GetLine Browser. GetLine is also going to implement an on-chain solution that will create economic costs for fraudulent ARAs performing such attacks – the Network Trust Fee.

The Network Trust Fee (NTF) is one of the most important features of the GetLine Network. It is the main mechanism preventing ARAs from manipulating their metascore, and thus preserving the integrity and trustworthiness of the network. NTF is meant to incur economic costs to any manipulation of metascores, unethically leveraging pseudonymity, and concluding contracts between ones' own Ethereum wallets.

The NTF fee is 1% per annum of any loan created in the GetLine Network. Every GetLine contract burns an amount of GET tokens, paid as collateral.

4.9 Preventing strategic defaults

A strategic default is defined as a deliberate default by a borrower. Strategic defaults often result from a borrower's economic calculations, when he finds the costs of such a default to be lower than the costs of a loan repayment. There are many costs involved in defaulting on a loan.

The most obvious one is the loss of collateral that gets liquidated to satisfy the lender. If it were only collateral that borrowers take into account, they would default each time

when the value of collateral becomes lower than the outstanding loan. But there are also two other major factors that affect borrowers: namely damage to the credit score, and debt enforcement proceedings.

Defaulting would negatively affect a borrower's credit score in the GetLine Network as lenders will submit information about the defaulted borrower's identity to the chain, which will in turn increase interest rates required by lenders to fund the next borrower's loan, or raise the collateral requirements in their next loan in order to even get an acceptable default rate from any ARA. However, defaulting on a loan will damage not only their credit score inside the GetLine Network, but also will affect their off-chain credit score, as ARAs will pass information about defaulted loans to credit rating agencies. Some ARAs could offer reporting services to lenders and make it even easier for all lenders to report defaulted borrowers, and lower their off-chain credit score such as the FICO® score. Borrowers generally care about their credit score and thus will be discouraged from strategically defaulting on loans.

Loan agreements using blockchain could be just as enforceable and binding as those concluded using more traditional means. In all researched jurisdictions there is no legal reason why a loan agreement cannot be a purely oral contract. Structuring it as a smart contract and putting it on a blockchain would result in a binding and enforceable contract in most jurisdictions. It can be argued that the U.S. Electronic Signatures in the Global and National Commerce Act (ESIGN) and the state laws modeled on the Uniform Electronic Transaction Act (UETA) allows for digital signatures to have the same effect as a physical signature and provide a sufficient legal foundation for a blockchain-based smart contract to be enforced under current U.S. law. Ultimately, it will be the ARAs' responsibility to determine whether or not jurisdictional variations affect the viability of the concluding loan contract with the borrowers from a given jurisdiction, and account for this factor in the issued credit score. If a loan agreement concluded in the form of a smart contract is enforceable, a lender, or a hired debt collector, can obtain a payment order issued by a court or other competent authority and enforce such a contract. It will deter borrowers from defaulting on GetLine loans, as their personal assets could be liquidated by a law enforcement officer to satisfy the lender.

5 Loan lifecycle

The process of obtaining a loan in the GetLine Network:

1. The borrower will be able to apply for a loan either through the GetLine Browser, an Ethereum dApp developed by GetLine, or by using a third-party interface integrated with the GetLine Network.
2. If the borrower's identity has not been previously identified by an identity service provider, he or she would be redirected to the boson.me or the civic.com portals to get verified.
3. A verified borrower will be able to specify desired terms of a loan – its value, duration, and maximum interest rates. Determining whether the loan would be denominated in a cryptocurrency or in a *fiat* currency will also be possible.
4. The GetLine Browser or a third-party application will then issue a loan request to the Ethereum blockchain. The request will list all the terms of the loan specified by the borrower. At this stage, the loan request would get funded with collateral in GET tokens.
5. The loan request will then be scored by an ARA picked by the borrower. ARAs will attach their scoring to the loan request and sign it with their unique signatures. The process of credit scoring will vary depending on the ARAs' policies.
6. The assessed loan request will then be put up for public auction for investors to bid for the lowest interest rates.
7. Investors who offer the lowest interest rate will then fund the loan. In exchange for the loan, the investors receives ERC20 tokens representing rights to the loan's repayment.
8. After the loan matures, the borrower might:
 - (a) Repay the loan in full – the contract would release the repayment proportionally among holders of ERC20 tokens representing right to repayment, the collateral would be returned to the borrower, minus the Network Trust Fee;
 - (b) Pay only a fraction of the money – only full repayment will be accepted by the GetLine Network lending contracts, thus the loan contract would return the money to the borrower;
 - (c) Fail to repay the loan – in this case investors will be able to extend the repayment period; if they do not do it, they will be able to fight for the repayment in court or sell the ERC20 tokens of non-performing loans to specialized debt collectors.

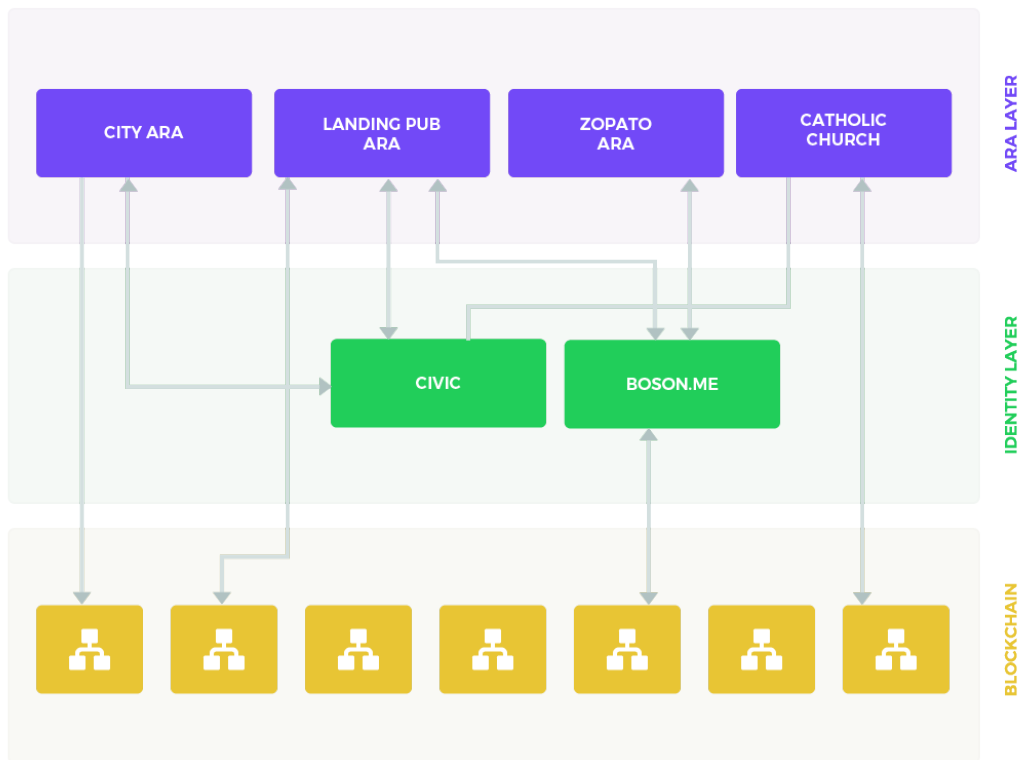


Figure 1: GetLine Network functioning.

6 Competition

The lending sector has failed to innovate and has proven itself prone to disruption. This has led to establishing P2P lending platforms, like the Lending Club or Zopa, that have continued to grow exponentially and have taken a significant slice of the lending market. Companies based on cryptographic technologies, such as BitBond, BitLendingClub, and GetLine.in (company co-owned by the creators of the GetLine Network) have created their own P2P lending platforms. In this chapter we will compare GetLine with these already established market players and discuss key differences that give the GetLine Network a competitive edge over:

- Traditional financial market entities (e.g. banks, credit unions, etc),
- Centralized P2P *fiat* currency lending market operators (e.g. Lending Club, Zopa),
- Centralized P2P cryptocurrency lending market operators (e.g. BitBond, BitLendingClub),
- Decentralized P2P cryptocurrency lending market networks (e.g. WeTrust, Dharma).

6.1 Legacy *fiat* currency credit system

In 2011, 50 percent of all new mortgage money was loaned by the three biggest banks in the United States: JPMorgan Chase, Bank of America and Wells Fargo. But by September 2016, the share of loans by these three big banks dropped to 21 percent.

[The Washington Post](#)

In many cases legacy financial institutions, such as banks and credit unions, just cannot keep pace with newer, more agile, companies that benefit from the fact that from 2008 onward banks seem to be in the terminal decline.

The GetLine Network shows the following advantages over the legacy lending system:

- Has less regulatory overhead,
- Has a borderless nature,
- Will be able to leverage a robust & competitive credit risk assessment market,
- Encourages international arbitrage and cooperation,

- Allows for greater financial inclusion and could more easily serve the unbanked population,
- Puts most of the profits into the lenders' pockets, thanks to disintermediation,
- Can operate on cryptocurrencies that are free from risks faced by *fiat* currencies due to central banks' cheap and abundant money policy.

Over-regulation combined with huge write-offs after the latest financial crisis, and a lack of innovation that could cut operating costs, put banks worldwide in a very difficult position. We believe that the GetLine Network will be delivered just in time to fully benefit from all the ills of the legacy financial system.

6.2 Legacy credit bureaus and credit scoring agencies

As counter-intuitive as it may seem, the main industry that the GetLine Network aims to disrupt is the legacy credit bureaus and the credit scoring agencies market. The biggest innovation of the GetLine Network is the concept of a transparent credit score market, where the past performance of ARAs can be measured, and every ARA can be ranked by its metascore. This, we believe, will lead to a complete disruption of the credit scoring industry. The metascore system is meant to boost competition in a domain dominated by oligopolies, and leverage low operation costs and data-driven models of ARAs to overall provide significantly better risk assessment for lenders.

The GetLine Network's ARA network shows the following advantages over the legacy credit scoring organizations:

- Potentially has much more intense competition than on the legacy market,
- Is borderless in nature,
- Offers many more choices for lenders,
- Has the potential of huge efficiency gains thanks to the use of data-driven approaches.

All lending institutions, including banks, centralized P2P lending marketplaces, and even centralized cryptocurrency lending markets rely on credit reports from legacy credit bureaus. We believe that after the GetLine Network's credit scoring market matures, it will represent the most resilient, innovative, and competitive credit scoring mechanism in the world.

6.3 P2P lending marketplaces

Centralized P2P lending marketplaces, such as the Lending Club, have encountered huge success. Their ever growing market share has inspired us to create the first decentralized lending platform. Although P2P lending marketplaces brought important efficiency to the lending market, they are still expensive, relatively unstable, and force participants to trust a third party with credit scoring and handling all the money.

Today's P2P lending marketplaces' shortcomings could be circumvented by using a fully decentralized architecture to harvest network effects and benefit from the scale factor. The GetLine Network is designed to disintermediate the process of lending with the money handled by smart contracts, never touched by any third party. Moreover, in the only aspect where a trusted third party is needed, credit scoring, we aim to build a network of ARAs to choose from, with a metascoring system assessing their performance, in order to boost competition and innovation.

We believe that eventually most of today's centralized P2P lending marketplace operators might transform into ARAs in the GetLine system, as their biggest assets are actually their credit scoring algorithms and their client base. These could be easily used to bootstrap an excellent ARA network and significantly scale up operations volume thanks to the GetLine Network's borderless nature. In seven years from now, we envision the Lending Club as one of the prominent ARAs in the GetLine Network, or at least having one of our prominent ARAs being just as large.

The GetLine Network shows the following advantages over the centralized P2P platforms:

- Has less regulatory overhead,
- Has a borderless nature,
- Will be able to leverage a robust, competitive, credit risk assessment market,
- Encourages international arbitrage and cooperation,
- Allows for greater financial inclusion and could easily serve the unbanked population,
- Puts most of the profits into the lenders' pockets thanks to disintermediation,
- Can operate on cryptocurrencies that are free from the risks faced by *fiat* currencies due to central banks' cheap and abundant money policy.

Current cryptocurrency P2P lending marketplaces function almost exactly like those specialized in *fiat* currency lending marketplaces. There is no fundamental difference

between the manner in which BitLendingClub and the Lending Club allow participants to lend money. The only significant difference is the type of currency that is being lent. Therefore, cryptocurrency and *fiat* currency lending marketplaces share most of the key characteristics, including most of the caveats. Not to mention that for us, creating centralized marketplaces for lending in cryptocurrencies (which are decentralized by definition), seems like a bit of an unfortunate idea.

6.4 Decentralized cryptocurrency P2P lending platforms – experiments

There are just a few attempts to create a truly decentralized lending market. We find them intriguing, yet we believe that none of these projects are likely to create a stable, worldwide, effective, and compliant lending system, such as the GetLine Network will. We still look forward to cooperating with other lending protocols' creators. If you are one of them, please contact us at hello@getline.in.

6.4.1 WeTrust

WeTrust is a very interesting approach to introducing decentralized lending. It is based on an idea of lending circles and focuses primarily on third world countries, where informal lending groups are already formed as a reaction to a poorly developed financial system. As a result, it's definitely not a full-stack lending solution and might be a bad market fit for developed markets and higher-income users in general. We find the WeTrust system hard to scale and to compose into the existing financial ecosystem in developed countries. This makes us believe that WeTrust is going to exist in symbiosis with the GetLine Network, where WeTrust loans might serve as money helping people to move out of poverty, and later use GetLine as they develop a credit score.

6.4.2 Dharma.io

Dharma is a newly introduced project by Nadav Hollander, proposing a decentralized lending system. It shares many of the key mechanisms in the GetLine Network, such as embracing disintermediation and introducing a decentralized credit scoring market, among others. We believe however, that the creators of this system need to employ more sophisticated fraud prevention systems to prohibit Risk Assessment Attestors (Dharma's ARA equivalent) from manipulating their accuracy scores. We see many vulnerabilities in the Dharma system that were eliminated in the GetLine Network, thanks to the GET token and the Network Trust Fee mechanism.

We believe that Dharma's system, if ever introduced to the market, could eventually be

merged with the GetLine system, as these both share key mechanisms. Yet, we believe that this could only happen if Dharma users would adopt the GET token and start to use the NTF mechanism. Only then could the Dharma lending contract be listed in the GetLine Browser, and ultimately start using the GetLine Network's metascoring, which is, in our view, superior to Dharma's way of scoring risk assessing organizations.

7 Challenges

7.1 Identity fraud

The GetLine Network aims to ensure proper identification of the borrowers' identities. One of the most obvious attacks which can surface in a decentralized lending system is the possibility of multiplying one's identities and repeatedly applying for new loans with the intention of defaulting on them. To prevent this type of fraud and to ensure that each lender has only one consistent identity in the network, GetLine will use decentralized, blockchain-based, identity verification to allow for independent validation of the borrowers.

The GetLine ARA will integrate Boson identification technology, and make all GetLine participants become part of the Boson ecosystem. Boson is an identity management product that allows individuals and other entities to create global and trusted identities verified and saved in a decentralized system. Identity records containing name, address, nationality, and other information, are encrypted and safely saved in a blockchain. Boson makes it possible to verify such an identity record by multiple institutions, such as banks, employers, and governments. Entities verifying identities in the Boson ecosystem are called verifiers. Each identity saved in the Boson blockchain has a percentage value attached that displays the network's confidence in the identity's authenticity and integrity. After each verification, the value rises or falls, depending on verification results and the verifier's trustworthiness.

After integrating the GetLine Network with the Boson system, each ARA may become a Boson verifier. Each borrower will be required to issue a Boson identity record. Each ARA will verify the identity, while also scoring the creditworthiness of the borrower. ARAs will be incentivized to check the Boson network during credit scoring to ensure that an individual with little or no verification history in the Boson network did not create a duplicate identity in order to hide his previous credit history in GetLine. Every GetLine contract will have to contain the encrypted hash of the borrower's identity record in the Boson network.

This way, the credit history of an individual in the GetLine Network will be attached to his Boson identity, and each ARA will be able to verify it effortlessly. Thanks to advancements in the field of decentralized blockchain-based identity verification, borrowers applying for loans in GetLine repeatedly will be able to lower their loan costs by presenting ARAs with their already verified Boson identities. Since the creators of GetLine also established the Boson project, in the future, GetLine credit history might be integrated with Boson identities, in a way that would allow GetLine borrowers to prove their credit score to other entities that use the Boson ecosystem. By this the GetLine and Boson creators intend to create a strong and lasting network effect, lowering overall costs, and leveraging trust among all participants.

7.2 Cryptocurrency value change

Because of the high fluctuations of their value, loans given in cryptocurrencies may constitute a high risk, unacceptable for the borrowers. The solution of this problem is to enable denominating loans in *fiat* currencies.

7.3 Legal compliance and mitigation of regulatory risk

Marketplace lending is an area of financial technology that has not been thoroughly regulated. Startups operating in this field often face ambiguous and shifting regulatory burdens. Moreover, financial regulations concerning marketplace lending differ greatly from jurisdiction to jurisdiction. Hence any entity that aims to centrally coordinate global lending is bound to fail. Despite the borderless nature of cryptocurrencies, no single organization can undertake responsibility to ensure compliance of innumerable loan contracts signed across the globe in the long run. Some centralized lenders have already either restricted their activity or have been forced to go out of business by regulatory pressure. BTCJam, one of the most popular bitcoin lending platforms, **restricted opening new accounts for US clients** in order to limit the compliance risk. BitLending-Club claimed that **it was no longer feasible to run the platform** and be compliant, and decided to limit its activity and ultimately close the platform. Internationally, major issues regarding marketplace lending activity are regulated by various laws, including, but not limited to:

- Securities laws,
- International financial sanctions,
- OFAC/laws regarding international assets trade,
- Lending laws, including:
 - Lender registration/licensing requirements,
 - Usury laws;
- Consumer protection laws,
- Bankruptcy laws,
- Crowdfunding rules,
- Tax requirements and considerations,
- Remittances regulations.

We believe that the best available way to mitigate the compliance risk concerning the creation of a truly global and perdurable lending marketplace is to split and delegate the compliance risk. Our protocol is designed to place the burden of ensuring compliance of individual loan contracts on the ARAs. Therefore ARAs will have an incentive to provide their services only to lenders under jurisdiction of one or a couple of (e.g. harmonized) jurisdictions rather than most or all jurisdictions, as today's centralized lending platforms do.

Moving this point of friction to the level of local ARAs is not only a better way to ensure compliance of each individual loan contract, but also to shield the protocol itself against the hazards of governmental intervention. Some ARAs might turn out to authorize some loans in a way that violates the law and they could be held accountable for it by each sector's regulators, yet it likely would not constitute a major event leading to a ban or shutdown attempt of the whole GetLine Network.

We recognize the obligation of institutional lenders to comply with the KYC/AML and OFAC regulations, as well as the measures implemented by counter-terrorism laws. Thus, ARAs will be required to provide complementary services to allow regulated entities to participate in the GetLine protocol. In most jurisdictions, financial institutions are allowed to outsource KYC/AML/OFAC processes to third parties. However, despite the fact of outsourcing these processes, obligated institutions remain accountable for all breaches of respective regulations, so financial institutions will be able to participate in the system only after the ARA market solidifies, and trustworthy ARAs emerge with proven track records. We hope that eventually this will attract big lenders that would not otherwise be able to enter cryptocurrency lending markets, and give a huge liquidity injection to the system.

The focus on local markets will also allow ARAs to efficiently report credit defaults to local credit scoring agencies. This would allow the translation of the borrower's lowered creditworthiness in the GetLine system into lowered credit risk in standard (*fiat* currency) financial institutions, and in effect satisfy the ARAs' fraud deterrence function better.

8 GET tokens

8.1 Introduction

The GetLine Network introduces its native token called GET. GET is meant to bootstrap the product, and capture the value of the network. More importantly, GET is going to stabilize the GetLine Network, preventing frauds, and allowing for more trust between its participants. The GET token is going to be a standard ERC20 token issued during the crowdsale event (see [crowdsale section](#)).

8.2 GET token functions

8.2.1 Loans' collateralization in GET

GET tokens will be the only tokens allowed as collateral in the GetLine loan contracts. Collateral is one of the central features in the GetLine Network. It enables new participants with little to no credit history to gain more trust by taking and paying back collateralized loans. Higher collaterals will result in better default rate predictions and lenders' willingness to fund loans.

The loan's smart contract will lock up a certain amount of GET and send them to the lender(s) in case of default, but are returned to the borrower after loan repayment. As the network's participants build up their creditworthiness, they might be able to leverage the GET tokens, taking higher loans with the same collateral value. Minimal collateral in the network will be 5% of the borrowed amount.

8.2.2 ARAs' reserve

ARAs will also be required to stack up GET tokens as provisions for potential defaults. ARAs will put their skin in the game, risking a percentage of their own GET reserves to be paid to the lender in case the borrower defaults on his loan. Failure to comply would result in delisting loans scored by the given ARA from the GetLine Browser (more about required provisions in the [provisions section](#)).

8.2.3 Network Trust Fee

A fundamental GET functionality will be to protect the network from manipulating ARAs' metascore. To achieve this, a certain percentage of the collateral of each loan will be burned, in order to make manipulations economically unfeasible (see [credit](#)

[risk management section](#)). The Network Trust Fee is, therefore, necessary in order to ensure a trustworthy metascoring. The burning process destroys tokens irreversibly and thus redistributes the burned tokens' value across the network's participants. Apart from the NTF, the GetLine Network participants will not be charged any fees for the loan issuance.

8.2.4 Network value capturing

Finally, the tokens are designed to capture the value of the network, encourage early adoption, and support the growth of the GetLine community. If the value of GET rises, so does the value of the network as a whole, and the ability to borrow for all the participants. This can be compared to Ethereum and Ether tokens, where the success of every solution that uses ETH appreciates Ether's value, benefiting the entire Ethereum network.

9 GET tokens distribution and crowdsale

The GetLine Token Genesis Contract will mint a total of 100,000,000 ERC20 GET tokens on the Ethereum blockchain. We do not plan to mint any more tokens on the Ethereum Network thereafter.

9.1 GET tokens distribution

1. 50% of GET tokens will be distributed among the crowdsale participants – future GetLine Network users who will need them to use the system and obtain loans or become ARAs.
2. 10% of GET tokens will stay in the company for an Employee Token Ownership Plan, to be split among current and future team members. The tokens will be vested for around two years with a six-month cliff.
3. 4% of GET tokens will be transferred directly to Kacper Wikieł, CEO and founder of GetLine.in and of the GetLine Network.
4. 6% of GET tokens will be distributed among early contributors and advisers of the project.
5. 20% of GET tokens will be retained by the GetLine Company. 80% of the GetLine Company's tokens will be vested over the period of two years.
6. 10% of GET tokens will be split among the early GetLine investors who funded early development.

9.2 GET crowdsale

A crowdsale event will be held in order to distribute the GET tokens among future participants of the GetLine Network. In addition, thanks to the crowdsale, the GetLine Company will be able to raise funds for future stages of development for the system.

The final shape of the GetLine Network will be determined by the amount of money raised during the sale fundraising event. We aim to raise at least \$3 million in order to be able to develop the network to adequate size and functionality. Thus, we are going to soft cap our sale fundraiser and allow the participants to retire their contribution in case we will fail to raise at least \$3 million.

In order to comply with KYC and AML legal requirements, all sale participants will have to get verified by a trusted identity platform such as Boson or Civic – final decisions regarding the choice of the platform is yet to be announced, we are leaning heavily on

Boson, and perhaps another platform in addition to it, but it's not yet a concrete decision. Unfortunately, because of the U.S. Securities and Exchange Commission's recent communiqué and legal uncertainty about sale legal status in the United States, U.S. investors will not be able to participate in the sale event.

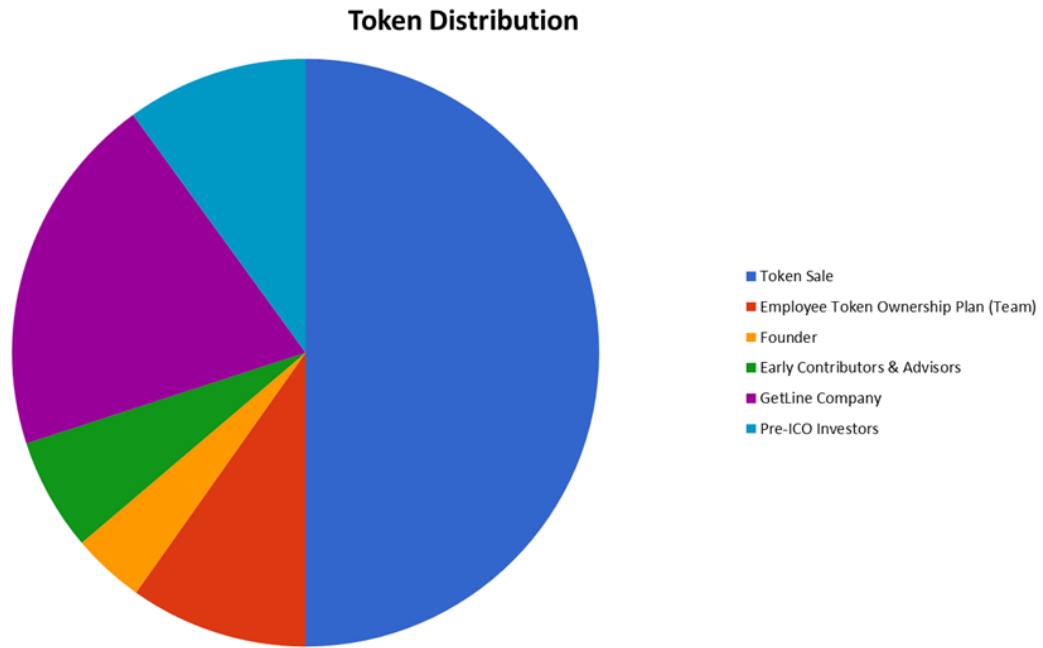


Figure 2: GET token distribution after crowdsale.

9.3 Crowdsale proceedings distribution

80% of the crowdsale's proceedings will fund the GetLine Company, the organization set up to develop the GetLine Network. The money obtained during the crowdsale will secure funding for future improvements, business development, marketing, and other expenses needed to grow the network. The other 20% of the proceedings will be transferred to initial founders of a centralised version of GetLine.

9.3.1 Reverse ICO

The GetLine crowdsale will enable the so called **reverse ICO** of GetLine.in, where GetLine.in will be dissolved and its shareholders will get paid back for the company, its intellectual property, and its user base with 20% of the crowdsale proceedings. In this way, GetLine.in will dissolve its operations and reestablish itself on-chain in a new, decentralized, formula.

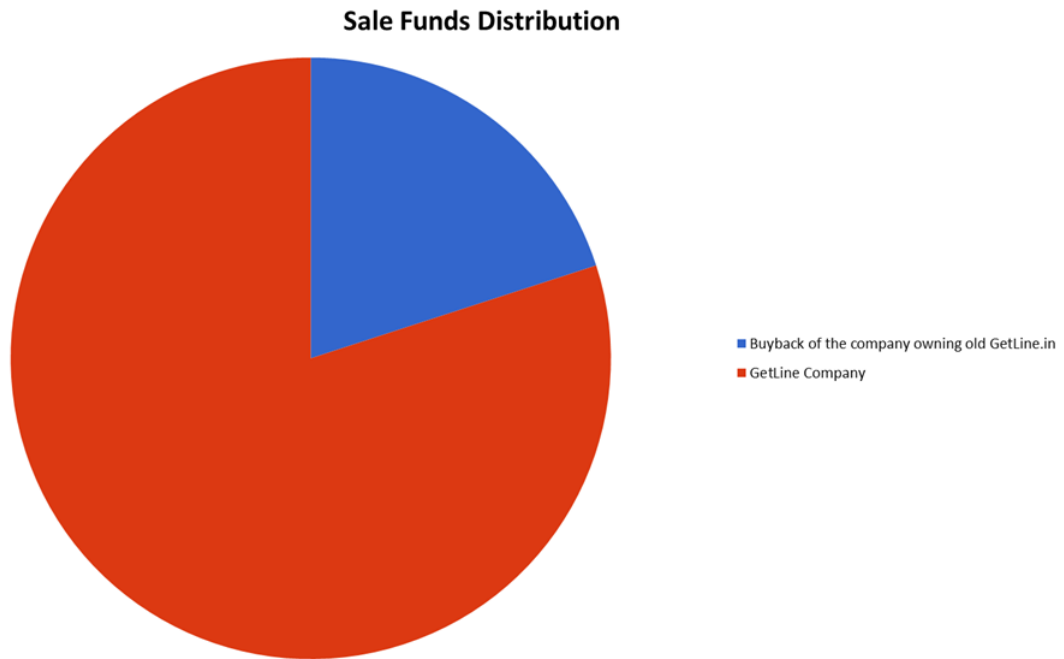


Figure 3: Sale funds distribution.

9.4 Allocation of GetLine Company's funds

The GetLine Company will be funded with 20% of issued GET tokens and 80% of the GET tokens' crowdsale proceedings. All these funds will be used to further develop the GetLine Network.

1. 10% of the funds will be spent on community grants, partnerships, and bounties – for example some portion of those funds might be used to cover the expenses of early integration of the GetLine Network with other services, especially those based on cryptographic technologies. We also plan to fund a security bounty program in order to ensure the highest standards of the security and trustworthiness of the network.
2. 40% of the funds will cover expenses of further software development – although the GetLine Network will be a functional product at the time of the crowdsale, we want it to be constantly improved and developed. Those funds will cover software engineers' and other employees' payrolls, as well as the pay for outside contractors.
3. 17% of the funds will be used to fund legal expenses – the project is interwoven with many local laws and is spread across multiple jurisdictions. We expect a lot of legal expenses associated with operation of the GetLine Company, and unforeseen

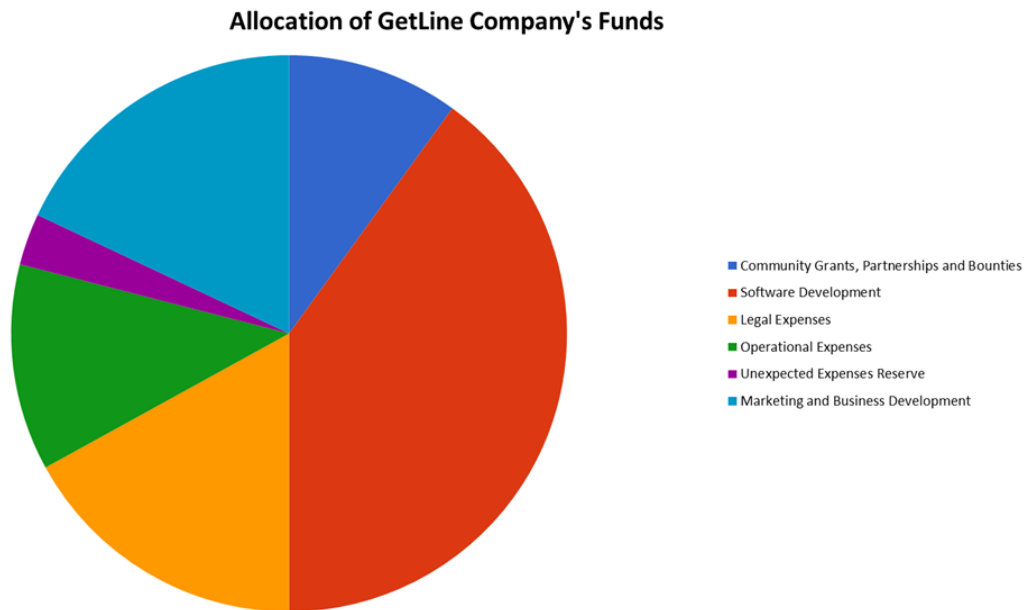


Figure 4: Allocation of GetLine Company's funds.

legal costs necessary to resolve matters that could pose a threat to the continued efforts of the GetLine Company and operations of the GetLine Network;

4. 12% will be spent on operational expenses, such as office space, travels, support, recruiting, managing the company, establishing subsidiaries in other countries, etc.
5. 3% will be reserved for unexpected expenses, just in case something truly unforeseeable happens.
6. 18% of the money will be spent on marketing and business development in order to grow the network.

10 Roadmap

In this section we present planned milestones for the GetLine Network's development. This plan should not be considered definitive, as GetLine is pioneering bleeding-edge blockchain technology, so changes to the original roadmap are very likely. Some elements of the GetLine Network's functioning may be required to change in order to meet regulators' demands. Thus the plans, dates, and milestones are presented for illustration purposes only.

A minimally functional version of the GetLine Network requires the crowdsale to raise at least \$3,000,000. This is the minimal cap of the crowdsale contract. The maximum cap of the crowdsale is \$12,000,000. We don't want to leave the crowdsale uncapped, as we believe that too much money may be as harmful for a startup as too little. On top of that, we believe that this will force us to rely more on the percentage of GET tokens we leave in the company, and in affect align the company's incentives better with the rest of the GET token holders.

Below we list consecutive forms of the GetLine Network that we intend to gradually release to the market. Mind you, that despite GetLine being fully operational at the time of the crowdsale, we intend to commit to its further development and ongoing improvement as outlined below.

10.1 GetLine Red

timeline: 16 weeks after crowdsale closes

GetLine Red is an early basic version of the GetLine Network, directed towards a narrow group of early adopters, most likely cryptocurrency enthusiasts. It is very close to the current version of the GetLine Network, yet it features security improvements and passes strict code security audits. The loans in the GetLine Red version will be denominated in ETH only. At this stage we will focus on developing the back-end of the system, and ensuring that it meets the strictest security standards. We also want to open the system for other dApp developers to allow them to use our lending standard.

- A safe and concise loan smart contract,
- Passing a series of rigorous security audits,
- Announcement of a bug bounty program,
- Release of an alpha version of the GetLine front-end service, capable of:
 - Displaying unfunded loans meeting GetLine's requirements,
 - Issuing loan contracts to the blockchain,

- Investing in already issued loan contracts.

10.2 GetLine Yellow

timeline: 32 weeks after crowdsale closes

In GetLine Yellow, we will incorporate integration with major identification services such as Boson.me and Civic.com with the GetLine Network. This step is crucial for proper credit scoring and debt collection. We will also enable sharing of a borrower's credit history between ARAs.

- Integration with identity service providers,
- Sharing of a borrower's credit history between ARAs,
- Interface for sharing information needed for filing lawsuits against non-paying borrowers,
- Programmatic interface for easy integration with other dApps, like cryptocurrency wallets.

10.3 GetLine Green

timeline: 48 weeks after crowdsale closes

GetLine Green will be a full fledged version of the GetLine Network. It will feature a graphic web interface for borrowers making it suitable for mass adoption. By this time we expect to have several trusted ARAs set up and running in key markets.

To ensure this, we will actively outreach potential ARAs and assist them in joining the network. We will consider funding the GetLine ARA, a flagship ARA of the GetLine Network, to facilitate establishment of best practices, and to exhibit the highest quality of the credit risk prediction market.

- Announcement of the first official ARA partners,
- Enabling of loans in ERC20 tokens, including tokens pegged to *fiat* currencies,
- Funding of legal research in key jurisdictions to help ARAs to comply with local laws,
- Establishment of the GetLine ARA, a flagship ARA of the GetLine Network.

10.4 Additional features

Here we list extra features that, although they are not part of the roadmap, might be introduced by GetLine in the future.

Depending on the level of funding for the project, and the overall market dynamic, we might develop all or none of features listed below.

10.4.1 Improved collection of defaulted loans

Loan collection is a necessary prerequisite of any un-collateralized loan issuance.

To speed up the process of adoption of our solution to existing loan markets we propose a legal bounty program for entities that will manage to obtain court rulings and binding interpretations from market regulators concerning various aspects of activities of the GetLine Network participants.

Although a basic version of the GetLine Network will allow for manual loan collection, we will consider implementing advanced solutions like smart contract functions, allowing for automated auctioning of non-performing loans, or providing additional services for professional debt collectors.

- Legal bounty program for legal loan enforcement,
- Interface for automated auctioning of non-performing loans,
- API for professional debt collectors allowing for the semi-automated sale of non-performing debt to professional collectors.

10.4.2 Extended securitization and collateralization

Depending on signals from the market and the level of funding received, we might explore additional methods of securitization of the loans, using on-chain ABS, MBS, and CDS contracts with automatic auctioning. This is a highly speculative goal and depends on financial regulators' approach to such activities and technological constraints. We want to stay fully compliant and cooperate with competent regulators to ensure and verify the legality of the GetLine Network's activities.

On the other hand we might explore the possibility of the collateralization of GetLine loans with real-world objects or even putting a lien on real estate. Such improvements depend heavily on local laws and might be achievable only in partnership with local lawmakers.

10.4.3 Additional loan contracts' features

Depending on signals from the market and the level of funding received, we might also implement new features to the loan contract, such as:

1. Advanced installments,
2. The possibility of early repayment,
3. Guarantor,
4. Floating interest rates,
5. Social circle lending.

We are also considering constructing a loan contract capable of issuing loans in BTC and other coins by utilizing the Cosmos Network or a similar technology.

Additionally, given high accuracy of ARAs' predictions, we may put a fraction of GetLine's GET tokens out to a market maker smart contract in order to create a liquidity guarantee.

10.5 Our vision for long-term development

In the long run we want to revolutionize the global lending market, leveraging the low-cost & trustless transfer of value over the blockchain, and self-enforcing, self-executing, smart contracts. We envision a world where a significant part of global capital is invested through borderless, instant, and low-cost loans. The low cost is achieved by the loans' commoditization, making them standardized, divisible, and instantly available for securitization on-chain. In this world, the majority of current retail lenders would be forced to either leave the market or integrate with a decentralized economy as ARAs. After many years, even the governments, in pursuance of creditors, might have to conduct debt issuance through the GetLine Network.

11 Loan contract design

The loan contract is the most sensitive part of the architecture, linking everything together, handling both collateral and the loan's capital. Thus, it was designed and written to mitigate damage in case of a security breach. To decrease deployment costs and to make code modifications easier, it is also modularized.

11.1 Modularization

To decrease costs of the deploying loan contracts, and to increase security, the code has been modularized. The main code for managing money has been abstracted to a Ledger Library contract whose goal is to manage money transfers and investors for a loan, without managing any time-dependence or state machines. The Ledger Library is deployed only once for each loan contract version, and each loan then communicates with the same library code. It allows for the code to be deployed beforehand, making each loan contract a mere shell which manages memory without duplication of the read-only memory that holds most of the code. It significantly reduces gas costs for all loans in the network.

Loan contracts still have separate code for state management, handling fundraising, payback, etc. for improved code clarity.

As every loan is a separate contract, a bug in one cannot influence any other. Damage from a breach is always minimized thanks to the granular architecture. It also make every single loan immutable and guarantees both the lender and the borrower that the contract can only be performed according to the terms previously agreed upon. Once the loan is deployed, there is no way to influence it by a third party.

The loan is split into two main modules and an attestation interface.

11.2 Attestation interface

Passed and verified during construction of the loan contract, the side of attestation in the Loan itself is extremely simple:

```
interface IAtestor {
    function isVerified(address _checkedUser) constant returns (bool success);
}
```

isVerified is called in a constructor of the loan contract and the contract shall throw an exception if the verification fails.

If the loan is a private one, an always-true-attestator can be passed, but for public and shortlisted loans on GetLine a specific Ethereum addresses will be white-listed as legal and working attestators. The addresses will be checked in the centralized part of the ecosystem and not on the blockchain.

11.3 Loan contract

The loan contract acts as an entry point for both parties. Acting as an API and containing business logic concerning timing and the loan's state, the loan's code itself does not manage tokens nor collateral at all, and passes all such operations to the Ledger Library, which is described in more details below.

The contract is designed as a state machine using an enum and modifiers written as a common pattern, as seen in the Solidity documentation, and has the following states:

```
enum State {
    CollateralCollection,
    Fundraising,
    Payback,
    Finished
}
```

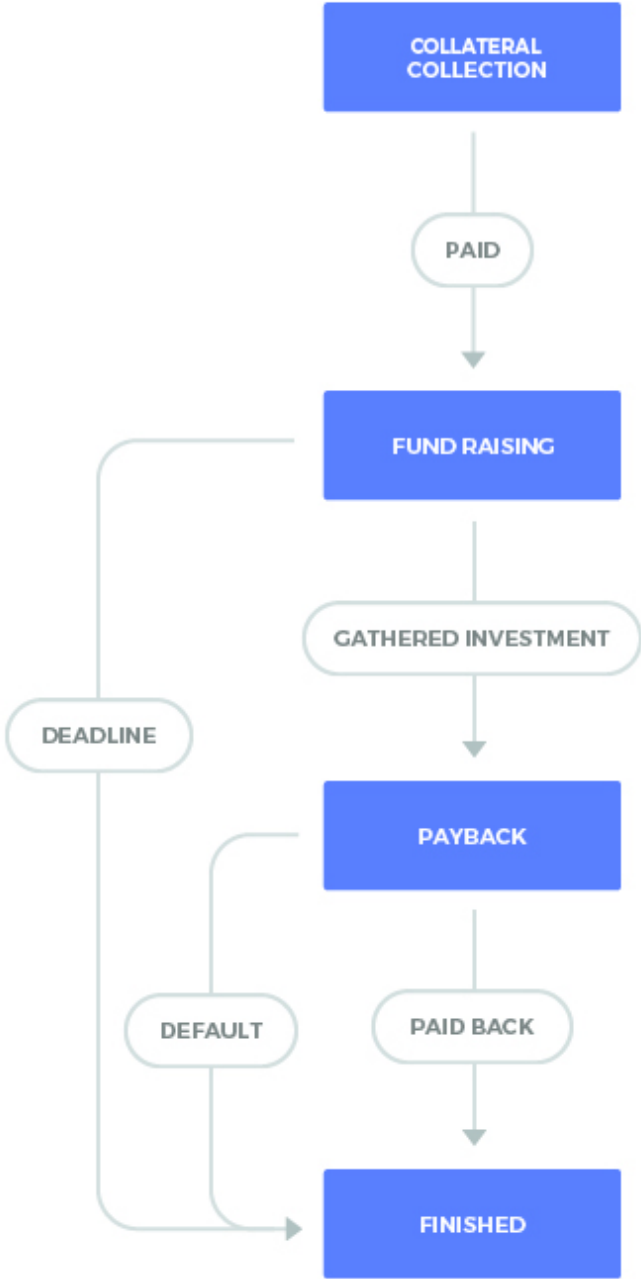


Figure 6: Collateral collection.

After the deployment of a loan, it awaits in the *collateral collection* state indefinitely. The borrower has to create an allowance in GET tokens according to the ERC20 token specification:

```
function approve(address loanAddress, uint256 _value) returns (bool success)
```

Afterwards, the loan contract needs to be notified of this fact by calling:

```
gatherCollateral()
```

which transfers the whole allowance into the loans' escrow (using the Ledger Library), and at the same time entering the first timed state – *fundraising*.

During fundraising the loan awaits input from potential investors. Should the goal not be reached, the collateral is returned to the borrower and the loan is finished, going directly to the *finished* state. Otherwise, for each investor a percentage of collateral, directly proportional to their investment value, is reserved in case of a loan default. That reserved collateral shall be freed to the investor only if the goal is reached and the borrower fails to pay back during the *payback* period. After the goal is reached, the loan is freed for the borrower and the *payback* state begins.

During that state the borrower can withdraw the loan from the contract and is expected to pay it back with interest. It is not possible to pay the loan back in multiple instalments, one and final pay back allowance is required with the full amount. If the loan is paid back during that period, the funds are released to the investors and can be withdrawn, and collateral is sent back to the borrower. Otherwise the loan defaults, and the collateral is released to the investors.

Loan contract behaviour in case of full repayment: [7](#). Loan contract in case of default, i.e. failure to repay in full: [8](#).

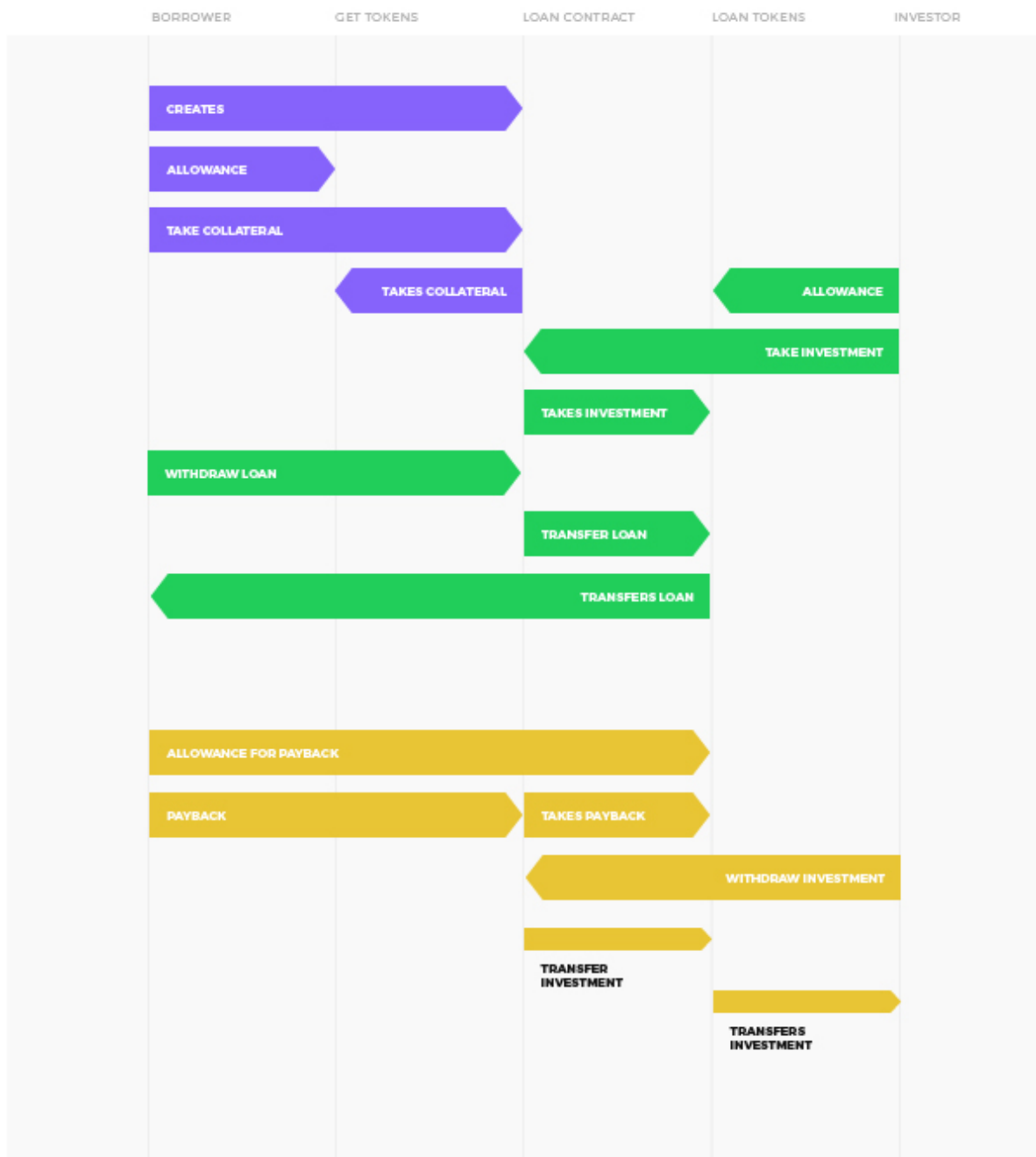


Figure 7: Fully paid back flow of the loan contract.

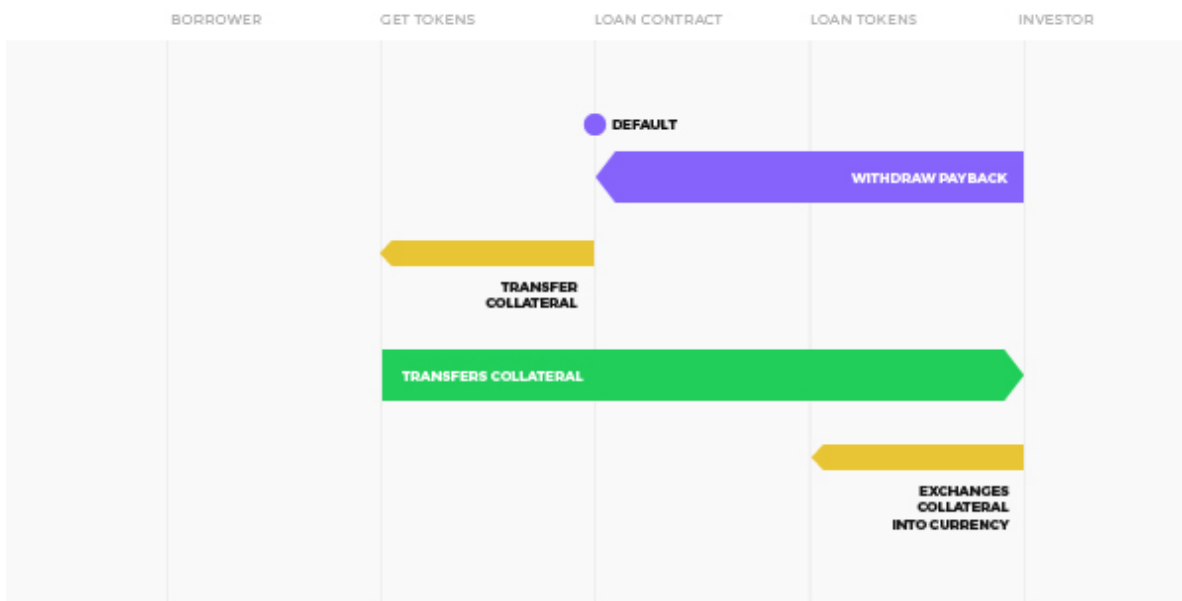


Figure 8: Changed flow in case of default.

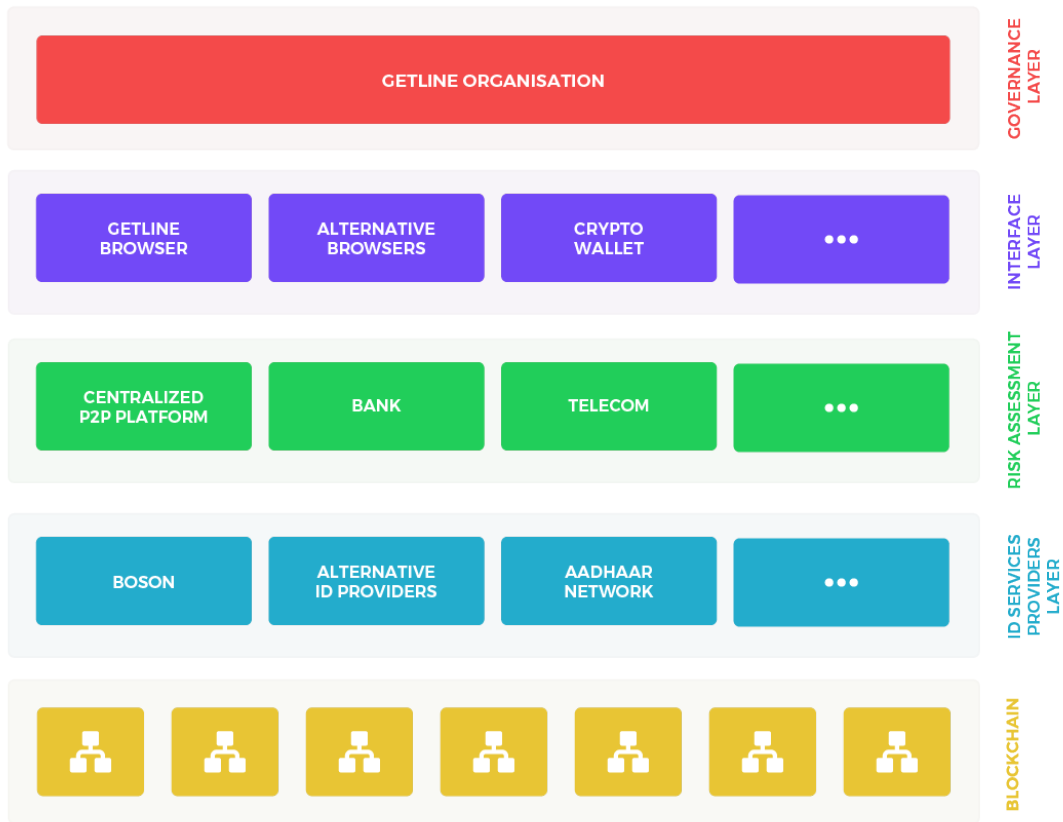


Figure 9: System layers.

11.4 Investment split

Each investor has reserved collateral tokens and revenue share proportional to the amount of the investment. If the loan is paid back, the amount received back works as expected, with interest rates bringing a higher return. Otherwise, if the loan has defaulted, each investor gets a number of collateral tokens that is a weighted average of the amount invested compared to the total loan amount. There is a possibility that a small amount of collateral (in a range of the least significant digits) is left due to division flooring and constant precision of uint256 numbers. That amount does not belong to any investor, but it would be sent back to the borrower.

