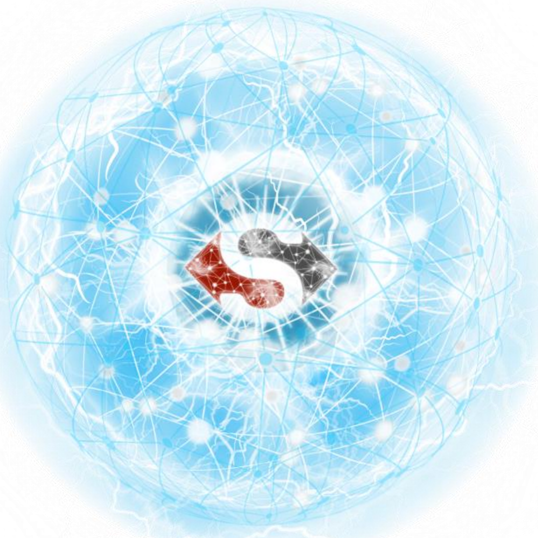

eraswap

NETWORK

White Paper

[Version 0.5.1 - Last updated on 16 Mar 2020]

DISCLAIMER

This Whitepaper is for Era Swap Network. Its purpose is solely to provide prospective community members with information about the Era Swap Ecosystem & Era Swap Network project. This paper is for information purposes only and does not constitute and is not intended to be an offer of securities or any other financial or investment instrument in any jurisdiction.

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Abstract

The early smart contracts of Era Swap Ecosystem like TimeAlly, Newly Released Tokens, Assurance, BetDeEx of Era Swap Ecosystem, are deployed on Ethereum mainnet. These smart contracts are finance-oriented (DeFi), i.e. most of the transactions are about spending or earning of Era Swap tokens which made paying the gas fees in Ether somewhat intuitive to the user (withdrawal charges in bank, paying tax while purchasing burgers) but transactions that are not token oriented like adding a nominee or appointee voting also needs Ether to be charged. As more Era Swap Token Utility platform ideas kept appending to the Era Swap Main Whitepaper, more non-financial transaction situations arise like updating status, sending a message, resolving a dispute and so on. Paying extensively for such actions all day and waiting for the transaction to be included in a block and then waiting for enough block confirmations due to potential chain re-organizations is counter-intuitive to existing free solutions like Facebook, Gmail. This is the main barrier that is stopping Web 3.0 from coming to the mainstream.

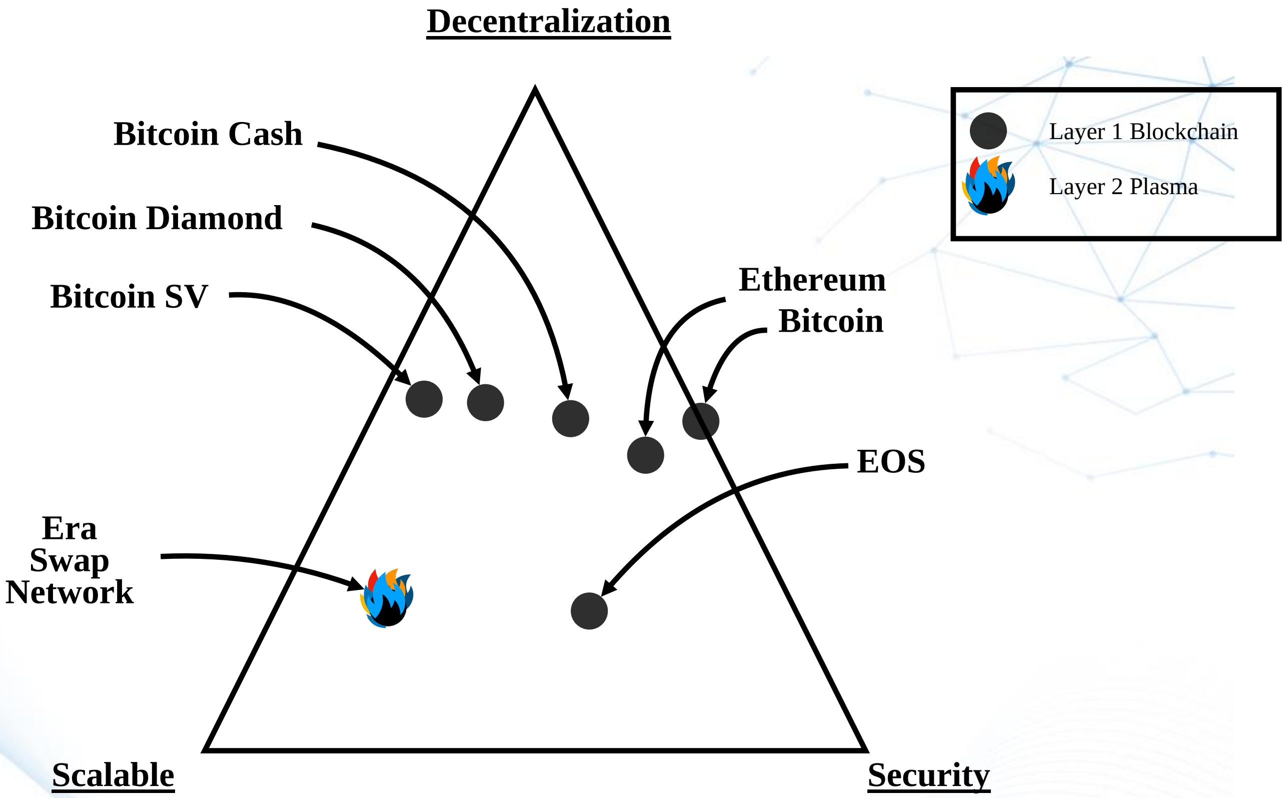
As alternatives to Ethereum, there are few other smart contract development platforms that propose their own separate blockchain that features for higher transaction throughput, but they compromise on decentralization for improving transaction speeds. Moreover, the ecosystem tools are most advancing in Ethereum than any other platform due to the massive developer community.

With Era Swap Network, the team aims to achieve scalability, speed and low-cost transactions for Era Swap Ecosystem (which is currently not feasible on Ethereum mainnet), without compromising much on trustless asset security for Era Swap Community users.

Introduction to Era Swap Network

Era Swap Network (ESN) aims to solve the above-mentioned problems faced by Era Swap Ecosystem users by building a side-blockchain on top of Ethereum blockchain using the Plasma Framework.

Era Swap Network leverages the Decentralization and Security of Ethereum and the Scalability achieved in the side-chain, this solves the distributed blockchain trilemma. In most of the other blockchain, blocks are a collection of transactions and all the transactions in one block are mined by



a miner in one step. Era Swap Network will consist of **Bunches** of **Blocks** of Era Swap Ecosystem **Transactions**.

A miner mines all the blocks in a bunch consequently and will commit the bunch-root to the ESN Plasma Smart Contract on Ethereum mainnet.

Development Overview

Initially, we will start with a simple **Proof-of-Authority (PoA)** based consensus of EVM to start the development and testing of Era Swap Ecosystem Smart Contracts as quickly as possible on the test-net. We will call this as an **alpha-release of ESN test-net** and only internal developers will work with this for developing smart contracts for Era Swap Ecosystem. User's funds in a Plasma implementation with a simple consensus like PoA are still secured as already committed bunch-roots cannot be reversed.

Eventually, we want to arrive on a more control-decentralized consensus algorithm like Proof-of-Stake (PoS) probably, so that even if the chain operator shuts down their services, a single Era Swap Ecosystem user somewhere in the world can keep the ecosystem alive by running software on their system and similarly more people can join to decentralize the control further. In this PoS version, we will modify the Parity Ethereum client in such a way, that at least 50% of transaction fees collected will go to the Luck Pool of NRT Smart Contract on Ethereum mainnet and rest can be kept by miner of the blocks/bunch of blocks if they wish. After achieving such an implementation, we will release this as a **beta version** to the community for testing the software on their computers with Kovan ERC20 Era Swaps (Ethereum test-net).

Era Swap Decentralized Ecosystem

Following platforms are to be integrated:

1. **Era Swap Token Contract (adapted ERC20 on Ethereum)**
   The original asset will lie on Ethereum to avoid loss due to any kind of failure in ESN.

2. **Plasma Manager Contract (on Ethereum)**
   To store ESN bunch headers on Ethereum.

3. **Reverse Plasma Manager Contract (on ESN)**
   Bridge to convert ES to ES native and ES native to ES. User deposits ES on Mainnet Plasma, gives proof on ESN and gets ES native credited to their account in a decentralized way.

4. **NRT Manager Contract (on Ethereum or on ESN)**
   If it is possible to send ES from an ESN contract to luck pool of NRT Manager Contract on Ethereum, then it’s ok otherwise, NRT Manager will need to be deployed on ESN for ability to add ES to luck pool.

5. **Era Swap Wallet (React Native App for managing ESs and ES natives)**
   Secure wallet to store multiple private keys in it, mainly for managing ES and ES native, sending ES or ES native, also for quick and easy BuzCafe payments.

6. **TimeAlly (on Ethereum or on ESN)**
   On whichever chain NRT Manager is deployed, TimeAlly would be deployed on the same chain.

7. **Assurance (on Ethereum or on ESN)**
   On whichever chain NRT Manager is deployed, TimeAlly would be deployed on the same chain.

8. **DaySwappers (on ESN)**
   KYC manager for platform. For easily distributing rewards to tree referees.

9. **TimeSwappers (on ESN)**
   Freelance market place with decentralized dispute management.

10. **SwappersWall (on ESN)**
    Decentralized social networking with power tokens.

11. **BuzCafe (on ESN)**
    Listing of shops and finding shops easily and quick payment.

12. **BetDeEx (on ESN)**
    Decentralized Prediction proposals, prediction and results.

13. **DateSwappers (on ESN)**
    Meeting ensured using cryptography.

14. **ComputeEx (on Ethereum / centralized way)**
    Exchange assets.

15. **Era Swap Academy (on ESN / centralized way)**
    Learn. Loop. Leap. How to implement ES Academy is not clear. One idea is if content is constantly being modified, then subscription expired people will only have the hash of old content while new content hash is only available to people who have done Dayswapper KYC and paid for the course. Dayswapper KYC is required because this way people won’t share their private keys to someone else.

16. **Value of Farmers (tbd)**
    The exchange of farming commodities produced by farmers in VoF can be deposited to warehouses where the depositors will get ERC721 equivalent tokens for their commodities (based on unique tagging).

17. **DeGameStation (on ESN)**
    Decentralized Gaming Station. Games in which players take turns can be written in Smart Contract. Games like Chess, Poker, 3 Patti can be developed. Users can come to DeGameStation and join an open game or start a new game and wait for other players to join.

Alpha-release Development Plan

1. Deploying Parity Node customized according to Era Swap Whitepaper with PoA consensus.
2. Setting up Plasma Smart Contracts.
3. Creating a bridge for ERC20 Swap from Ethereum test-net to ESN alpha test-net.

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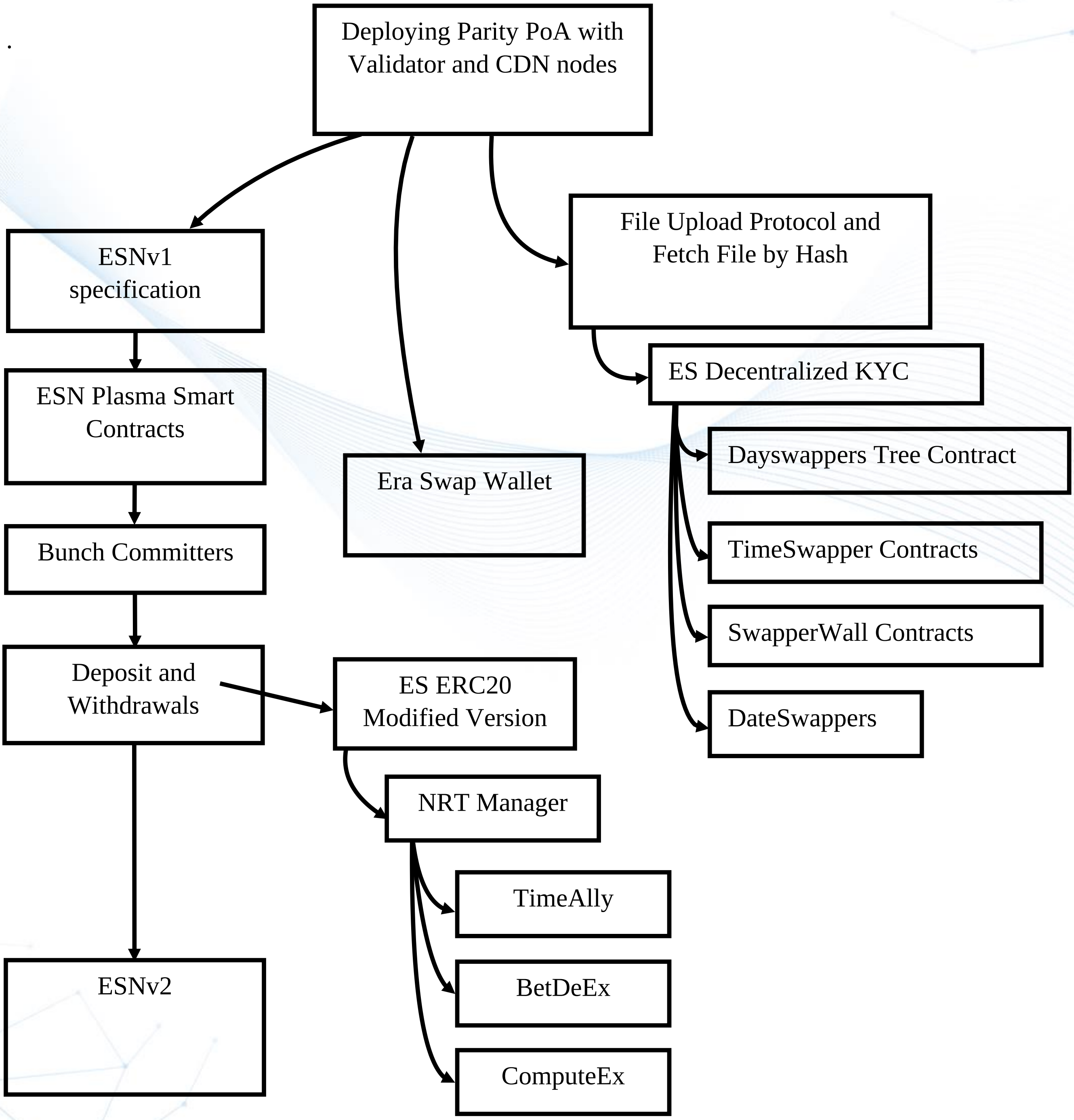

Era Swap Network Version 1 : Specification

The Version 1 release of ESN plans to fulfill the requirements for political decentralization and transparency in dApps of Era Swap Ecosystem using Blockchain Technology. After acquiring sufficient number of users, a version 2 construction of ESN will be feasible to enable administrative decentralization, such that the Era Swap Ecosystem will be run and managed by the Era Swap Community and will no longer require the operator to support for it's functioning.

Era Swap Network (ESN) Version 1 will be a separate EVM-compatible sidechain attached to Ethereum blockchain as it’s parent chain. ESN will achieve security through Plasma Framework along with Proof-of-Authority consensus for faster finality. The idea behind plasma framework is to avoid high transaction fees and high transaction confirmation times on Ethereum mainnet by instead doing all the ecosystem transactions off-chain and only post small information to an Ethereum Smart Contract which would represent hash of plenty of ecosystem transactions. Also, to feature movement of Era Swap Tokens from Ethereum blockchain to ESN using cryptographic proof, reverse plasma of Ethereum on ESN will be implemented.

Also, submitting hash of each ESN blocks to ESN Plasma Smart Contract on Ethereum would force ESN to have a block time equal to or more than Ethereum’s 15 second time as well as it would be very much costly for operator to post lot of hashes to an Ethereum Smart Contract. This is why, merkle root of hashes of bunch of blocks would instead be submitted to ESN Plasma Smart Contact on Ethereum.

Actors involved in the ESN:

1. **Block Producer Nodes**
   Lesser the number of nodes, quicker is the block propagation between block producers which can help quick ecosystem transactions. We find that 7 block producers hosted on different could hosting companies and locations reduces the risk of single point of failure of Era Swap Ecosystem and facilitates 100% uptime of dApps. Block Producer Nodes will also be responsible to post the small information to the Blockchain.

2. **Block Listener Nodes**
   Rest of the nodes will be Block Listeners which will sync new blocks produced by the block producer nodes. Plenty of public block listener nodes would be setup in various regions around the world for shorter ping time to the users of Era Swap Ecosystem. Users would submit their Era Swap Ecosystem transactions to one of these public nodes, which would relay them to rest of the Era Swap Network eventually to the block producer nodes which would finalize a new block including the user transaction.

3. **Bunch Committers**
   This will be an instance in the block producers which will watch for new blocks confirmed on ESN and will calculate bunch merkle roots and will submit it to ESN Plasma Smart Contract. This instance will also post hash of new Ethereum blocks to ESN (after about 10 confirmations) for moving assets between both the blockchain.

4. **Users**
   These will be integrating with dApps which would be connected to some public ESN nodes or

they can install a block listener node themselves. They can sign and send transactions to the node which they are connected to and then that node will relay their transactions to block producer nodes who would finalize a block including their transaction.

Bunch Structure

A Bunch Structure in Smart Contract will consist of the following:

- Start Block Number: It is the number of first ESN block in the bunch.

- Bunch Depth: It is Merkle Tree depth of blocks in the bunch. For e.g. If bunch depth is 3, there would be 8 blocks in the bunch and if bunch depth is 10, there would be 1024 blocks in the bunch. Bunch depth of Bunches on ESN Plasma Contract is designed to be variable. During the initial phases of ESN, it would be high, for e.g. 15, to avoid ether expenditure and would be decreased in due course of time.

- Transactions Mega Root: This value is the merkle root of all the transaction roots in the bunch. This is used by Smart Contract to verify that a transaction was sent on the chain.

- Receipts Mega Root: This value is the merkle root of all the receipt roots in the bunch. This is used to verify that the transaction execution was successful.

- Timestamp: This value is the time when the bunch proposal was submitted to the smart contract. After submission, there is a challenge period before it is finalized.

Converting ES-ERC20 to ES-Na and back

On Ethereum Blockchain, the first class cryptocurrency is ETH and rest other tokens managed by smart contracts are second class. On ESN, there is an advancement to have Era Swaps as the first class cryptocurrency. This cryptocurrency will feature better user experience and to differentiate it from the classic ERC20 Era Swaps, it will be called as Era Swap Natives (ES-Na). According to the Era Swap Whitepaper, maximum 9.1 Million ES will exist which will be slowly released in circulation every month.

Era Swaps will exist as ES-ERC20 as well as in form of ES-Na. One of these can be exchanged for the other at 1:1 ratio.

Following is how user will convert ES-ERC20 to ES-Na:

1. User will give allowance to a Deposit Smart Contract, and following that call deposit method to deposit tokens to the contract.
2. On transaction confirmation, user will paste the transaction hash on a portal which will generate a Proof of Deposit string for the user. This string is generated by fetching all the transactions in the Ethereum Block and generating a Transaction Patricia Merkle Proof to prove that user's transaction was indeed included in the block and the Receipts Patricia Merkle Proof to confirm that the user's transaction was successful.
3. Using the same portal, user will submit the generated proofs to a Smart Contract on ESN, which would release funds to user. Though, user will have to wait for the Etheruem block roots to be posted to ESN after waiting for confirmations which would take about 3 minutes. Once, it's done user's proofs will be accepted and will receive exact amount of ES-Na on ESN.

Following is how user will convert ES-Na to ES-ERC20:

1. ES-Na being first class cryptocurrency, user will simply send ES-Na to a contract.
2. User will paste the transaction hash on a portal which will generate a Proof of Deposit for the user. Again ES-Na being first class cryptocurrency, Transaction Patricia Merkle Proof is enough to prove that user's transaction was indeed included in the block. Another thing which will be generated is the block inclusion proof in the bunch.
3. User will have to wait for the bunch confirmation to the Plasma Smart Contract and once it's done, user can send the proof to the Plasma Smart Contract to receive ES-ERC20.

Hard Exit

Since the blocks are produced and transactions are validated by few block producers, it exposes a possibility for fraud by controlling the block producer nodes. Because ESN is based on the Plasma Model, when failure of sidechain occurs or the chain halts, users can hard exit their funds directly from the Plasma Smart Contract on Ethereum by giving a Proof of Holdings.

Old ES Tokens swapping with New ES Tokens

The old ES Tokens will be valueless as those tokens will not be accepted in ESN because of NRT (New Released Tokens) and TimeAlly contracts on mainnet which is causing high gas to users, hence reducing interactions. Also, there was an event of theft of Era Swap Tokens and after consensus from majority of holders of Era Swap Tokens; it was decided to create a new contract to reverse the theft to secure the value of Era Swap Tokens of the community. Below is the strategy for swapping tokens:

TimeAlly and TSGAP: Majority of Era Swap Community have participated in TimeAlly Smart Contract in which their tokens are locked for certain period of time until which they cannot move them. Such holders will automatically receive TimeAlly staking of specific durations from the operator during initialization of ESN.

Liquid Tokens: Holders of Liquid Era Swap Tokens have to transfer the old tokens to a specified Ethereum wallet address managed by team. Following that, team will audit the token source of the holder (to eliminate exchange of stolen tokens) and send new tokens back to the wallet address.

Post-Genesis Token Return Program

Primary asset holding of Era Swap tokens will exist on Ethereum blockchain as an ERC20 compatible standard due to the highly decentralized nature of the blockchain. Similar to how users deposit tokens to an cryptocurrency exchange for trading and then withdraw the tokens back, users will deposit tokens to ESN Contract to enter Era Swap Ecosystem and they can withdraw it back from ESN Contract for exiting from ecosystem network. The design of the token system will be such that, it will be compatible with the future shift (modification or migration of ESN version 1) to ESN version 2, in which an entirely new blockchain setup might be required.

To manage liquidity, following genesis structure will be followed:

Holder	**ES-ERC20**	**ES-Na**
Team Wallet	1.17 billion (Circulating Supply)	0
Locked in Smart Contract	7.93 billion (pending NRT releases)	9.1 billion

Though it looks like there are 9.1 * 2 = 18.2 Billion ES, but the cryptographic design secures that at any point of time at least a total of 9.1 billion ES (ES-ERC20 + ES-Na) will be locked. To unlock ES-Na on ESN, equal amount of ES-ERC20 have to be locked on Ethereum and vice-versa.

9.1 billion ES-ERC20 will be issued by ERC20 smart contract on Ethereum Blockchain, out of which the entire circulating supply (including liquid and TimeAlly holdings) of old ES will be received to a team wallet.

TimeAlly holdings of all users will be converted to ES-Na and distributed on ESN TimeAlly Smart Contract by team to the TimeAlly holders on their same wallet address.

Liquid user holdings will be sent back to the users to the wallet address from which they send back old ES tokens (because some old ES are deposited on exchange wallet address).

ES-Na will be issued in the genesis block to a ESN Manager Smart Contract address. It will manage all the deposits and withdrawals as well as NRT releases.

Attack Vectors

Following are identified risks to be taken care of during development of ESN:

Network Spamming: Attacker can purchase ES from exchange and make lot of transactions between two accounts. This is solved by involving gas fees. A setting of 200 nano ES minimum gas price will be set, which can be changed as per convenience.

DDoS: Attacker can query public nodes for computationally heavy output data. This will overload the public node with requests and genuine requests might get delayed. Block producers RPC is private, so they will continue to produce blocks. To manage user's denial of service, provider in dApps need to be designed in such a way such that many public nodes will be queried a simple information (let's say latest block number) and the one which responds quickly to user will be selected.

AWS is down: To minimize this issue due to cloud provider down, there will be enough nodes on multiple cloud providers to ensure at least one block producer is alive.

User deposit double spending: User deposits ES on Ethereum, gets ES-Na on ESN. Then issue happens that there are re-orgs on ETH mainnet and user's transaction is reversed. Since ETH is not a fixed chain and as per PoW 51% attack can change the blocks. As Ethereum is now enough mature and by statistics forked blocks are at most of height 2. So it is safe to consider 15 confirmations.

Exit Game while smooth functioning: User starts a hard exit directly from Plasma Smart Contract on Ethereum, then spends his funds from the plasma chain too. To counter this, the exit game will be disabled, only when ESN halts, i.e. fails to submit block header within time the exit game starts. This is because it is difficult to mark user's funds as spent on ESN.

Vulnerability in Ecosystem Smart Contracts: Using traditional methods to deploy smart contract results in situation where if a bug is found later, it is not possible to change the code. Using a proxy construction for every ecosystem smart contract solves this problem, and changing a proxy can be given to a small committee in which 66% votes are required, this is to prevent malicious change of code due to compromising of a single account or similar scenario.

ChainID replay attacks: Using old and traditional ways to interact with dApps can cause loss to users, hence every dApp will be audited for the same.

Era Swap Network Version 2 PlanB : Specification

In the PlanA, entire TimeAlly stakers were not able to participate in decision making process and only the top stakers were, which were some signs of centralized. This plan focuses more on large scale participation.

Right to administration, if given to every participant of the network, it will result in inefficiencies due to current infrastructural limitations like ping time which affects decision propagation over the network. Very frequent decisions cannot be made with everyone's confirmation because it is subject to availability of everyone which might not always be guaranteed.

To secure the network without sacrificing efficiency, ESN plans to implement Delegated Proof of Stake consensus (democracy system). Instead of entire nodes population, trusted node representatives are elected by the entire nodes population for a specific tenure. Just like in democracy, there is an election tenure like, for e.g. 4 years, here, the election tenure is 7 days and when it's finished a new set of trusted representatives will be elected.

This implementation also aims to solve problems in current democracy attempted by malicious candidates like voters are bribed to vote, fake promises, vote banks.

Digital Instruments involved

1. Ethereum-compatible crypto wallet
   An ethereum-compatible wallet generates a 160-bit wallet address which looks like `0xC8e1F3B9a0CdFceF9fFd2343B943989A22517b26`.

2. KYC hash
   A KYC id is generated for all approved physical identities (KYCs) by Era Swap Court. Just like one person can have multiple Ethereum-compatible wallets, but only one KYC hash. Users can assign a new wallet address with their existing KYC hash. Smart Contracts related to identities will store user information by KYC hashes instead of wallet addresses.

3. ESN Nodes
   Any one can run an Parity Ethereum node above version 2.6 with ESN chain spec to sync with ESN blockchain. If the account associated with this node wins the election to become validator for 1 week, then this node can also produce blocks to get block rewards. It is not required to run an ESN node.

Actors involved

1. TimeAlly Stakers
   These are wallet addresses with some amount of ES staked in a time bound way. These addresses can either vote or become a candidate. TimeAlly Stakers are not required to have KYC done for casting votes to prevent off-chain contact channel to such voters. Votes are casted based on total active stakings not expiring upto 2 months in the wallet address. Voting incentivises are given to ensure maximum participation in voting.

2. Candidates
   These are wallet addresses with non-zero stakings with KYC approved by Era Swap Court. Such wallet address can apply to become a Validator (similar to Member of Parliament). To become a candidate, 100 ES nominal fee has to be paid to the smart contract (to prevent just trying for fun cases) and this amount can be revised by Era Swap Court. This fee is sent to luck pool. TimeAlly Stakers will review such wallet addresses and choose to vote from their allowance (proportional to their stakes). There can be maximum 101 candidates. Whenever an election ends (every 7 days), validators are chosen among the candidate list and the candidate list is emptied and open for fresh registrations.

3. Validators
   These are the wallet addresses chosen by Era Swap community to maintain ESN. Validators run ESN node software on their computers or on cloud providers like AWS, Azure. Each validator take turns to add a block to the ESN blockchain. The order is according to the order from the election output. In case, the validator is offline, they miss their chance to propose a block and the chance goes to next one. If the validator plays malicious by signing two blocks for same height and relay different ones to different nodes to confuse the network, with consensus of entire network they are suspended as a validator. Everyone would be seeing this on the blockchain and for the next election the malicious validator won't likely receive enough votes. Validators also have to actively sign on bunch proposals.
   In initial phase of ESN, there will be 3 validators and it will increase by 2 every NRT month upto 11. This is to reduce costs for the operator in initial phase for supporting ESN. Max validators are 11 to balance the delay in block propagation to ensure 4 sec block time feasible. Though in future, this can be changed with a hard fork if required.

4. Bunch Submitters
   Bunches of ESN blocks merklize to a transaction bunch root and receipts bunch root and bunch depth. These two values need to be communicated to the Plasma Smart Contract on Ethereum mainnet. To remove responsibility of a centralized authority to submit these values to the Ethereum mainnet, this implementation allows any one to do a bunch submission with 66% signatures. This causes gas fee in ETH to submitter, so no one would want to do it and it would be only done by those who wants withdrawal of ES. This is solved by giving Bunch Submission Reward to anyone who submits a 66% signed bunch proposal to the Plasma Smart Contract.

5. Era Swap Users
   To use ĐApps of Era Swap Ecosystem, it is not required to run an ESN node (like Actor #1). Once can connect their ĐApp to any of the public ESN nodes. Public ESN nodes acts like a server which find requested information in their blockchain storage and send to ĐApps on

smartphones or laptops to display on their screen. Users can anytime switch between multiple peers public ESN nodes/servers from their ĐApp settings. This is Web 3.0. Different servers can have different response time depending on the capacity of the node as well as internet connection. Some fast public ESN nodes will be arranged by Era Swap initial supporters for easy Era Swap adoption for new users.

6. Era Swap Users (Not-yet KYC approved)
   Since, Not-yet KYC approved users can misuse ESN computing resources, newly joined Era Swap Users need to complete their KYC to unlock multiple features in Ecosystem. Also such users cannot deploy a Smart Contract in ESN for security purpose. We are also exploring a possibility of restricting any Not-yet KYC address to transact on ESN unless their KYC is approved and their KYC can be done by introducer whose KYC already needs to be done. This configuration can be changed with consensus from 66% validators.

Node Validator Rewards

The Node Validator NRT will be divided into following parts by the Smart Contract:

1. Voter Reward 20% NV NRT (by Validator Contract on ESN)
   This reward is given to incentivize TimeAlly Stakers to come online each week and cast their vote and get reward. This reward increases number of votes, hence making the election more democratic.

2. Block Finalizes Reward 50% NV NRT(by Block Reward Contract on ESN)
   When a block is finalized, the author of the block gets Block Finalizes Reward. After NRT is released, 70% of the funds from Node Validator NRT (from whitepaper) will be distributed proportionally to the holders of Block Finaliser Reward.

3. Bunch Submitter Reward 15% NV NRT (by Plasma Contract on Ethereum mainnet)
   When a bunch which is signed by at least 66% of signers, it can be submitted to Plasma Contract on Ethereum mainnet by anyone and this costs gas fee in ETH. As an incentive, Bunch Submitter Reward is awarded to the submitter. After NRT is released for the month, the holders of Bunch Submitter Reward can redeem it for 150 ES for each reward. Remaining ES are burned by sending to burn address (0xbbb…bbb). In case the NRT released is less than the total bounty to be given (NRT decreases every year) then ES will be proportionally distributed between Bunch Submitter Reward holders. The reward amount can be revised in future with 66% consensus from the validators.

4. Bunch Signer Reward 15% NV NRT (by Plasma Contract on Ethereum mainnet)
   For a bunch proposal to be accepted by plasma smart contract, 66% of validator signatures need to be present on the proposal. To decrease the waiting time between the proposal generation and achievement of 66% of signatures on the proposal, the availability of Bunch Signers to sign on the proposal is incentivized by awarding a Bunch Signer Reward to the signers of submitted bunch proposal by Plasma Smart Contract. After NRT is released for the month, the holders of Bunch Signer Reward can redeem it for 150 ES for each reward. Remaining ES are burned by sending to burn address (0xbbb…bbb).In case the NRT released is less than the total bounty to

be given (NRT decreases every year) then ES will be proportionally distributed between Bunch Submitter Reward holders. The reward amount can be revised in future with 66% consensus from the validators.

5. Validator Linking Reward 5% NV NRT (by Plasma Contract on Ethereum Mainnet)
   Validators are elected on ESN but Plasma Smart Contract on Ethereum chain does not about this. It needs to be updated with latest validators. This will be done by giving receipt proof for the Initiate Change event emitted on ESN.

Attack Vectors

Following are the risk vectors identified for ESNv2 and counter-measures:

Network Spamming: Attacker can spam the network with lot of transactions. To avoid this, Not-yet KYC users are not allowed to deploy a custom smart contract (to magnify the attack). *But still team is considering to not allow such users to make any transaction and a user can enter with an introducer only*.

DDoS: Attacker can query public nodes for computationally heavy output data. This will overload the public nodes with requests and genuine requests might get delayed. So, node validators would be instructed to never bring their nodes public for avoiding such attacks. In public nodes, tools like redis can be used to prevent repeated querying of data. Also to manage user's denial of service, provider in ĐApps need to be designed in such a way that many public nodes will be queried simple information (let's say latest block number) and the one which responds quickly to user will be selected.

User deposit double spending: Since Ethereum blockchain is not a finalized blockchain, i.e. data can change due to re-orgs. User deposits ES on Ethereum, gets ES-Na on ESN. Then issue happens that there are reorgs on ETH mainnet and user's transaction is reversed. Since ETH is not a fixed chain and as per PoW 51% attack can change the blocks. As Ethereum is now enough mature and by statistics forked blocks are at most of height 2. So it is safe to consider 15 confirmations.

ESN Chain Halts: Only possibility of this happening is when all validators shut down on same day. Even one validator being online is enough for blocks to keep producing and next week new validators can be elected. This can keep ESN alive. *But still a scene like in Kingsmen: The Golden Circle is possible where after data leak, missiles were fired on core offices and all team died.*
A worse situation can arise when all the chosen validators don't come online. Since, only validators are allowed for proposing a block others will not be able to do this. And to change the validators, existing validators have to sign off in the last block with the new validator set.
Since ESN is secured with Plasma Framework, if Plasma Smart Contract on Ethereum mainnet is not updated with latest bunches for 4 weeks, it will consider that ESN Chain is halted and will open a gateway for withdrawals of funds. Users would have to give proof of their holdings to the Plasma Smart Contract followed by Exit Games. TimeAlly Stakings on ESN would be given in the form of locked format on Ethereum mainnet.
In our design, we are including a revival scheme to save ESN from being destroyed. ESN chain can be hard forked with a new validator set. But validator set needs to be also updated in the Plasma Smart Contract on Ethereum mainnet. The Plasma Smart Contract after 2 weeks will open a gateway for updating the validators to those addresses who can give a proof of holding sufficient

multiple TimeAlly Stakings with 2 months or more to expire. Such an address can update the validator set in Plasma Smart Contract and the chain can resume without triggering Exit Games.

Vulnerability in Ecosystem Smart Contracts: Using traditional methods to deploy smart contract results in situation where if a bug is found later, it is not possible to change the code. Using a proxy construction for every ecosystem smart contract solves this problem, and changing a proxy can be given to a small committee in which 66% votes are required, this is to prevent malicious change of code due to compromising of a single account or similar scenario.

ChainID replay attacks: Using old ways of signing transactions to interact with ÐApps can cause loss to users, hence every ÐApp will be audited for the same to have ESN chain id in the transactions.

ESNv2 Roadmap Plan

1. **Setup Node Validators Smart Contract, Block Reward Smart Contract, Transaction Permissioning Smart Contract, TimeAlly Smart Contract**
   High Priority:
   1. Variable Node Validators Testing [Acheived]
   2. TimeAlly Smart Contract [13-18 March]
   3. Node Validator Smart Contract [13-18 March]
   4. Election Smart Contract [13-18 March]
   5. Block Reward Smart Contract [19 March]
   6. Transaction Permissioning Smart Contract [19 March]

2. **Setup ESN Plasma Smart Contracts**
   High Priority:
   1. Writing of Plasma Contracts for Bunch Verification [Achieved]
   2. Verification of Transaction in Smart Contract using Merkle Tree [Acheived]
   3. Reverse Plasma Smart Contract [Achieved]
   4. Validator Update Addresses data transfer using merkle tree from ESN to Ethereum [20 March]
   5. Transfer of Bunch Signer Awards, Submission, Validator Linking Awards to ESN [21 March]

3. **NRT Manager Smart Contract**
   Release some tokens locked inside itself. [23 March]

4. **Merkle Swap Portal between both chains**
   Uses merkle tree for transferring token from one chain to other
   High Priority:
   1. UI Design Draft [25 March]
   2. UI Development [25 March]
   3. UI Integration [25 March]

5. **Era Swap Network Block Explorer**
   - Architecture Design [Parallel work]
   - Backend [Parallel Work]
   - Front End [Parallel Work]

6. **ESN Monitored Framework**
   A system to monitor things happening in ESN, to be able to detect any attack happening on ESN.

7. **KYC System**
   This will initially rely on pure IPFS. Later, when ES IPFS is developed it will be changed with that. v1.0 will be a basic KYC system supported by Admin [27 March]

8. **DaySwappers Referral Program**
   To distribute amount in Tree. [3 April]

9. **TimeSwappers**

10. **BuzCafe**

11. **SwappersWall**

12. **Era Swap Court**

13. **TSGAP DApp**
    Ether version of TSGAP, the Assured Systematic Investment Plan.

14. **Decentralized Chat Application with Group Chatting Feature**
Email like service on ESN. UI will build message in a format and encrypt it with receivers public keys. Receiver UIs will query blockchain for their inbox and fetch their message then decrypt it on UI level. A contract for single chats and contract factory to deploy group chattings. Can also include hash of the attachment (can attach multiple) in a proper format which can be understood by UI.

15. **BetDeEx Open (v2)**
Earlier BetDeEx didnot receive much users because it was dependent on admin for functioning. The v2 to be deployed on ESN aims to increase participation in BetDeEx. Anyone can propose a new bet, and community can start betting on it. UI will be very intelligent which would show popular bets above to user and a new bets section too. Attention should be given because user can inject any data which would be fetched by UI and displayed, we can also have love and hate flags (with power tokens) for UIs to show or avoid showing inappropriate bets.
Bet Ending Right Answer by voting: some incentive (10% of prize pool) will be distributed to voters for voting the right answer. People with TimeAlly Active Stakings with at least 2 months to expire have right to vote for right answer with weightage according to their stakings amount. When bet added by someone ends, it will be open for voting period (e.g. 10 days), in this period TimeAlly Stakers will vote for correct answer or reverse bet in case no correct answer (give back bet amount to bettors). After voting round, a final answer will be found based on weighted votes at the end of voting period. After this winners will withdraw their prize from remaining prize pool out of which 10% will divided equally and distributed to every voter who voted the correct answer of Bet. We can also add a provision for penalising staking of wrong answer givers (their penalty time will increase, i.e. they will be able to withdraw their staking 10 days later because of giving wrong answer). This is good way to involve TimeAlly stakers in BetDeEx and earn ES.

16. **ZES Token on ESN (Zero Knowledge Era Swaps) based on (ZK-Proofs)**
Blockchain has done a great job to remove trust and add transparency to distributed applications. This has caused that user data like wallet balances to be open for public to see (for verifying whether next transaction is allowed). But this also reveals things like user's salary and in this competitive world, it's natural for user to wish to not reveal such details. Using Zero Knowledge proofs, it is possible for user to prove he/she has enough balance to spend. And this concept will be used to develop a privacy token ZES on top of ESN. ES-Na can be swapped with ZES, and these ZES can be used for certain applications in which user wants to keep their interactions private.

17. **BetDeEx Secret**
BetDeEx based on ZES Token. Bettors and their betting amounts would not be revealed to the public using zk proofs. In real life when we place a bet, we don't know how much others have bet and we bet based on our interest. This will hide number of bettings and ES amount on bets which will make user think only about the bet outcome and user will consider amount actually bet on BetDeEx (which would make user take different decision that otherwise).

18. **IPFS / File System**
    IPFS protocol can be used. If it is not suitable to be integrated with ESN ĐApps, we will temporarily use a centralised server with CDN facility (with appropriate charges in ES). We will wait for other technology people in the world to develop a good distributed/decentralised solution or we have to develop our own.
    Users will be able to store their data by uploading to the protocol, which would generate a hash of the data, and user can use this hash to reference their public profile pictures on Swappers Wall.
    In some cases, user will want the file available certain people, in this case user will encrypt the file with a random key (password) and put on IPFS. Following that, user will also use a special smart contract to send the decryption key (password) to targeted users by encrypting it with their public key.
    Public Images / Files would be quick to load obviously, while targeted files would take a while for the user's UI to authenticate, decrypt and display the image to the user using core cryptography in a decentralized way.

19. ES KYC.
    This is like the phone directory of ESN, and doing this will make many doors open to users. User will have to

20. **DaySwapper Automated Incentive.**

21. **Buzcafe Payments.**

22. **TimeSwapper.**

23. **SwappersWall.**

24. **DateSwappers.**

25. **Era Swap Academy**

26. **ComputeEx**

27. **Era Swap Connect**
    This will be a phone app. User will be able to use multiple ethereum compatible wallets to manage ES-ERC20 on Etheruem blockchain and ES-Na on ESN.
    Users can use this app to acheive utilise popular frequent functionalities on the go (lite version of every ecosystem ĐApp) like view price, asset swaps, Stakings, benefit withdrawls, KYC with great UX (like in Binance app), Dayswapper Network management, quick BuzCafe payment, End-to-end Encrypted Messaging (to pick chat and quick reply someone from dateswappers or timeswappers) and few more.
    Main use of this app would be for using the full version of ĐApp with user's wallet safelt on any trusted or untrusted computer around exposing private key outside phone.
    We have to wait for phone apps to integrate blockchain wallet on OS level to create heavy and full featured apps untill that ĐApps can be best experienced on computer only.

28. **VoF Commodity Exchange**

Conclusion

Era Swap Network is an EVM-compatible sidechain attached to the Ethereum blockchain through Plasma Framework. This allows off-chain processing of Era Swap Ecosystem transactions and posting only the hash of the bunch to Ethereum. This greatly reduces the high network fee and confirmation time issues faced by the current Era Swap Ecosystem DApps deployed on Ethereum. Also, having a separate EVM-compatible blockchain tailored to Era Swap Ecosystem improves the user experience to a higher extent. Since by design, Plasma Framework makes the Era Swap Network as secure as the Ethereum Network, user's funds on the network would be secure as well.

We believe Era Swap Network will help scale dApps of Era Swap Ecosystem to onboard the increasing numbers of users.

Era Swap Ecosystem

Era Swap Ecosystem consist of multiple interlinked platforms which is powered by Era swap (ES) token, a decentralized utility token to be used on below utility platforms. Users can access the Platforms through Era Swap Life which is the Single Sign on (SSO) gateway to the one world of Era Swap Ecosystem. **Era Swap Life**: https://eraswap.life/

Era Swap 1DAAP is mobile application currently live which provides Users to access multiple platforms within Era Swap Ecosystem & will remain logged in once connect with decentralized Wallet. https://play.google.com/store/apps/details?id=com.eraswaponeapp&hl=en

• **TimeAlly DApp** -> Decentralized Token Vesting: https://www.timeally.io/ <Beta Version>

• **BetDeEx** -> Decentralized prediction platform: https://www.betdeex.com/ <Beta Version>

• **Swappers Wall** -> Social Time Ledgerise: https://timeswappers.com/swapperswall <Alpha Version>

• **TimeSwappers** -> Global P2P marketplace: https://timeswappers.com/ <Alpha Version>

• **BuzCafe** -> Connects local P2P outlets: https://buzcafe.com/ <Alpha Version>

• **DaySwappers** -> Unique Affiliate Program: https://dayswappers.com/ <Alpha Version>

• **Era Swap Academy** -> E-mart for skill development: https://eraswap.academy/ <Alpha Version>

• **Value of Farmers (VOF)** -> Farming ecosystem: https://valueoffarmers.org/ coming soon

• **ComputeEx** -> P2P lending and borrowing: https://computeex.net/ coming soon

• **DateSwappers** -> Next gen dating: coming soon

Smart Contract address

- **Era Swap Token (ES)**

  https://etherscan.io/address/0xef1344bdf80bef3ff4428d8becec3eea4a2cf574#code

- **Newly Released Token (NRT)**

  https://etherscan.io/address/0x20ee679d73559e4c4b5e3b3042b61be723828d6c#code

- **TimeAlly DApp**

  https://etherscan.io/address/0x5630ee5f247bd6b61991fbb2f117bbeb45990876#code

- **BetDeEx DApp**

  https://etherscan.io/address/0x42225682113E6Ed3616B36B4A72BbaE376041D7c#code

- **TSGAP DApp**

  https://etherscan.io/address/0xbad9af4db5401b7d5e8177a18c1d69c35fc03fd3#code

White Paper

Era Swap Whitepaper: https://eraswaptoken.io/pdf/eraswap_whitepaper.pdf

Era Swap Light Paper: https://eraswaptoken.io/pdf/eraswap_lightpaper.pdf

Howey Test

Howey Test: https://eraswaptoken.io/era-swap-howey-test-letter-august7-2018.php

Era Swap SOCIAL LINKS

Telegram:	**https://t.me/eraswap**
Twitter:	**https://twitter.com/EraSwapTech**
Facebook:	**https://www.facebook.com/eraswap/**
Instagram:	**https://www.instagram.com/eraswap/**
BitcoinTalk:	**https://bitcointalk.org/index.php?topic=5025979.msg45502457**
Youtube:	**https://www.youtube.com/channel/UCGCP4f5DF1W6sbCjS6y3T1g**
LinkedIn:	**https://www.linkedin.com/company/eraswap/**
Reddit:	**https://www.reddit.com/user/EraSwap**
Medium:	**https://medium.com/@eraswap**
Tumblr:	**https://eraswap.tumblr.com/**
Mix:	**https://mix.com/eraswap**
Pinterest:	**https://www.pinterest.com/eraswapt/**
GitHub:	**https://github.com/KMPARDS/EraSwapSmartContracts**