Nearlend
Let our world be transparent

Whitepaper

V1.0

February 2022

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https://nearlend.web.app

Abstract

This document introduces a decentralized protocol which establishes money markets with algorithmically interest rates based on supply and demand, allowing everyone to optimize asset's value in Near Protocol.

1. INTRODUCTION

1.1. Market's potential & Birth of Nearlend

Defi or Decentralized Finance is now one of the fastest-growing sectors in the blockchain and cryptocurrency market. Starting from a humble beginning in early-2018, Defi gained traction in the wider community during 2020 and has continued until now. And even the Covid-19 epidemic can be seen as a catalyst for the Defi market to become very active in the second half of 2021; Defi protocols are constantly innovating. Defi allows users to use financial services without the need to rely on centralized entities. These financial services are provided via Decentralized Applications (Dapps).

To assess the attractiveness as well as the potential of the DeFi market, let's take a look at one of the most important index named Total Locked Value (TVL), which express total asset locked into smart contract and serves as a growth indicator of the DeFi ecosystem. In spite of the market conditions, the total value locked (TVL) in all DeFi protocols combined reached a new ATH of $207B in September 2021. As the figures show, DeFi's TVL has increased by more than 8,400% in just one year.
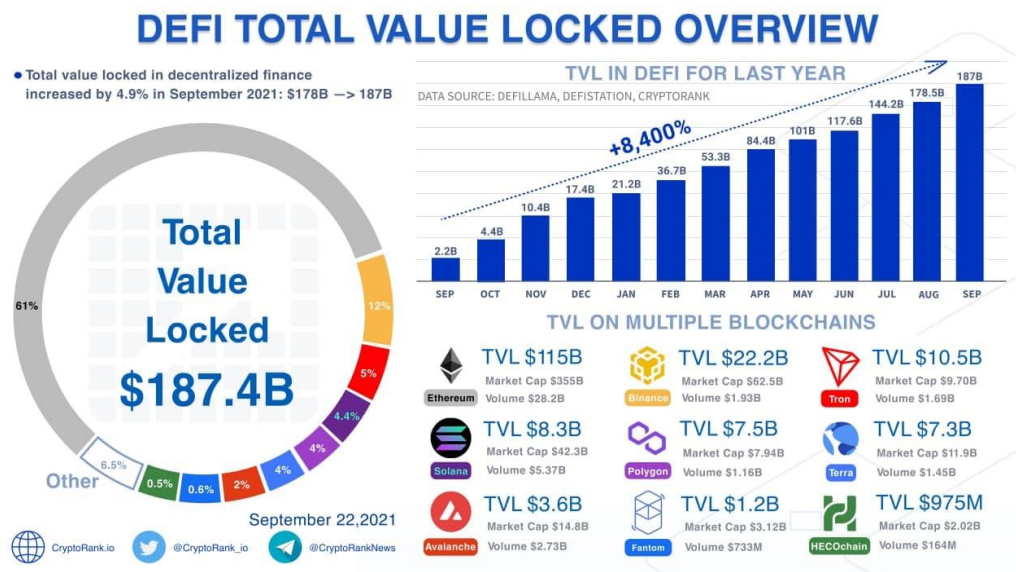
Picture 01 – DeFi Total Value Loked Overview at September 2021

(Source: CryptoRank.io)

As we have already familiar, the major services in financial industry is lending and borrowing of crypto asset, which based on the concept of credit and collateralization. As of April 2021, the borrowing volume increased 102 times after 12 months, reaching $9.7 billion. So what has caused the spectacular growth? It is thanks to the advantages of blockchain technology combined with smart contracts and terrible attraction of the cryptocurrency market.

Inspired by the ideas of DeFi, Web3 and DAO, a small group of young developers from Vietnam decided to jointly develop Nearlend - Dapp for lending and borrowing assets in Near Protocol.

Nearlend aims to become the financial hub in Near Protocol, adopted a dynamic interest rate model and created more capital-efficient pools, allowing more collateral types to be fully utilized

in a safe way. Furthermore, designed tokenomics enables continuous incentive allocation to encourage beneficial activities for protocol

Picture 02 – Logo of Nearlend Version 2.1

1.2.   Why Near Protocol?

Near Protocol is a decentralized platform where developers can host decentralized applications and smart contracts that effortlessly join to "open finance" networks and benefit from an ecosystem of "open web" components. Near Protocol is built from the ground up to be the easiest in the world for developers and their end users, while still providing the scalability and security you need to serve those users. Specifically, Near is designed to make it easier to:

• **Build** decentralized applications, even if you're only used to building with "traditional" web or app concepts.

• **Onboard** users with a smooth experience, even if they have never used crypto, tokens, keys, wallets, or other blockchain artifacts.

• **Scale** application seamlessly - the underlying platform automatically expands capacity via sharding without additional costs or effort on your part.

DeFi projects in Near have already hit a significant milestone of more than $150M Total Value Locked (TVL). Near has an ambitious goal to grow that number quickly and securely. Near is also actively looking for projects focused on NFTs, DAOs, and gaming. One of the most attractive elements of Near is the "Near Ecosystem" with almost all the elements to support new ideas that can be developed with a long-term vision.

• **Near Funds:** The NEAR ecosystem million is funding in a monumental $800 initiative targeted at hastened growth. The announcement, which includes the $350 million in funding announced by Proximity Labs – is designed to build on the momentum in the NEAR ecosystem.

• **Near University:** Here developers, entrepreneurs can learn, earn and connect among friends in the NEAR community.

• **Near MetaBUILD:** Write, test and deploy scalable decentralized applications in minutes on the most developer-friendly blockchain. NEAR is here to help reimagine your world and empower users to have full control and responsibility for their data.

According to Near Protocol Official Sources, as of 31 December 2021, there has not yet been a major lending protocol deployed on the Near Protocol. Encouraged and inspired by the other

Dapps as Aave, Compounnd as well as the Near ecosystem, we are determined to take the challenge and the opportunity to build Nearlend – the lending hub of Near Protocol.

2. THE NEARLEND PROTOCOL

Nearlend is a Near Protocol-based, open-source money market protocol aimed at establishing liquidity pools whose interest rates are determined by an algorithm based on the supply and demand. Supplier supply assets to the liquidity pool to earn interest, while borrowers take a loan from liquidity pool and pay interest on their debt. In essence, Nearlend bridges the gaps between lenders who wish to accrue interest from idle funds and borrowers who want to borrow funds for productive or investment use.

As well as many similar protocols on the market today, Nearlend lowers the barrier for financial services by allowing users to interact directly with the protocol for interest rates without needing to negotiate loan terms (e.g., maturity, interest rate, counterparty, collaterals), thereby creating a more efficient money market.

2.1. Supplying Asset

On peer-to-peer platforms where borrowers are matched with lenders, a user's asset is directly lent to another. By contrast, the Nearlend protocol pools the supply of each user, which drives up liquidity and strikes a better monetary balance. The supplier can withdraw their assets anytime without having to wait for a specific loan to expire, allowing Nearlend much higher liquidity than their peer-to-peer counterparts.

For the long-term vision, Nearlend will focus on creating a protocol for the other valuable assets, including NFTs are supported on Nearlend as collaterals for borrowing of crypto assets, participating in third party protocols, and powering the real economy.

Primary use cases

- Users can supply tokens on Nearlend and earn interest at low risk.

- Assets of DApps, institutions, and exchanges can appreciate on Nearlend.

2.2. Borrowing Asset

If users wish to borrow an asset on Nearlend, they need to first acquire nToken as collateral through depositing tokens, and then borrow any available asset on the platform. Unlike peer-to-peer protocols, Nearlend only asks borrowers to specify the borrowing asset with no other requirements such as the expiry date. Borrowing is executed real-time, and its interest rate will be automatically adjusted based on the market's supply and demand. Different assets have varying interest rates, which are automatically calculated according to the market's supply and demand.

2.2.1. Collateral Value

Assets held by the protocol (represented by ownership of a nToken) are used as collateral to borrow from the protocol. Each market has a collateral factor, ranging from 0% to 100%, that represents the portion of the underlying asset value that can be borrowed. Liquid, high-cap assets have high collateral factors and vice versa. The total account's value underlying token balances, multiplied by the collateral factors, equals a user's borrowing capacity.

Users are able to borrow up to, but not exceeding, their borrowing capacity, and an account can take no action that would raise the total value of borrowed assets above their borrowing capacity; this protects the protocol from default risk.

Token	Loan-to-Value (LTV)	Liquidation fee
USDC	90%	3%
ETH	80%	5%
NEAR	70%	7%
AURORA	60%	7%
OCT	60%	7%
REF	60%	7%
PARAS	50%	9%

Table 01 – Expected LTV & Liquidation fee for Nearlend Protocol

2.2.2. Risk and Liquidation

If the value of a borrower's borrowing outstanding exceeds the collateral factor that is deemed safe (their borrowing capacity), liquidation will be triggered automatically in Nearlend smart contract to eliminate risks and ensure the over-repayment capacity for asset withdrawal and supply while safeguarding the depositors' assets. The current liquidation fee from 3% to 5%.

2.2.3. Primary Use Cases

Nearlend protocol allows us to hold new assets seamlessly without having to sell tokens or go to various exchanges. This opens users, developers and traders to various forms of trading, such as:

- User can finance new IDO investments by borrowing **NEAR**, using their existing portfolio as collateral.

- Without having to wait for an order to fill, or requiring off-chain behavior, dApps can borrow tokens to use in the Near Protocol ecosystem, such as to yield farming on Ref.finance.

- Traders looking to short a token can borrow it, send it to an exchange and sell the token, profiting from declines in overvalued tokens.

2.3.   Interest Rate Model

The Annual Percentage Yield (APY) differs between assets as it is algorithmically set based on the supply and demand of the various assets. Generally, the higher the borrowing demand, the higher the interest rate (APY) and vice versa. Theoretically, there are 3 main methods of calculating interest rates applied to most protocols on the Defi market today, including as following:

- **Linear Rates:** Interest Rates are set as a linear function of utilization. With a linear interest rate model, interest rates are determined algorithmically as the equilibrium value in a loanable market.

- **Non-linear Rates:** In comparison to the linear rate model, a non-linear model allows for the interest rate to increase at an increasing rate as the protocol becomes more heavily utilized, creating an non-linearly incentive for suppliers to supply to the liquidity pool.

- **Kinked Rates:** In the final interest rate model, interest rates exhibit some form of kink: they sharply change at some defined threshold. Such kind of interest rates are applied widely in current defi protocols as Compound, Aava and Nearlend also. The biggest difference for the jump rate model is that If an asset is being utilised beyond a certain level, a kink in the interest rate will occur to deter borrowers from taking out loans and encourage outstanding loans to be paid back. Mathematically, kined interest rates can be characterized as follows:

$$i_b = \begin{cases} \alpha + \beta U & \text{if } U \leq U^* \\ \alpha + \beta U^* + \gamma(U - U^*) & \text{if } U > U^* \end{cases}$$

Where α denotes a per-block base rate, β denotes a per-block multiplier, U denotes the utilization ratio (with U^* denoting the optimal utilization) and γ denotes a 'jump' multiplier.

Protocol	Interest Rate Model	Stable Interest Rate	Variable Interest Rate	Governance Token	Additional Functionality
Compound	Kinked	*No*	*Yes*	*Yes*	
Aava	Kinked	*Yes*	*Yes*	*Yes*	Swap rates, flash loans
dYdX	Non-linear	*No*	*Yes*	*No*	Decentralized exchange, flash loans
Apricot	Kinked	*No*	*Yes*	*N/a*	X-farming
Cream Finance	Kinked	*No*	*Yes*	*Yes*	Flash loans
Nearlend	Kinked	*(*)*	*Yes*	*Yes*	*Swap rates, swap collateral (**)*

Table 02 - Comparison of different protocols for loanable funds

(*) & (**) to be applied

This interest rate model allows for calibration of key interest rates:
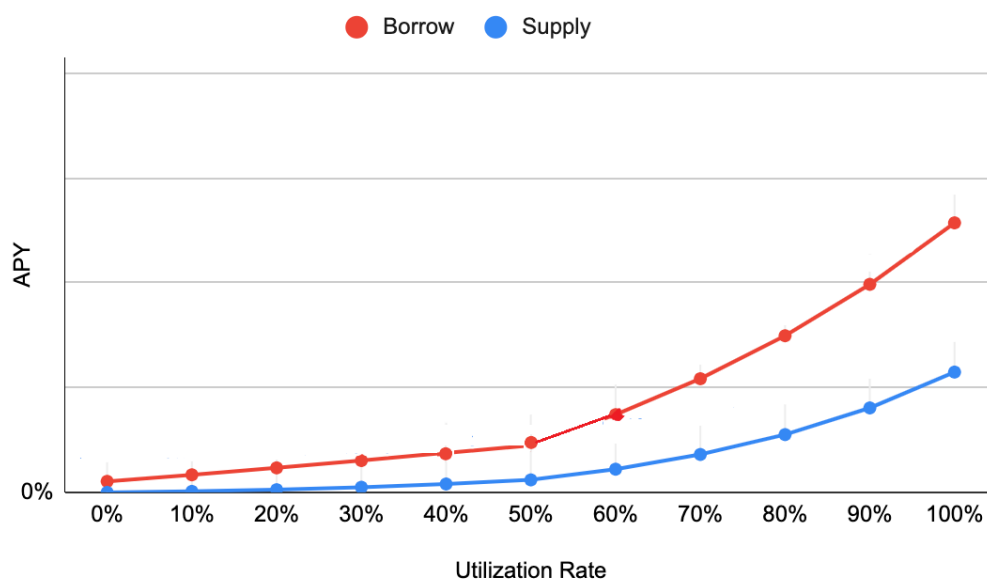
At U = 0, ib = α

At U = U^*, ib = α + βU^*

At U > U^*, ib sharply

The associated saving rates are given by:

$$i_s = U(i_b(1 - \lambda))$$

Where λ is a reserve factor - the percentage of fee paid to protocol. If the reserve factor is 0.1, then that would imply that 10% of the interest paid on the asset is for protocol.

Picture 03 – Kinked Interest Rate Model

2.4. NFT Marketplace

By the end of 2021, the marketplace for non-fungible tokens, which are digital pieces of art tied to blockchain technology, reached a $41 billion value, according blockchain data company Chainalysis, which updated a previous report. NFTs are now inching closer and closer in value to the traditional art market, where people buy and sell physical works.

We firmly believe that this digital asset market will be as big as or even bigger than the physical asset market in the long run. Nearlend's strategy in the next 02 years is creating marketplace allow user to use NFTs as collateral to access loans. This will benefit NFT collectors and investors in a number of ways by: promoting instant liquidity and accurate pricing for NFTs; promoting portfolio variety; and opening up a new market of possibilities with other DeFi applications.

3. IMPLEMENTATION & ARCHITECTURE

3.1. nToken Contract

In the Nearlend protocol, each money market is a smart contract that implements the NEP141 standard, and a user's balance is denoted as nToken, which can be minted by supplying assets to the market or redeemed. The exchange rate between nToken and a corresponding underlying asset will increase over time.

```
exRate = (underlyingBalance + totalBorrowBalance - reserves)/nTokenSupply
```

Where:

- exRate = exchange rate at which nToken is converted to the corresponding asset.

- underlyingBalance = the amount of assets supplied to smart contracts, but not yet loaned.
- totalBorrowBalance = the amount of loaned assets at the moment.
- Reserves = total reserve on the platform.
- nTokenSupply = total circulation of nToken at the moment.

3.2. Interest Rate Mechanism

Borrow APY:

= [1 + Base + Multiplier * min (UtilizationRate, Kink) + max (JumpMultiplier * UtilizationRate - Kink, 0)] ^ 5266000 – 1

BlocksPerYear = 526,600 (60 sec per block)

Supply APY:

= Distribute (Interest Paid by Borrowers Per Block - λ) to all suppliers, and convert it into APY

= Distribute [(1 + Borrow APY) ^ (1 / BPY) - 1] * Total Borrow * (1 - λ) to all suppliers, and convert it into APY

= {[(1 + Borrow APY) ^ (1 / BPY) - 1] * Total Borrow * (1 - λ) / Total Supply}, and convert it into APY

= {1 + [(1 + Borrow APY) ^ (1 / BPY) - 1] * Total Borrow * (1 - λ) / Total Supply} ^ BPY - 1

= {1 + [(1+Borrow APY) ^ (1/ BPY)-1] *(1-Reserve Factor) *Utilization Rate} ^ BPY -1

Category	Tokens	Base	Multiplier	Jump Multiplier	Kinked 1	Kinked 2	Reserve Factor (λ)
Stable	USDT, USC	0%	18%	800%	80%	90%	15%
Major	ETH, NEAR	0%	15%	200%	80%	90%	20%
Governance & Seeds	AURORA, OCT, REF, PARAS	0%	20%	500%	70%	80%	30%

Table 03 - Main parameter of Nearlend's Interest Rate Model

Utilization Rate:

The utilization rate U indicates how much money is loaned out from the entire pool. The higher the proportion of money loaned out, the higher the utilization rate. The utilization rate U for a given market can be expressed as follows:

UtilizationRate = Total Borrow / Total Deposit

3.3. Liquidation

Liquidation occurs when the value of the collateral provided is less than the borrowed funds. Liquidation happens to ensure that there will always be excess liquidity for withdrawal and borrowing of funds, protecting lenders against default risk. As crypto assets are subject to great market volatility, collateral value changes all the time. The protocol also tracks loan amount based on indicator as Account Status (AS):

```
        AS = Loan-to-Value (LTV) / Total borrowed Value (TBV)
```

```
Where,

At AS ≥ 2.0: Excellent status

At 2.0 > AS > 1.5: Good Status

At 1.5> AS > 1.0: Alert status

At AS ≤ 1.0: Liquidations will occur automatically
```

In a liquidation, a borrower's debt is repaid and that value plus a liquidation fee is taken from the available collateral.

Token	Loan-to-Value (LTV)	Liquidation fee
USDT	90%	5%
USDC	90%	5%
ETH	80%	6%
NEAR	70%	7%
AURORA	60%	7%
OCT	60%	8%
REF	50%	8%
PARAS	50%	8%

Table 04 – Expected LTV & Liquidation fee

for Nearlend Protocol

3.4. Price Feed

Nearlend will integrate Chainlink Price Feeds to secure borrowing and lending operations. Initially, Chainlink can be seen as the best oracle solution because its infrastructure is seamless to integrate and time-tested in production. Chainlink already helps secure leading DeFi protocols responsible for billions of dollars in smart contract value, maintaining security and availability even amidst unexpected events, such as exchange downtime, flash crashes, and data manipulation attacks via flash loans. Chainlink Price Feeds provides a multitude of critical features such as high-quality data, secure node operators, decentralized network, reputation system.

3.5. Governance – DAO

Nearlend will begin with centralized control of the protocol, and over time, will transition to semi- decentralized control or Decentralized Autonomous Organization (DAO). DAO's members will vote on high-level decisions related to the operations and investment of the protocol, and will authorize subdivision such as "NEL Opera" to perform those decisions. The following rights in the protocol are controlled by the DAO:

a. List new liquidity pool

b. Update the interest rate model

c. Change mains parameters of protocol (kinked, LTV, reserve factor...)

d. Add or remove functionality of the protocol

e. Update the oracle address

f. Appoint a new manager of subdivision

g. Distribute of revenue from the protocol to DAO's member and subdivisions.

h. Approve budget for new projects with financial resources from "Reserve & Treasury Fund"

i. Add new rights for DAO

Each DAO member needs to own at least at least 1% of the total tokens of Nearlend. This rate can be reduced at the discretion of the DAO by the time. All DAO's members have the right to make proposals and vote. Each member's voting power is equal and is not affected by the amount of tokens. The proposal will be approved when more than 51% of the members vote in favor.

"NEL Operation" is a subdivisions created to enforce the decisions of the DAO and operate on an allotted budget. This budget is derived from the revenue of the protocol (please refer to item f). The manager of the "NEL Opera" will be proposed and decided by the DAO.

3.6. Risks

Unclear regulatory environment

The first and most important risk we'll need to consider is the regulatory environment in country. Despite its widespread adoption and sky-rocketing growth, Blockchain is still a new technology, which means that in many countries its regulation is a grey area. At the positive end, there's the European Union, which is taking great strides in Blockchain implementation. Governments and financial institutions alike are developing legislation to regulate the emerging Blockchain industry and facilitate Blockchain capital and investment. Switzerland, Sweden, UK and Singapore are leading the way in Blockchain innovation and these countries are considered ideal destinations for blockchain-related startups.

Lack of information

Nearlend is still under development and its design concepts, algorithms, codes, and other technical details and parameters may be constantly and frequently updated and changed. So that all the content herein is incomplete and definitely will be adjusted and updated in the testing phase of the project (testnet) time to time. Therefore, Nearlend will not be able to notify the community in a detailed day by day. This can lead to fear of people and especially investors.

Competitor

Lending & Borrowing Dapps is not actually a new application in DeFi. Just like Nearlend, there are many groups of developers trying to build up similar applications and the level of competition in this field is obviously increasing. Therefore, in addition to the positive factors, the negative effects are completely possible for Nearlend projects.

Internal conflict

The development of Nearlend greatly depends on the continued co-operation of all members as core team, advisors, investors. Stability and cohesion within the team is critical to the overall development of Nearlend. There is the possibility that conflict within the team and/or departure of core personnel may occur, resulting in negative influence on the project in the future.

Forces Major

There is the risk that the development of Nearlend will not be executed or implemented as planned, including but not limit to the event of a decline in the prices of any digital asset, virtual currency or NEL, unforeseen technical difficulties, and shortage of development funds for activities.

Security

Hackers or other malicious groups or organizations may attempt to interfere with Nearlend in a variety of ways as malware attacks, denial of service attacks, consensusbased attacks, Sybil attacks, smurfing and spoofing. Further, the future of cryptography and security innovations are highly unpredictable and advances in cryptography, or technical advances (including without limitation development of quantum computing), could present unknown risks to Nearlend by rendering ineffective the cryptographic consensus mechanism that underpins that blockchain protocol.

4. CONCLUSION

This papers provides an overview of the Nearlend protocol, including the details of supplying, borrowing and the interest rate mechanics in the protocol. It also covers the several features such as asset supplying and order matching, as well as the architecture of the Nearlend protocol and smart contracts of money markets. Fully operated on the Near Protocol, Nearlend provides a high-speed and lower-cost decentralized lending protocol accessible to all.

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