finance
SPHERIUM
Finance reDeFined

WHITEPAPER

A DECENTRALIZED AND BORDERLESS FINANCIAL ECOSYSTEM THAT GIVES USERS COMPLETE CONTROL OF THEIR FINANCES

Version 1.1

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Executive Summary

Introduction

The traditional financial infrastructure is fraught with bureaucracy, inefficiency, and censorship. A handful of financial institutions hold the power to sway the global financial markets.

Decentralized finance (DeFi) aims to liberalise the financial ecosystem by building an open, trustless, permissionless, and cost-efficient financial framework. The DeFi industry has started building momentum with first-generation DeFi platforms garnering attention across the world.

- **Total Volume Locked (TVL) in** DeFi projects has reached $99.11 billion.
- **DeFi already has its first unicorn projects ($1 billion+) with more set to disrupt the industry**
    - Maker
    - Compound
    - Uniswap

DeFi Scalability Bottlenecks

DeFi is witnessing exponential growth in TVL volumes and promising initiatives across the world. However, current DeFi platforms at their initial stages face various challenges:

- **Fragmented DeFi Landscape**: Users have to register across multiple DeFi platforms to access a full suite of financial services
- **Complicated UI, Design**: Current DeFi platforms are built with tech-users in mind, making them complicated for most of the retail users
- **High Transaction Fees**: DeFi platforms built with layer 1 architecture are experiencing high transaction charges, hindering their mass adoption

Spherium Finance: Redefining The New Age Of DeFi Solutions

Spherium Finance is building a financial ecosystem set to unify the current scattered DeFi (Decentralized Finance) landscape. Spherium utilises the principles of decentralized finance to provide a single platform for multi-asset, cross-chain swaps, crypto financing solutions, and cross-chain interoperability.

Spherium is designed to scale the adoption of Crypto and DeFi among institutions and retail investors alike.

- A Cross-Chain DeFi Platform
- Customer Centric Interface
- Built on Layer 2 for Cost-Efficiency

Spherium Finance Initial Stage Product Line

HyperSwap

A Decentralized Exchange (DEX) making token-swap across chains efficient and sustainable.

HyperLaunch

An Incubation & Grant Program to break the silos of individual blockchains and support cross chain ecosystem

HyperLend

A lending and borrowing protocol optimized through AMM based algorithms

Spherium Mobile Application

A cross-chain mobile application to give access to all Spherium's DeFi products as well as integrations with the partners

Spherium Mission & Vision

Mission

Spherium's mission is to provide a transparent, decentralized, non-custodial, and user-friendly one-stop platform for all segments of the Financial system, empowering average users to avail the best products and services in the De-Fi space to maximize their investment/loans returns with minimal efforts. *Spherium* offers a collection of DeFi services including a universally usable wallet, token swap platform, money markets, and inter-Blockchain liquidity transfer, which will further be enriched by integrating new innovative services developed by the *Spherium* team in the near future. From a broader perspective, *Spherium can* function as a banking and investment solution for the 1.7 billion global unbanked population. Further, through our emphasis on connecting the world through our financial solutions, we are planning to implement other innovative features in the DeFi-Blockchain space, which are not available in legacy financial systems.

Vision

Spherium will play a vital part in changing traditional finance and redistributing the profits and power balance of the shared financial system to the users. We are aiming to create an ecosystem where every individual, irrespective of his/her geographical location, faith, and social standing becomes its own "Wealth Manager" that ensures maximum returns on their investments with relatively low risk.

To realize this vision, *Spherium's* team of global DeFi experts with diverse areas of expertise including fintech, law, smart contract development, business development, AML/KYC, and blockchain research is focusing to develop services that will unleash the potential DeFi revolution.

DeFi Industry/Background

A Case for Decentralized Finance

The idea behind money is to provide people with a store of value that's open, free from manipulation, and accessible to all. However, a careful look at the history reflects that's rarely the case - let it be the global financial meltdown of 2008-09 or manipulative practices by leading financial institutions.

Decentralized finance (or DeFi) aims to build a financial ecosystem that leverages blockchain technology (other DLTs) to create a suite of financial services that is transparent, permissionless, trustless, cost-efficient and self-governed.

Unlike digital finance, DeFi doesn't replicate traditional financial frameworks with cumbersome bureaucracy. The primary focus of DeFi is to utilise the fundamental concepts set forth by financial institutions, but redefine them with users at the centre of their ecosystem. Some of the early applications in the DeFi world already provide a primer into what decentralized finance can do.

Like the traditional financial system, DeFi constitutes several components/products that include but not limited to the following:

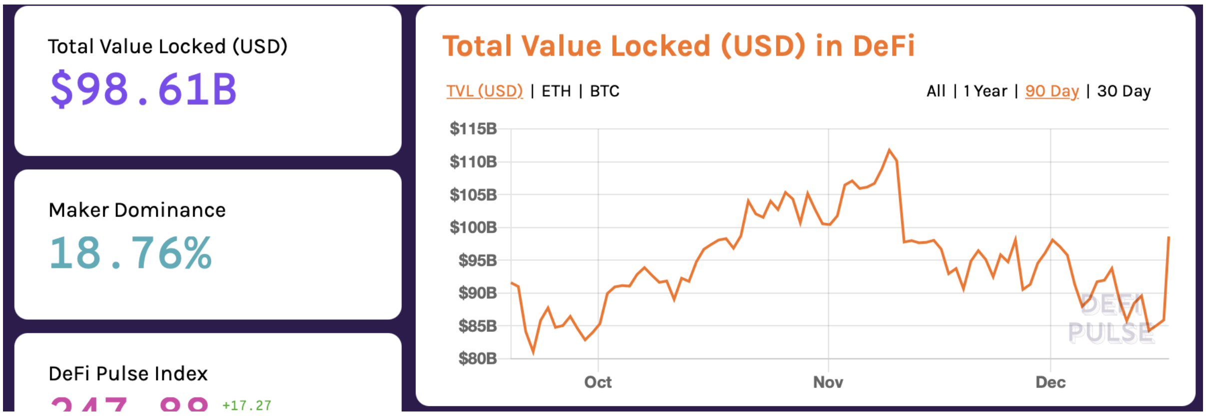
- Lending and borrowing platform
- Trading platform or exchange
- Derivative or synthetic assets
- Insurance platform
- Prediction markets
- Alternative savings/investment platform

Insights into the DeFi Industry

The DeFi industry has started to gain traction as more blockchain projects leverage existing networks (Ethereum & BSC) to create open, permissionless financial products. 2020 was a milestone year for DeFi, as the net value locked in DeFi products soared over 2,000%.

$1 Billion to $140.90 Billion in Total Volume Locked (TVL)
The proliferation of DeFi platforms across different financial verticals is evident with the growing amount of assets locked in DeFi smart contracts, also known as Total Volume Locked (TVL).

The TVL in DeFi projects crossed the $1 billion mark for the first time in February 2020 and ended the year with a TVL of roughly $15 billion. The current year (2021) is defying these historical growth trends, witnessing 10x growth in TVL.



Some of the leading industries in the DeFi landscape in terms of TVL are:

- Lending industry ($46.43B)
- Decentralized exchanges ($30.49B)
- Derivatives ($2.92B)
- Assets ($16.17B)
- Payments ($2.6B)

Rise of Unicorns in DeFi Landscape

The initial acceptance towards DeFi has been overwhelming the way it has been able to challenge the current financial systems in place and promise to disrupt it entirely, all with the virtue of extremely analytical tech implementation. The DeFi industry, although being fairly new, has already given rise to several unicorns (projects with a market cap of $1B+).

Lending

DeFi lending projects are based on the concept of pooling crypto assets from suppliers and lending them to borrowers against an algorithmically-driven interest rate. The interest rates vary in accordance with the demand and supply of crypto assets.

Some of the primary players in DeFi lending space are (TVL):

- Maker ($18.50 billion)
- Aave ($11.42 billion)
- InstaDApp ($10.77 billion)

DEXs (Decentralized exchanges)

Decentralized exchanges or DEXs challenge the centralized trading practices witnessed in the crypto industry. These exchanges work on the principles of peer-to-peer (P2P) asset trading, matching a buyer of crypto with a seller at the desired prices. Unlike centralized exchanges, traders don't have to lose the ownership of their digital assets while trading them through DEXs.

Some of the leading DEXs in terms of TVL are:

- Curve Finance ($14.20 billion)
- Uniswap ($8.29 billion)
- SushiSwap ($2.83 billion)

Derivatives and assets

Derivatives and assets form a critical component of any financial market and the same principle applies to DeFi. dYdX is one of the leading derivatives platforms in the DeFi world with a net TVL of $1.03 billion. In the assets segment, Convex Finance is the leading platform ($10.05 billion) along with several upcoming projects including yearn.finance.

A Growing DeFi Ecosystem

DeFi represents a seismic shift in how investors, early-adopters, and future users will interact with financial platforms. The emergence of ingenuous DeFi platforms over the past couple of years has helped in the development of a fundamental infrastructure for the DeFi industry. A careful analysis of the current pulsating growth in the DeFi sector indicates a prudent approach towards liberalising traditional finance.

Challenges in DeFi Industry

A Fragmented DeFi Landscape

One of the prerequisites of mass DeFi adoption is the ability to provide an immersive consumer experience. The current DeFi industry is fragmented, with a siloed operational structure.

- **Need to register on multiple platforms:** A user has to register on multiple platforms to leverage different services within the DeFi industry. For instance, if a user wants to trade cryptos, he must create an account on a DEX. If the user wants to put his crypto to use by lending them, he has to create a second account on a lending marketplace. The need to switch across different platforms leads to a frustrating, complicated user experience.
- **Basic cross-platform functionality:** Some of the leading platforms have identified the need to provide a comprehensive user experience by collaborating with other service providers (a Dex collaborating with a DeFi lending platform). However, the current framework for cross-chain interoperability doesn't offer a smooth user experience.

Ingenious or Primitive UI/UX Interface

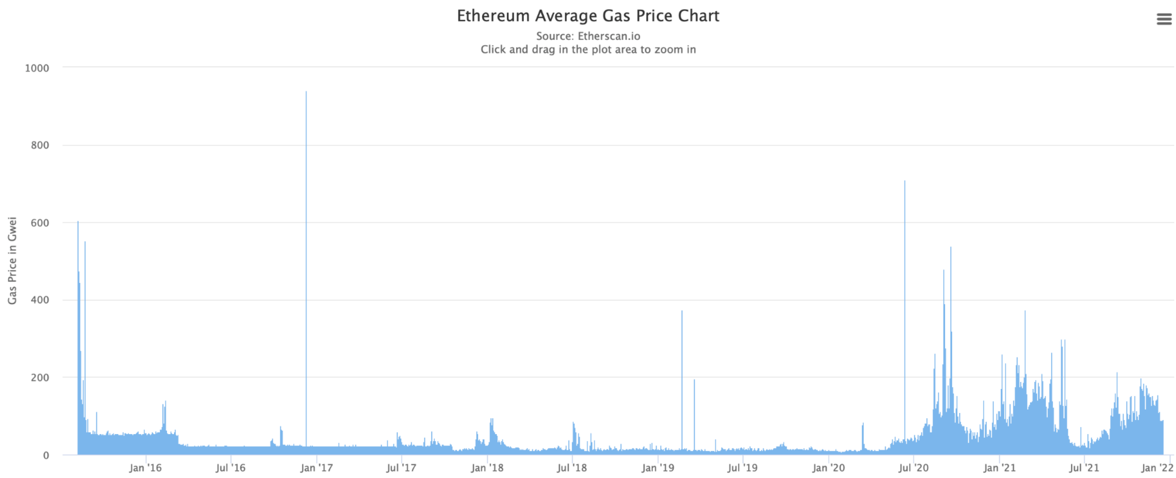
Every tech product has a life cycle including introduction, growth, maturity, and decline stages. DeFi platforms are in their introductory stages, gaining traction among early-adopters. One of the primary challenges with these platforms is their ingenious UI/UX interface which is ideal for users with a high degree of technical proficiency.

Some of the challenges that DeFi products have to address are:

- **Focus on user-friendly UI interface:** The existing DeFi platforms need to focus on user experience when it comes to interface designs. Instead of creating a design that requires technical sophistication, DeFi platforms should be simple enough for retail adoption.
- **Lack of intuitive design:** Intuitive designs enhance user experience, but the current DeFi products focus on functionality instead of a user experience.
- **Multi-wallet integration:** Crypto wallets are poised to become the storefront of the DeFi Universe, which makes it critical for every DeFi platform to provide support for multi-currency wallet integration. One approach is to develop a wallet that supports multiple cryptocurrencies, whereas the other approach is to integrate existing multi-currency wallets within the platform.

Rising Transaction Fees for Layer 1 Products

A fundamental principle behind cryptocurrencies is to reduce the cost of any financial transaction by eliminating intermediaries. Cryptocurrencies have been able to address this challenge to some extent. However, a growing demand for resources from proliferating DeFi platforms has led to a surge in transaction charges.



Solution: **Spherium Ecosystem**

The *Spherium* ecosystem stands on the shoulders of DeFi's predecessors and provides the best solutions for problems faced by traditional finance by offering a transparent, decentralized, cross-chain, and user-friendly one-stop platform - where users with little to zero exposure to the DeFi ecosystem will find the best available products in the space to maximize returns and minimize the complexity of investing in DeFi. To this end, the *Spherium* ecosystem will launch a whole bunch of products and services in several phases. The first phase, i.e Phase I will focus on foundational services to implement all the key bricks for the ecosystem, while Phase II will enhance the platform by adding advanced and innovative functionalities to *Spherium Finance*.

Spherium Ecosystem – Phase I Deployment

Spherium offers the following products and services as a part of its **Phase I** deployment:

HyperSwap

- A Decentralized Asset Swap that is based on an automated market-making mechanism.
- Application Layer protocols for mitigating high transaction costs while maintaining a security guarantee of the Settlement layer.
- Integrated via an exhaustive Cross Chain Swap platform

HyperLaunch

- A Native Incubation and Grant Program to expand the cross-chain ecosystem
- Onboarding enterprising projects onto Spherium cross-chain DEX
- Creating a cohort of 50 ground breaking projects and assisting them with DeFi centric solutions

HyperLend

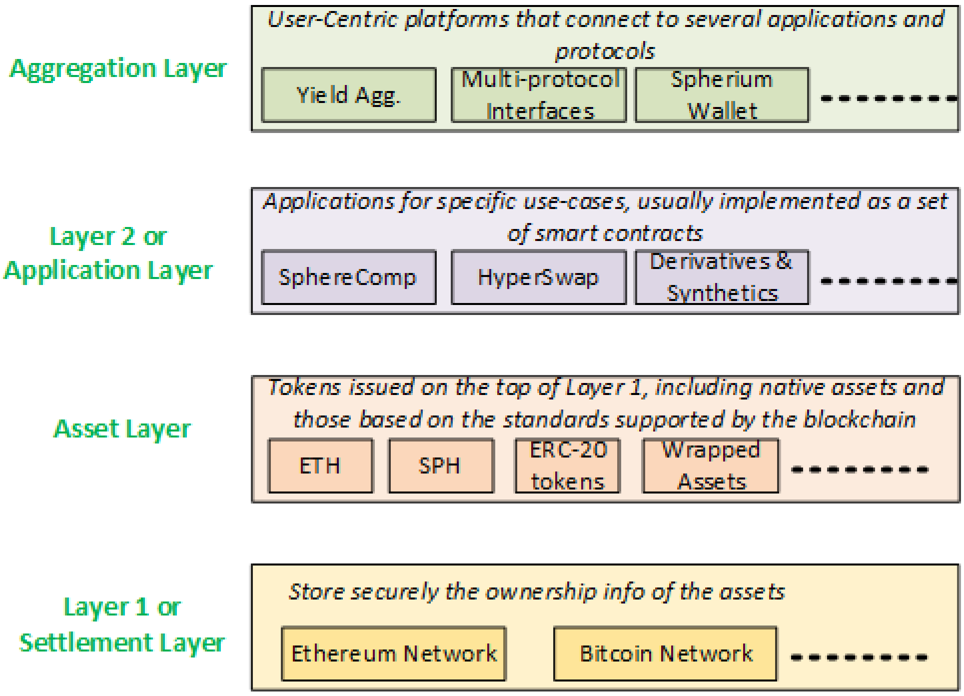
- Decentralized borrowing and lending protocol powered by money markets
- Enabling investors to lend or borrow digital assets with interest rates that are determined by the law of supply and demand
- Direct interaction between lenders and borrowers

Spherium Wallet

- A Decentralized Wallet which can be used in conjunction with other Spherium products and services.
- In-built cross-chain token-swap, staking, lending/borrowing accessibility

Spherium Token

- $SPHRI is the native utility token for Spherium ecosystem
- Will primarily be used for the governance of the *Spherium* ecosystem, with proposals and voting rights that will together determine its future.
- Be a catalyst to bring more value and liquidity and investors in the project who can participate in the bigger metaverse by just being holders



The DeFi Stack

Spherium Product Specifications

HyperSwap

HyperSwap will provide a decentralised platform for swapping ERC20 tokens using a cutting-edge *Automated Market Maker* (AMM) algorithm that enables the liquidity providers, rather than arbitrageurs, to capture profits by reducing the price skew (for an asset in a pool) and bringing the asset price back to the market price. *HyperSwap* will create different liquidity pools, and will incentivise the liquidity providers via the ***Liquidity Mining*** or ***yield farming***. Users can add liquidity for any asset pair on *HyperSwap* liquidity protocols. Additionally, liquidity providers earn SPHRI tokens for approved asset pairs. At the start, the *Spherium* team will add liquidity pools for assets with a large market cap, however, this list will be updated over time by the community (or trading pairs). Initially, the liquidity pool will be restricted to two ERC20 tokens (e.g., SPHRI/ETH, SPHRI/LINK etc.) of equal worth. However, with time, multi-token pools with custom distribution will be supported (e.g., like *Balancer* [Ref3]).

Apart from earning SPHRI tokens via liquidity mining, the liquidity providers will earn the pool's trading fees paid by the *HyperSwap* users for swapping their tokens. Initially, *HyperSwap* protocol will be configured to charge a 0.30% trading fee for a token swap across all the liquidity pools. Out of the 0.30%, 0.27% will be granted to the liquidity providers, while the remaining 0.03% will be paid to the stakers of SPHRI token as a staking reward. Later, these values can be modified based on the consensus or majority view of the *Spherium* community.

When liquidity is supplied to a pool, the liquidity provider will receive special tokens called ***LPtokens*** in proportion to how much liquidity they supplied to the pool. When a trade is facilitated by the pool a 0.27% fee will be proportionally distributed amongst all the ***LPtoken*** holders. Later, if the liquidity provider wants to get their underlying liquidity back, plus any accrued fees, they must burn their ***LPtokens***.

Note that *HyperSwap* itself does not hold user assets for liquidity pools; instead, assets are controlled entirely by smart contracts. These contracts will handle every aspect of trading/swap and *HyperSwap* will create separate contracts to handle each trading pair.

A common problem among AMM based DeFi exchanges is the "Impermanent loss", which occurs when an asset price slips against its market rate on other exchanges due to lower liquidity. Higher slippage opens opportunities for arbitrage traders to make up that difference by conducting the reverse trade. In essence, they extract a value in excess of the desired 50-50 balance, only returning the exchange fee of 0.3% to the liquidity pool. If the slippage amounts to 10%, a total of only 0.3% is returned to the pool as fees, while arbitrageurs pocket the remaining 9.7%.

To fix this problem, HyperSwap will adopt a similar approach to MooniSwap [Ref4], where HyperSwap will try to return more of the profit to liquidity providers instead of arbitrage traders.

HyperSwap will adopt the concept of virtual balances. More specifically, when a high-slippage trade occurs, the internal balance of HyperSwap will not immediately reflect this change. At first, any new trade will still be executed at the old price. However, after five minutes, the price will gradually be updated to its true value based on the pool balances. This will open a small window of arbitrage opportunities, which we expect will be taken as soon as possible.

The main benefit of this new approach is that HyperSwap will take a much higher percentage of the trader's profit. Thus, the arbitrageurs return a much higher proportion of the price slippage to the pool. Also, any normal trader who is placing orders at the old price will be effectively returning a portion of that slippage difference to the pool, as they are technically overpaying for the trade.

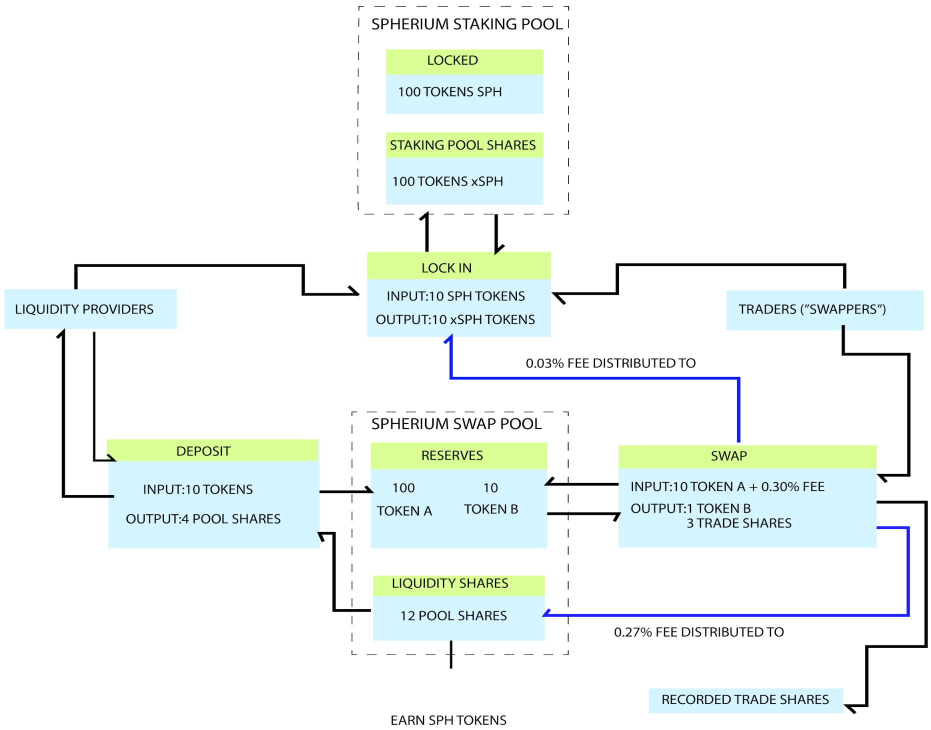
The *HyperSwap* will consider the use of Layer 2 technology for dramatic improvement in Gas fees and the number of transactions per second. For this purpose, *HyperSwap* will combine Automated Market Maker (AMM) with off-chain scaling solutions such as ZK-rollup [Ref5] and optimistic rollup [Ref6] solutions for swapping/exchange of digital assets to minimize transaction fees for users.

Currently, many non-ERC20 assets cannot be mapped on dApps (such as Uniswap [Ref7], Compound [Ref8], etc.) built on Ethereum blockchain due to the lack of cross-chain communication protocols. In other words, existing blockchains (such as BTC, Ethereum, etc.) work and exist in silos. Hence, there is a need for the formation of unified, interoperable, and broad supported DeFi markets and dApps.

In the DeFi space, interoperability implies a situation where two or more blockchains can communicate with each other and exchange value or assets.

To promote interoperability, the Spherium team will extend *HyperSwap* to a cross-chain asset exchange, i.e., a one-step exchange of multiple assets from different chains, such as BTC, Binance Smart Chain, etc. For this, *Spherium* will create alliances with other projects in the crypto space that aim to bring interoperability to DeFi while focusing on niche use cases, technologies, or markets. *HyperSwap* will integrate novel interoperability products/solutions in the space (such as REN multi-chain bridge [Ref9]), making it effortless for an average user to move its assets across different chains.

HyperSwap will implement ZK Rollups for the on-chain verification of transactions using the ZK Sync reference implementation architecture followed by *Matterlabs* [Ref10]. *Spherium* team has considered the reference implementations of *Iden3* [Ref11] and *Matterlab*s and decided to take the ZK Sync as it is already in Ethereum MainNet. ZK-Rollups is a Layer 2 construction that increases scalability through mass transfer processing rolled into a single transaction. The transaction is written as a verifier smart contract corresponding to a proof construction following the zero-knowledge proof paradigm. Essentially, Zero Knowledge Proof reduces computing and storage resources for validating the block by reducing the amount of data held in a transaction.



HyperSwap - Flow diagram of the Swap Pool and the Staking Pool

HyperLend

HyperLend is a decentralised pool-based lending protocol built on the Ethereum ecosystem, where different Ethereum-asset-based money markets can be created. *HyperLend* money market is a pool of particular assets that algorithmically derive interest-rates based on the supply and demand for the asset. Lenders and Borrowers of the asset will interact with the protocol directly in order to earn and pay, respectively, a floating interest rate, without having to negotiate any kind of terms such as maturity, interest rate, or collateral.

When a lender supplies an asset to *HyperLend* lending protocol, the lender will be issued with an ERC20 token called '***sToken***'. Based on demand and supply of a particular asset type in the market, functions of the *HyperLend* will calculate the interest accrued for all those issued ***sTokens***. The incentivization process is done by converting ***sTokens*** into an increasing amount of its holder's underlying asset. Furthermore, the ***sTokens*** issued to a lender for supplying liquidity to one pool of assets can be used as collateral for the other pools of assets.

Each money market will have a collateral factor (or *Asset Maximum Loan-to-value (LTV)*), ranging from 0 to 1 that represents a portion of the underlying asset value that can be borrowed. Naturally, illiquid, small-cap assets will have low collateral factors as they do not make good collateral, while liquid high-cap assets will have high collateral factors. The borrowing capacity of a user will be determined by the value of the user underlying token balances multiplied by the collateral factors. Users can borrow up to but not exceeding their borrowing capacity.

The *HyperLend* will take no action as long as the total value of the borrowed assets is above the borrowing capacity. However, to protect *HyperLend* from default risk, a threshold will be triggered when the value of a user borrowing outstanding exceeds the borrowing capacity (either due to price appreciation of the borrowed asset or price depreciation of the underlying collateral asset). The user can avoid triggering this threshold (i.e., raising the borrowing capacity value above the borrowed asset value) by adding more underlying assets to its account. In case of not doing so, the *HyperLend* will close the position, meaning the borrower will keep the borrowed assets but lose the collateral asset - a process known as *liquidation*.

For the entire process described above, the accurate price data of the underlying asset plays a very critical role, which is off-chain information and can be acquired by the smart contract via the oracle. In general, oracle is a mechanism used to acquire/report off-chain information to a smart contract. Considering the importance of oracle for DeFi realization and growth, there are several projects [Ref13-Ref16] working on solving the oracle problem for DeFi using different approaches.

HyperLend will ensure that its smart contracts acquire swift but accurate price data to facilitate instant transactions and eliminate the chances of fraud transactions during periods of price volatility. For this purpose, *HyperLend* will adopt different models depending on the volume of a transaction - for small value transactions, a swift but partially verified (i.e., verified by a majority but not all agents) oracle model will be followed, while for large value transactions, a fully verified but slow oracle model will be utilized.

How HyperLend works

HyperLend provides money markets to users, where lenders can earn interest on their digital assets by supplying supported (or whitelisted) assets into the protocol. Assets deposited by lenders will be transferred into a smart contract that aggregates the total liquidity of each asset into a pooled fund, which is available for borrowers to borrow. Loans are not matched individually between lenders and borrowers, but are taken from the pooled fund. Interest lenders' earning comes from the interest that borrowers pay, which is distributed proportionately to the liquidity they provide. Once lenders supply assets into the protocol, these assets act as collateral, enabling lenders to also borrow any asset up to a certain limit, as explained in the figure shown below. This means that any borrower must first supply assets into the protocol as collateral before taking out any loan.

The key concepts of *HyperLend* protocol are outlined below:

Depositing an Asset

Suppose Alice deposits one of the supported (whitelisted) assets, such as ETH (Ethereum), into the protocol. Once deposited, the deposited ETH is added into a pooled fund, which is referred to as the ***Total Liquidity***. This *Total Liquidity* is calculated as follows:

Total Liquidity = Total Available Liquidity + Total Borrows

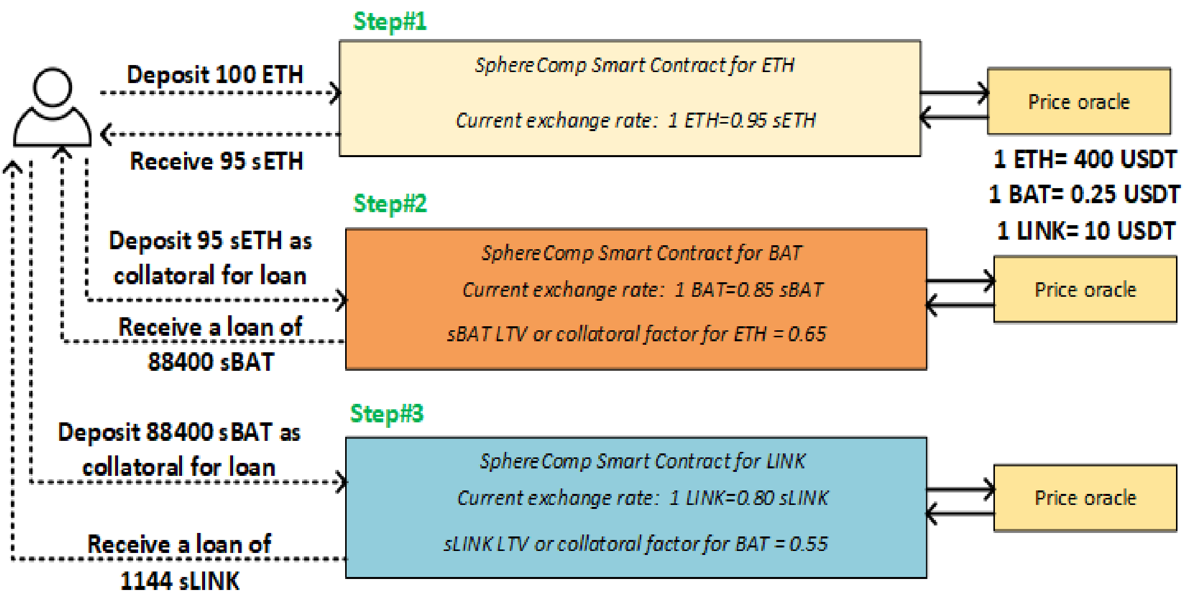
Total Available Liquidity is the liquidity available of that asset for borrowers to borrow or lenders to withdraw. The ***Total Borrows*** of an asset is the sum of the total borrowed amount and the accumulated borrowed interest from all borrowers. *Total Borrows* is calculated as follows:

Total Borrows = Borrow Amount + Cumulative Borrow Interest

This means that *Total Liquidity* will continue to grow as *Cumulative Borrow Interest* grows over-time. Alice will receive *sTokens*, such as sETH, that represent her share of ETH deposited to *Total Liquidity* of ETH. *sToken* is a tokenized representation of the user's lending position and is an interest-bearing ERC20 token, which means an *sToken* can claim more of the underlying asset over-time as *Total Liquidity* grows from the interest collected from the borrowers. The number of *sTokens* each user receives is calculated as follows:

Number of sTokens = Deposit Amount * Total sToken / Total Liquidity

Total *sTokens* are based on the first user who deposits this asset. For example, if Bob is the first user who deposits 1,000 ETH, then Total sETH starts with 1,000 sETH. If Alice then adds 100 ETH when the *Total Liquidity* is 1,100 ETH, then Alice gets 90.90 sETH (100 * 1,000 / 1,100).



Example of how a lender can use its sTokens of one pool as collatoral for another pool

Borrowing an Asset

Before a user can borrow, the user has to first deposit some of their digital assets that can be used as collateral on the protocol. Note that *HyperLend* will initially support only digital assets (e.g., ETH, BAT, etc.) but will be enhanced to support tokenization of physical assets. Upon depositing such assets, the user receives *sTokens*, representing the user's shares in the asset pools. To protect the protocol security, only the whitelisted assets will be accepted as collateral. Even though these *sTokens* are used as collateral, the user will still earn deposit interest on them since other users are borrowing the underlying asset from the asset pool and paying borrowed interest to the pool, or *Total Liquidity*.

For instance, s user - let's call her Alice - can deposit LINK - one of the available collateral assets into the protocol and receives a balance of sLINK that represents her share in the total LINK pool. Alice can then use this sLINK as collateral, enabling her to borrow other assets such as ETH. In this case, Alice is earning a deposit interest on LINK and paying borrow interest on ETH. Each asset that can be used as collateral has an assigned ***Asset Maximum Loan-to-value (LTV)***. For instance, if Alice deposits $100 worth of LINK, which has an *Asset Maximum LTV* of 75%, then Alice can borrow any asset with the ***Borrow Limit*** of $75. *Borrow Limit* is calculated based on the total value of deposited assets that can be used as collateral and *Asset Maximum LTV* of each deposited asset. Specifically, the *Borrow Limit* for an asset can be calculated as follows:

Borrow Limit = (Deposit Value in USD of Asset1*Asset Maximum LTV1 + Deposit Value in USD for Asset2*Asset Maximum LTV2 + …)

A user can only borrow if the ***Account Status*** remains healthy after considering the new borrowed amount. *Account Status* can be calculated as follows:

Account Status = Healthy (borrow value ≤ Borrow Limit)

Account Status = Unhealthy (borrow value > Borrow Limit)

When a user borrows and receives the borrowed amount, *HyperLend* protocol calculates how many ***Borrow Shares*** the borrowed amount equals to. *Borrow Shares* represent the share of the user's borrowed amount to the *Total Borrows* of that asset. *Borrow Shares* is calculated as follows:

Borrow Shares = (Borrow Amount * Total Borrow Shares) / Total Borrows

The number of ***Total Borrow Shares*** is set based on the first user who borrows this asset. For example, if Bob is the first user who borrows 1,000 ETH, then the number of *Total Borrow Shares* starts with 1,000. If Alice then borrows 100 ETH when the *Total Borrow* is 1,000 ETH, then Alice gets 100 *Borrow Shares* (100 * 1,000 / 1,000).

Withdrawal Procedure

A user can only withdraw assets if there is enough *Total Available Liquidity* to do so and if the *Account Status* remains healthy after the transaction. To withdraw a part or all the deposited amount, the protocol calculates from the *withdraw amount*, burns *sTokens* equal to the number of *Withdraw Shares*, before transferring the withdraw amount to the user. *Withdraw Shares* is calculated as follows:

Withdraw Shares = Withdraw Amount * Total sToken / Total Liquidity

Because *Total Liquidity* increases over-time from accruing borrowed interest, the same withdrawal amount will equal smaller *Withdraw Shares* over-time, and thus burns fewer *sTokens* to claim the same *withdrawal amount*. If the user withdraws all the deposited amounts, the user will receive a withdrawal amount that is more than the originally deposited amount from accruing deposit interest.

Repaying loan process

To repay a part or all of the borrowed amount, the protocol calculates ***Repay Shares*** from the repay amount, transfers the repay amount to the pool, and reduces *Borrow Shares* by *Repay Shares*. *Repay Shares* is calculated as follows***:***

Repay Shares = Repay Amount * Total Borrow Shares / Total Borrows

Since *Total Borrow* increases over-time from accrued borrowed interest, the same repay amount will equal smaller *Repay Shares* over-time, reducing *Borrow Shares* by a smaller *Repay Shares*. If the user repays all of the borrowed amount, the user will pay more than the original amount because of accrued borrower interest.

Floating interest rate

Interest rates for borrowers and lenders are determined by ***Utilization Rate***. The *Utilization Rate* is calculated as follows:

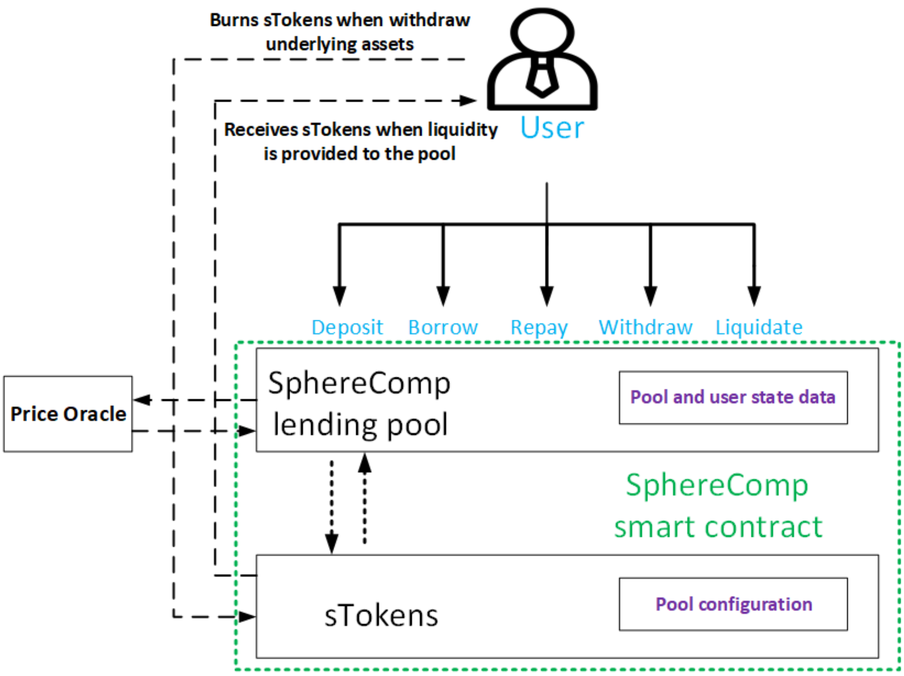
Utilization Rate = Total Borrows / Total Liquidity

The *Utilization Rate* reflects the demand to borrow an asset, a higher *Utilization Rate* corresponds to a higher cost of borrowing or borrow interest rate. Each asset has its own Base Borrow Rate and *Slope* value that depends on the asset market cap, price volatility, etc. The ***Borrow Interest Rate*** for any asset can be calculated as:

Borrow Interest Rate = Base Borrow Rate + (Utilization Rate * Slope)

Since the *accumulated borrowed interest* is added to *Total Liquidity* and the *sTokens* that lenders receive, they can claim the share of *Total Liquidity*. The higher borrow interest rate corresponds to the higher ***Deposit Interest Rate***, which can be calculated as:

Deposit Interest Rate = Borrow Interest Rate * Utilization Rate



SphereComp Architecture

Risk and Liquidation

A borrower bears the risk of having an unhealthy *Account Status* when the user's total value of borrowed assets exceeds the *Borrow Limit*. Volatility in collateral assets and borrowed assets can cause *Account Status* to be unhealthy.

For instance, Alice deposits $100 worth of LINK, which for instance has an *Asset Maximum LTV* of 75% - enabling Alice to borrow any asset up to the *Borrow Limit* of $75, and borrows $75 of ETH (e.g., 0.18 ETH) when ETH price is $400. If ETH price increases afterward, Alice's total value of borrowed assets increases since 0.18 ETH now equals to more than $75, resulting in her total value of borrowed assets being higher than her *Borrow Limit*. *Account Status* can also become unhealthy when the price of the collateral asset, or in this case LINK, decreases (e.g., drops from $100 to $80) such that *Borrow Limit* becomes less than the total value of *borrowed assets*.

- When *Account Status* becomes unhealthy, any external actor called a liquidator can repay up to the ***Close Factor*** of the user's borrowed amount. This *Close Factor* is the portion of the borrowed asset that can be repaid by a liquidator in one transaction. The liquidation process may continue until the user's *Account Status* becomes healthy, or when the total value of borrowed assets is below *Borrow Limit*. The *Close Factor* ensures that the user's account will not be fully liquidated if not necessary.

- When a liquidator repays the user's borrowed amount, liquidator inputs ***Liquidate Shares*** and the protocol reduces the user's *Borrow Shares* by *Liquidate Shares.* To reward the liquidator for liquidating an unhealthy account, the liquidator can purchase ***Collateral Amount***, or the value of the user's collateral asset equivalent to the liquidate value at a discounted price. The difference between *Collateral Amount* that the liquidator receives and the ***Liquidate Amount*** the liquidator pays is captured by ***the Liquidation Bonus.*** *Collateral Amount* is calculated as follows:

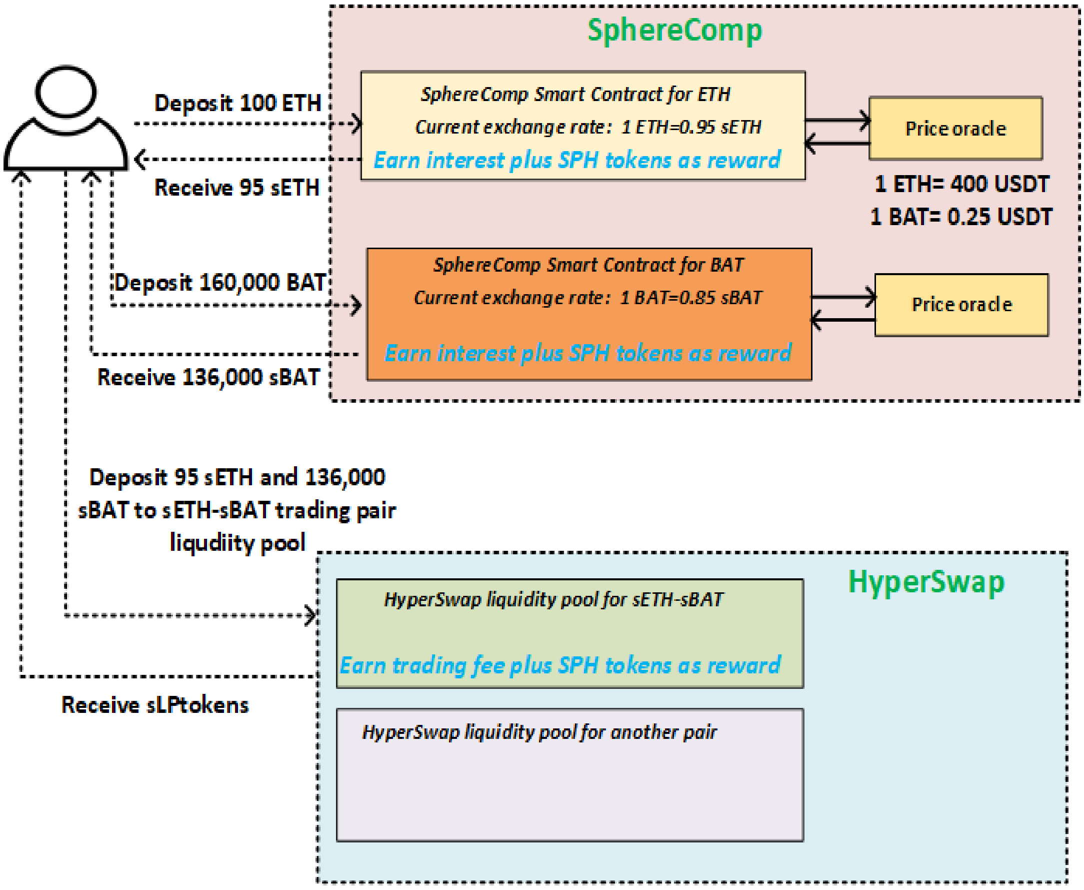
Collateral Amount = (Liquidate Amount * Price of Liquidated Asset / Price of Collateral Asset) * (Liquidation Bonus)

- Liquidate Amount is calculated as follows:

Liquidate Amount = (Liquidate Share * Total Borrows) / Total Borrow Shares

Integrating HyperLend with HyperSwap

In order to maximize the returns on investment, lenders of the *HyperLend* can even add their *sTokens* to the *HyperSwap* liquidity pool for *sTokens*. The figure below shows an example of how an investor can maximize its returns by exploiting the different investment and earning SPH tokens opportunities offered by the *Spherium* ecosystem.



How a user can maximize its returns by smart investment in SphereComp and HyperSwap

Spherium Wallet

Spherium Wallet is a non-custodial and secure mobile wallet for ERC20 tokens, which will facilitate our customers to use all the services provided by the *Spherium* ecosystem anytime and anywhere from their mobile device. The wallet can be connected to any DeFi platform via the *WalletConnect* protocol [Ref12], however, the *Spherium* team will ensure the safety and security of the user assets by adopting best practice in the cybersecurity space. Initially, the wallet will be launched on Android devices and will later be available on IOS devices. The wallet will also have integrations with payment gateways and crypto-to-fiat payment offboarding facilities.

Additional cutting edge features, such as post-quantum cryptography powered security and multi-signature aggregation capabilities will be part of the wallet in the roadmap ahead. Furthermore, *Spherium* wallet will evolve to include staking opportunities for other ERC20 tokens and services such as virtual debit cards so that users can buy and pay with their cryptocurrencies. Subscription fees and gas for the *Spherium* Wallet will be defined at a later stage.

SPHRI Token: Uses and Acquisition

SPHRI will be the keystone of the *Spherium* ecosystem, which will be used not only for all the *Spherium* services but will also be earned in several ways. More specifically, SPHRI will be the governance token of *Spherium,* which will be used to build the *Spherium* community. The community provides proposals and will have voting rights to collectively determine the future of *Spherium*. Users can earn SPHRI rewards by building the *Spherium* ecosystem. For example, *HyperLend* will provide the following incentives to the early adopters of the platform:

Incentive for HyperLend users

- Floating interest rate based on the *utilization rate* of the underlying asset
- Daily SPHRI tokens under the liquidity mining for *HyperLend*

Similarly, early adopters or users of HyperSwap will be incentivised in the following ways:

Incentive for liquidity providers to HyperSwap

- 0.27% out of the 0.30% of the trading fee paid by the users of the *HyperSwap*
- Daily *SPH token under liquidity mining* for *HyperSwap*

Incentive for HyperSwap traders/users

- Daily SPH tokens under liquidity mining from the pool allocation for *HyperSwap* traders

Incentive for SPHRI Token Stakers

- 0.03% of the trading fee paid by the users of the *HyperSwap*

Spherium Token Distribution

- **Token name: SPHERIUM**
- **Symbol ticker: SPHRI**
- **Token type: ERC20**

The process of the *Spherium* token allocation will be based on a community-type distribution, whereby each of these stakeholders will play an important part in the ecosystem.

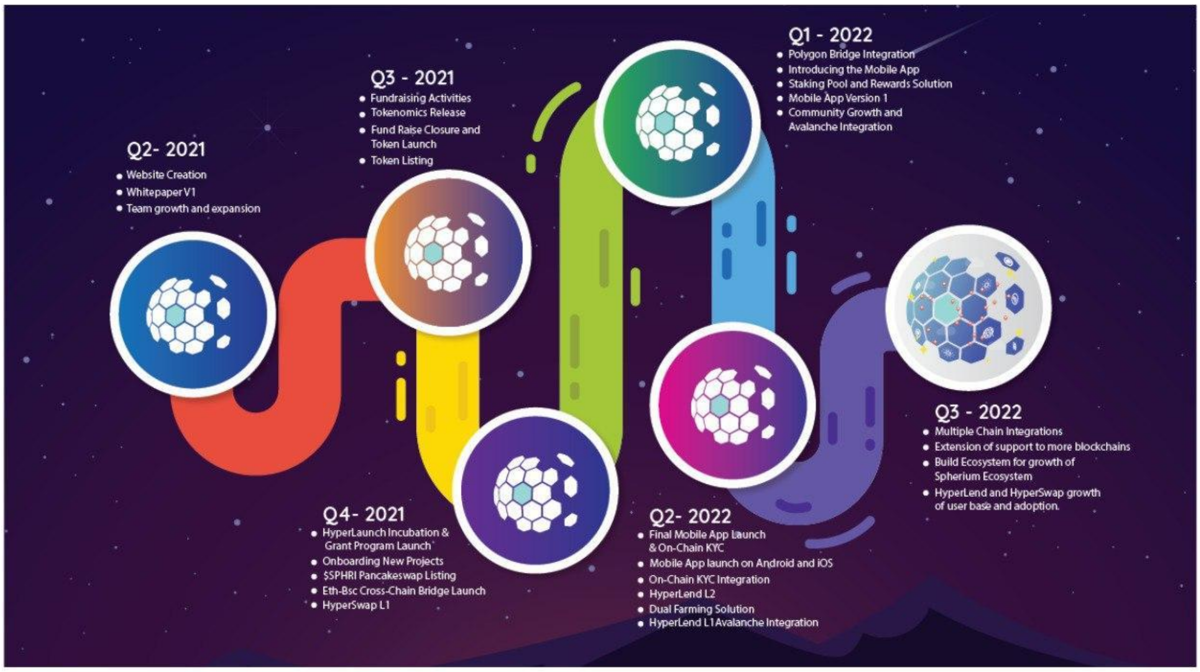
Spherium will release version 1.0 of the tokenomics paper as the project approaches its launch.

Spherium Smart Contracts Security Audit

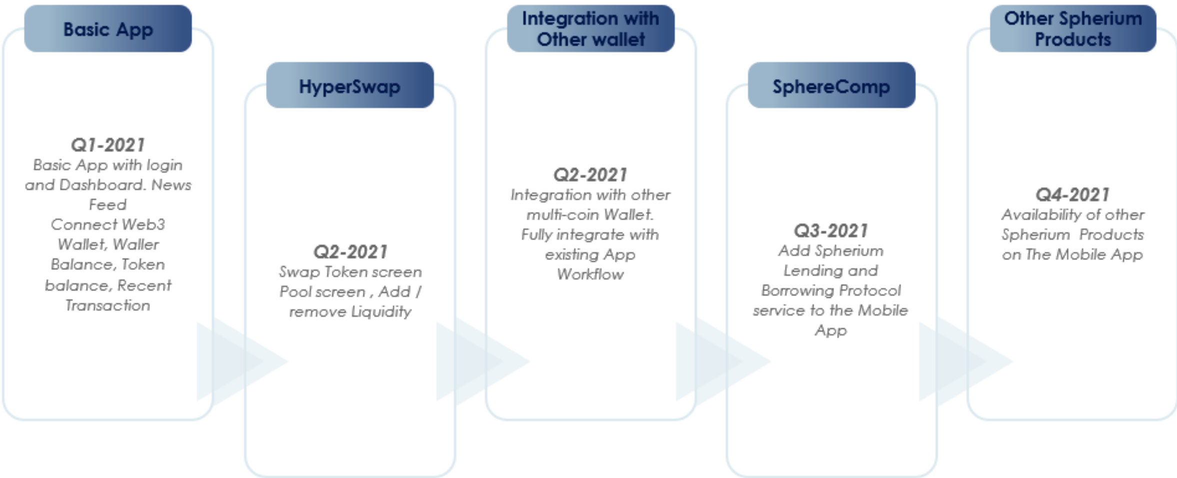
Security is very critical for DeFi and hence *Spherium* Finance will thoroughly test their smart contracts on testnets before launching them on the Mainnet. In addition, *Spherium* smart contracts will be reviewed by renowned firms in the field of smart contract auditing.

Furthermore, Spherium Finance aims to invite well-known smart contract auditors, and other independent teams to audit the smart contracts at different stages of development. The smart contracts will be audited as they are made available by the development team.

Spherium Product Roadmap



Mobile Application Roadmap



Spherium Future Products – Phase II

Spherium will constantly evolve by providing novel and valuable services to its customers. Some of the future services that are part of phase two deployment are outlined below however with fast innovation and changes in DeFi space, Spherium technical team and the community will constantly evaluate the market conditions and viability of new product development.

SphereLock

SphereLock will facilitate a range of time-based and event-based functionalities to enable safe and secure P2P transfers and payments. For example, a small to medium-size business/company can use *SphereLock* to make time-based (weekly/monthly, etc.) salary payments to their employees. Similarly, the company can use the event-based service for giving bonuses to its employees after achieving a milestone. We will be leveraging the innovative Randomness Beacon Contracts from Starkware Veedo Verifiable Delay Functions (VDF) [Ref17] for the implementation of *SphereLock*.

SphereEx

The *SphereEx* will facilitate strangers to perform reliable escrow-based transactions. For example, a seller wants to sell some tokens into a stablecoin over the counter to avoid slippage and find a buyer on Spherium forum (or other platforms) where both (the seller and buyer) agree on the price. The seller will create a *SphereEx* and activate it by sending its tokens to the specified contract. The buyer will send the agreed amount of stablecoins to the same contract, and once both funds arrive the stablecoins will be automatically transferred to the seller's wallet while the tokens will be automatically sent to the buyer's wallet. *SphereEx* will be implemented in the most secure and gas efficient way leveraging the reference implementation models of *StarkEx* [Ref18] and *Loopring* [Ref19].

SpherePortfolio

The *SpherePortfolio* service of *Spherium* platform will automatically rebalance an investor portfolio by availing the arbitrage opportunities. For example, an investor builds a portfolio with X%, Y%, and Z% (X+Y+Z=100%) of the investor's total capital allocated/invested in assets A, B, and C, respectively. Suppose at some point the price of asset A appreciates while that of asset B depreciates. This imbalances the portfolio since the portion of asset A is now greater than X% while that of asset B is less than Z%. *SpherePortfolio* will automatically rebalance the portfolio by trading the extra asset A for the needed asset C.

SphereVault

SphereVault will provide savings account opportunities, where users can deposit their crypt assets for different *Rate of Returns* (RoR) and under different terms and conditions. For example, a flexible saving account will allow users to withdraw their assets any time but will offer relatively low RoR. On the other hand, depositing assets for a fixed period will offer better RoR and users will have a choice to select a period. Naturally, the longer the deposit period the better the RoR on the deposited assets. The users will have the option to further enhance the RoR on their assets by depositing a certain amount of *Spherium* native token along with other crypto assets.

Spherium Synthetic Tokens Factory

Spherium synthetic tokens factory will enable investors to create/mint new tokens (collateralized by crypto assets) for real-world assets, stocks, and fiat currencies, which will track the price of these underlying assets and can be traded on DEX. Note that the smart contracts (for synthetic tokens) will tokenize the price rather than the actual assets, hence, investors creating these synthetic tokens do not have to own the financial assets (e.g., precious metals, stocks, etc.) but crypto assets as collateral.

Cross Chain Interoperability

The RenVM is a custodian that holds digital assets as they move between different blockchains, such as BTC and Ethereum [Ref9]. An asset holder gives BTC to RenVM, where RenVM holds the BTC and mints that BTC as an ERC20 (a.k.a RenBTC) on Ethereum with a 1:1 ratio. This RenBTC can then be used for yield farming on the Ethereum ecosystem. Spherium will make use of the RenBridge to seamlessly integrate non-ERC20 tokens with our existing products.

Spherium Governance

The *Spherium* governance model inspired by Uniswap will be put in place. The full control of the Governance model will be handed over to SPHRI token holders by March 31, 2022, at approximately 12:00 GMT. In the meantime, *the Spherium* core team will make decisions whenever needed for the wider interest of the Spherium ecosystem but will provide a 30-day period between decision and implementation.

Once the 20% total supply of SPHRI is released, Spherium token holders will be able to initiate *Spherium Improvement Proposa*l (SIP) on the *Spherium* community forum and vote in favour of or against the SIP. Some examples for the SIP could be:

- Increase or decrease the *HyperSwap* liquidity pool fee depending on the volatility of the trade.
- Adding new liquidity pools for *HyperSwap*.
- Adding new money markets to *HyperLend*.
- Adjusting the SPHRI allocation weights between different liquidity pools.

Apart from the SIP, the community forum will be used for general discussion on issues related to the Spherium ecosystem, and Request for Comment (RFC). The general principles of *Spherium* governance are:

- 2.14% of the total supply (delegated) to submit a governance proposal
- 5% of SPHRI supply required to vote **'YES'** to reach quorum
- 7-day voting period
- At least 1 SPHRI token holding is required to vote
- 2-day time lock delay on execution of the proposal

More details about the governance will be provided on our website as the ecosystem evolves.

AML and KYC

AML (Anti-Money Laundering) and KYC (Know Your Customer) are critical components for any company that operates in the financial sector. When it comes to DeFi, since the vast majority of DeFi protocols are built in a permissionless fashion and all smart contracts are on-chain, the platforms are by design not inherently dependent on successful KYC proceedings to function. However, we recognize the importance of protection against illegal access/use of financial services and will take all steps required for providing a more transparent and secure space in this respect. *Spherium's* first strategy is to ask for KYC information from all of the potential investors who want to use the *Spherium* platform.

Furthermore, since *Spherium* services will be built on the Ethereum network (and later extended to other networks), the Ethereum block data and transactions history will be utilized by *Spherium* Artificial Intelligent (AI) algorithms to acquire useful insights and information about the nature and purpose of transactions made by *Spherium* users. In this context, *Spherium* plans to deploy bots, which will help our team to track any illegal transactions and blacklist/block those addresses from using *Spherium* services. In addition, the *Spherium* team plans to cooperate with all government regulators to prevent illegal activities within the DeFi space.

Conclusion

The DeFi industry or landscape holds significant potential in terms of its ability to reshape consumer finance. However, it is critical to accept that DeFi is still in its nascent stages only. The current DeFi platforms hold a huge promise, but they are nowhere close to their traditional counterparts in terms of UI/UX design, consolidated solutions or frictionless functionalities. We believe that Spherium will be able to solve most of DeFi's most pressing issues making the use of a standardized DeFi platform as easy, convenient and practical as the most progressive online banking tools of today.

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