Tech Design - Claims Process (Publication)

Background

To migrate from Lisk Mainchain (Lisk Chain) to LSK L2 Network (L2 Chain). A token claim process is needed to transfer users' valuable token to the new network.

Requirement

Token Claim could:

- Let user claim LSK token at L2 Chain
- Validate proof-of-existence by accepting proof from user
- Identify holder at Lisk Chain at L2 Chain by verifying ED25519 signature
- Prevent imposter front-running others' claim
- Recover unclaimed LSK after 2 Years to DAO address

Component

Lisk-db

Stores all user balance at Lisk Chain. To be used here to generate snapshot for later stage

Lisk-token-claim

A monorepo that stores 2 components, lisk-tree-builder and lisk-claim-backend:

- Lisk-tree-builder
  A script to generate Merkle Tree during the claim preparation process. It will read db directly to get address balances and multisig information. The result will be passed to Lisk-claim-backend.
  located at lisk-token-claim/lisk-tree-builder
- Lisk-claim-backend
  A Server for users to check eligibility, and retrieve required information for the claim. Such as proof. The backend also stores signatures of multisig account, such that users could gather signatures from the backend, without sending JSON files between signers.
  located at: lisk-token-claim/lisk-claim-backend

Lisk L2 Claim Contract

The main Claim Contract that users interact with.

Lisk-token

Newly deployed LSK Token contract at L2, the token to be claimed in this process.

lisk-portal

The platform user interacts with, including the Server, Walletconnect and Metamask extensions.

Specification

Lisk-tree-builder

It is the main service to build Merkle Tree with Merkle Root.

Merkle Tree can be generated by the following command

```
$ ./lisk-tree-builder generate-merkle-tree --dbPath=/User/.lisk/lisk-core/data/
```

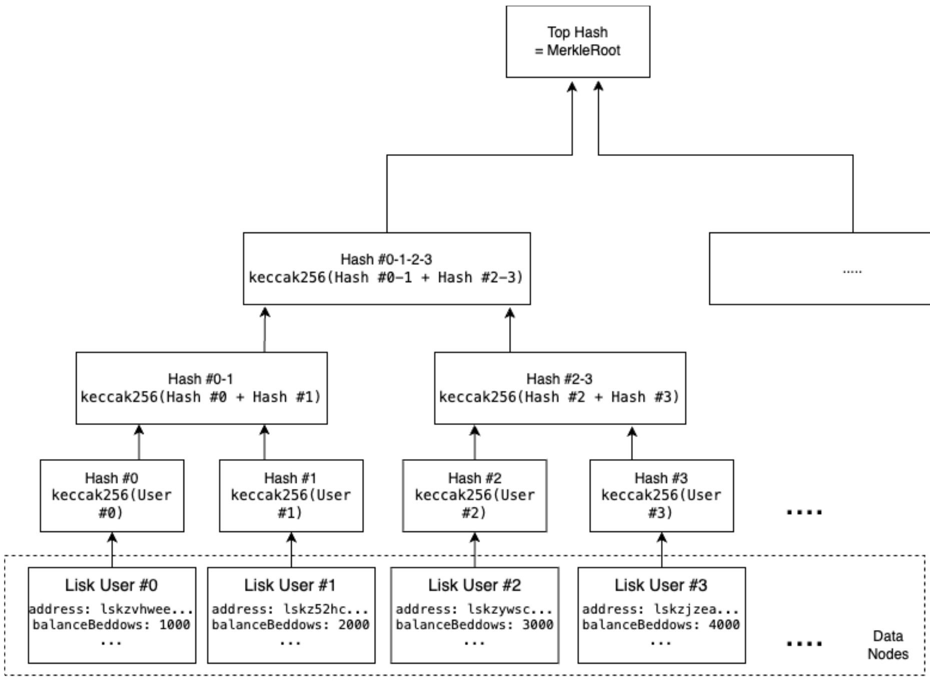
The above path should contain blockchain data, namely `state.db`

According to Specification document, each Merkle Leaf consist of the following detail of each user.

```
LSK_ADDRESS_IN_HEX: bytes20
BALANCE_IN_BEDDOWS: uint64
NUMBER_OF_SIGNATURES: uint32
MANDATORY_KEYS: bytes32[]
OPTIONAL_KEYS: bytes32[]
```

After sorting user by address, all users will be placed at the bottom of the tree node (leaf). They would then be hashed and paired up, concatenate and become another hash.

After several operations, there will be 1 top hash left, this hash would be the **MerkleRoot**. For each leaf, the hashes along its way up to the root, are **MerkleProof**.



Lisk-tree-builder uses Openzeppelin's MerkleTree library to achieve tree generation mentioned above. After generation of the tree. A JSON file will be output to store the tree for further operation.

After running tree-builder, 3 files will be generated.

	merkle-root.json (For Claim Contract deployment)	**merkle-tree-result.json** (For testing purpose)	**merkle-tree-result-detailed.json** (For publication to website)
merkleRoot	✓	✓	✓
leaves			

• lskAddress	❌	❌	✓
• b32Address		✓	✓ `(as address)`
• balanceBeddows		✓	✓
• numberOfSignatures		✓	✓
• mandatoryKeys		✓	✓
• optionalKeys		✓	✓
• hash		❌	✓
• proof		✓	✓

Lisk-claim-backend:Endpoint

After the MerkleTree data is created by Lisk-tree-builder, the result will be stored as JSON. Lisk-claim-backend would then read the JSON during startup.

Lisk-claim-backend will be hosted at Digitalocean, since the request is requested statelessly, load-balancing mechanism could be used, when high-traffic immense, extra server could be added so that no downtime is needed during scaling.

Backend will be using JSON RPC 2.0 Standard. Currently the backend has 2 method. Sharing the common endpoint:

⚠ In JSON RPC 2.0, error triggered from method itself, would still respond with 200. i.e. All responses below are 200 Response.

```
<<server>>/rpc
```

POST checkEligibility

It accept POST request with param `lskAddress`. If the address has eligible LSK to claim, it will return amount of token (`account`), proof and, should this `address` owns any multisig account, it will also be displayed here (`multisigAccounts`).

For multisig addresses, there is a `ready` flag to determine if the claim is ready.

`signatures` stores signatures that are related to accounts in `multisigAccounts`, and `account` if that is also a multisig address

Request

```
{
    "jsonrpc": "2.0",
    "method": "checkEligibility",
    "params": {
        "lskAddress": "lskfcu7z7sch46o67sq24v9h9df2h5o2juvjp3fjj"
    },
    "id": 1
}
```

Response

OK (Address is regular account, has eligible LSK to claim, and is not a member of any multisig account)

```
{
    "jsonrpc": "2.0",
    "id": 1,
    "result": {
        "account": {
            "lskAddress": "lskfcu7z7sch46o67sq24v9h9df2h5o2juvjp3fjj",
            "address": "0xf0e0e03b63ea54c53b75c244deb75ec756cc7202",
            "balanceBeddows": "865518296094",
            "numberOfSignatures": 0,
            "mandatoryKeys": [],
            "optionalKeys": [],
            "hash": "0xcf56d515e14469654f651b1433d7ad8ad6590dbe596c6a206c42e5bb8ca4adbc",
            "proof": [
                "0xd033adcd94586212816701172d897c4c7cbd9be9bbaa503d92065e4b3c5b2530",
                "0x6d96f4064bfc717721e8e890f38d2b66a05ae3a82e8f0bf671ef6dda4b2b50fd",
                "0x61cd10db4642b211ee32a574c1e48928eb63411d3827bbbda578d80b79782454",
                "0xa7afb573620be2a708796b5d2bdcf1c7f582fb4af6e94189b8b494ff0fc97f6a",
                "0x50cddb7c845bf4bac6b2dc0567ad24e3bcb211807653ded0494aa0db89129371",
                "0x743659f8f5bdbf49a0b5f65b6877a394cae4bd047b973ed03d9a85ab2af3421f"
            ]
        },
        "multisigAccounts": [],
        "signatures": []
    }
}
```

OK (Address is a multisig account, has eligible LSK to claim, and is not a member of any multisig account, including itself)

```
{
  "account": {
    "lskAddress": "lskf9t4eho3cayhhp7k5rruu4g7gr8yzo9b6yg4s4",
    "address": "0xf3669b75881e63de91d45ca50827eefc9f1031a6",
    "balanceBeddows": "551573764672",
    "numberOfSignatures": 2,
    "mandatoryKeys": [
      "0x83eac294606806e0f4125203e2d0dac5ef1fc8730d5ec12e77e94f823f2262fa"
    ],
    "optionalKeys": [
      "0xc75fd8d6cdb26f53f1fc9d16b5361099ae73907dfbfba112c6dcc94b5afbb600",
      "0x0824f95c67a1bf7726a928db60d9966ad644d3a50f135d8c2bc7862cf08ea5b1"
    ],
    "hash": "0x99ceb57a2b44f7788e14f147f6bce45b4b59ac778467e4234a090289e4e1be95",
    "proof": [
      "0x992fae426541ebc572b3ece341c0c91ec9f2cb5e84da42e984a4b4cff6a79582",
      "0xb62e06184adf8cd8c77efc0b59a70b07119420b1983c520922310b5025f3a577",
      "0x31778e330a6170e7219906a678fffada94359e252e8333b8156f8ba24dcc00a6",
      "0xe7ef1afc74c540d7f5b0de144df97567682b23f248c72c18b100f61f1d76c677",
      "0x51db133405b8a8965573896ba94575e8dba883075c7b20fad2b89dda200a0ec5",
      "0xdd50eede5efdffa8505ec6c9d39734b0d651c10e7986718f2b992d6f3cc610b0",
      "0x94f518fc2f5364d69469f7b4a6e8c73321d0252459fae9be85be6faad06e421b"
    ],
    "ready": false
  },
  "multisigAccounts": [],
  "signatures": []
}
```

OK (Address is a multisig account, has eligible LSK to claim, and the address is a member of itself)

```
{
  "account": {
    "lskAddress": "lskf9t4eho3cayhhp7k5rruu4g7gr8yzo9b6yg4s4",
    "address": "0xf3669b75881e63de91d45ca50827eefc9f1031a6",
    "balanceBeddows": "551573764672",
    "numberOfSignatures": 2,
    "mandatoryKeys": [
      "0x83eac294606806e0f4125203e2d0dac5ef1fc8730d5ec12e77e94f823f2262fa"
    ],
    "optionalKeys": [
      "0xc75fd8d6cdb26f53f1fc9d16b5361099ae73907dfbfba112c6dcc94b5afbb600",
      "0x0824f95c67a1bf7726a928db60d9966ad644d3a50f135d8c2bc7862cf08ea5b1"
    ],
    "hash": "0x99ceb57a2b44f7788e14f147f6bce45b4b59ac778467e4234a090289e4e1be95",
    "proof": [
      "0x992fae426541ebc572b3ece341c0c91ec9f2cb5e84da42e984a4b4cff6a79582",
      "0xb62e06184adf8cd8c77efc0b59a70b07119420b1983c520922310b5025f3a577",
      "0x31778e330a6170e7219906a678fffada94359e252e8333b8156f8ba24dcc00a6",
      "0xe7ef1afc74c540d7f5b0de144df97567682b23f248c72c18b100f61f1d76c677",
      "0x51db133405b8a8965573896ba94575e8dba883075c7b20fad2b89dda200a0ec5",
      "0xdd50eede5efdffa8505ec6c9d39734b0d651c10e7986718f2b992d6f3cc610b0",
      "0x94f518fc2f5364d69469f7b4a6e8c73321d0252459fae9be85be6faad06e421b"
    ],
    "ready": false
  },
  "multisigAccounts": [{
    "lskAddress": "lskf9t4eho3cayhhp7k5rruu4g7gr8yzo9b6yg4s4",
    "address": "0xf3669b75881e63de91d45ca50827eefc9f1031a6",
    "balanceBeddows": "551573764672",
    "numberOfSignatures": 2,
    "mandatoryKeys": [
      "0x83eac294606806e0f4125203e2d0dac5ef1fc8730d5ec12e77e94f823f2262fa"
    ],
    "optionalKeys": [
      "0xc75fd8d6cdb26f53f1fc9d16b5361099ae73907dfbfba112c6dcc94b5afbb600",
      "0x0824f95c67a1bf7726a928db60d9966ad644d3a50f135d8c2bc7862cf08ea5b1"
    ],
    "hash": "0x99ceb57a2b44f7788e14f147f6bce45b4b59ac778467e4234a090289e4e1be95",
    "proof": [
      "0x992fae426541ebc572b3ece341c0c91ec9f2cb5e84da42e984a4b4cff6a79582",
      "0xb62e06184adf8cd8c77efc0b59a70b07119420b1983c520922310b5025f3a577",
      "0x31778e330a6170e7219906a678fffada94359e252e8333b8156f8ba24dcc00a6",
      "0xe7ef1afc74c540d7f5b0de144df97567682b23f248c72c18b100f61f1d76c677",
      "0x51db133405b8a8965573896ba94575e8dba883075c7b20fad2b89dda200a0ec5",
      "0xdd50eede5efdffa8505ec6c9d39734b0d651c10e7986718f2b992d6f3cc610b0",
      "0x94f518fc2f5364d69469f7b4a6e8c73321d0252459fae9be85be6faad06e421b"
    ],
    "ready": false
  }],
  "signatures": []
}
```

OK (Address has only eligible multisig accounts, i.e. address itself has no LSK balance)

```
{
  "account": null,
  "multisigAccounts": [{
    "lskAddress": "lskf9t4eho3cayhhp7k5rruu4g7gr8yzo9b6yg4s4",
    "address": "0xf3669b75881e63de91d45ca50827eefc9f1031a6",
    "balanceBeddows": "551573764672",
    "numberOfSignatures": 2,
    "mandatoryKeys": [
      "0x83eac294606806e0f4125203e2d0dac5ef1fc8730d5ec12e77e94f823f2262fa"
    ],
    "optionalKeys": [
      "0xc75fd8d6cdb26f53f1fc9d16b5361099ae73907dfbfba112c6dcc94b5afbb600",
      "0x0824f95c67a1bf7726a928db60d9966ad644d3a50f135d8c2bc7862cf08ea5b1"
    ],
    "hash": "0x99ceb57a2b44f7788e14f147f6bce45b4b59ac778467e4234a090289e4e1be95",
    "proof": [
      "0x992fae426541ebc572b3ece341c0c91ec9f2cb5e84da42e984a4b4cff6a79582",
      "0xb62e06184adf8cd8c77efc0b59a70b07119420b1983c520922310b5025f3a577",
      "0x31778e330a6170e7219906a678fffada94359e252e8333b8156f8ba24dcc00a6",
      "0xe7ef1afc74c540d7f5b0de144df97567682b23f248c72c18b100f61f1d76c677",
      "0x51db133405b8a8965573896ba94575e8dba883075c7b20fad2b89dda200a0ec5",
      "0xdd50eede5efdffa8505ec6c9d39734b0d651c10e7986718f2b992d6f3cc610b0",
      "0x94f518fc2f5364d69469f7b4a6e8c73321d0252459fae9be85be6faad06e421b"
    ],
    "ready": false
  }],
  "signatures": [
    {
       "lskAddress": "lskf9t4eho3cayhhp7k5rruu4g7gr8yzo9b6yg4s4",
        "destination": "0x34A1D3fff3958843C43aD80F30b94c510645C316",
        "pubKey": "0xc75fd8d6cdb26f53f1fc9d16b5361099ae73907dfbfba112c6dcc94b5afbb600",
        "r": "0x1c830b8f8989682e7fd05b53f5be0b4c85700a0c962fdf6b04a08463de3eb08e",
        "s": "0x445e88a32365e453db5eb3fdcb8a7f454b61108b998d7395ff5ba5331537b304"
      }
  ]
}
```

OK (Address has NO eligible LSK to claim, NOR owning any multisig account)

```
{
    "jsonrpc": "2.0",
    "id": 1,
    "result": {
        "account": null,
        "multisigAccounts": [],
        "signatures": []
    }
}
```

Error (lskAddress not a valid LSK address)

```
{
    "jsonrpc": "2.0",
    "id": 1,
    "error": {
        "code": 0,
        "message": "INVALID_LSK_ADDRESS"
    }
}
```

POST submitMultisig

After the user has signed a multisig signature, this API will be called to record the signature to backend DB.

If this endpoint is submitted by the last signer of the multisig account, the 200 response will show `"ready": true`. In that case the UI could call `/checkEligibility` again to obtain all signatures and submit to smart contract.

Request

Submitting with publicKey and Signatures

```
{
    "jsonrpc": "2.0",
    "method": "submitMultisig",
    "params": {
        "lskAddress": "lskfcu7z7sch46o67sq24v9h9df2h5o2juvjp3fjj",
        "destination": "0x34A1D3fff3958843C43aD80F30b94c510645C316",
        "publicKey": "0x83eac294606806e0f4125203e2d0dac5ef1fc8730d5ec12e77e94f823f2262fa",
        "r": "0x930c55f4b8190e71de7bddf207458cfec44c1f6a7b1d418d8be561bde20eda9a",
        "s": "0x5aee6ff896ab9d61b1f98237d1bd727577fd1f6bfd66bff866547f048d5ffd09"
    },
    "id": 1
}
```

Response

OK (Number of signatures has not reached)

```
{
    "jsonrpc": "2.0",
    "id": 1,
    "result": {
      "success": true,
      "ready": false
    }
}
```

OK (Number of signatures has been reached)

```
{
    "jsonrpc": "2.0",
    "id": 1,
    "result": {
      "success": true,
      "ready": true
    }
}
```

Error (The requested signature has been signed)

```
{
    "jsonrpc": "2.0",
    "id": 1,
    "error": {
        "code": 0,
        "message": "ALREADY_SIGNED"
    }
}
```

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Error (Destination address is not in ETH format)

```
{
    "jsonrpc": "2.0",
    "id": 1,
    "error": {
        "code": 0,
        "message": "INVALID_DESTINATION_ADDRESS"
    }
}
```

Error (lskAddress not valid, not a multisig address, or does not have eligible token to claim)

```
{
    "jsonrpc": "2.0",
    "id": 1,
    "error": {
        "code": 0,
        "message": "INVALID_LSK_ADDRESS"
    }
}
```

Error (PublicKey not part of Multisig address)

```
{
    "jsonrpc": "2.0",
    "id": 1,
    "error": {
        "code": 0,
        "message": "PUBLIC_KEY_NOT_PART_OF_MULTISIG_ADDRESS"
    }
}
```

Error (Invalid Signature)

```
{
    "jsonrpc": "2.0",
    "id": 1,
    "error": {
        "code": 0,
        "message": "INVALID_SIGNATURE"
    }
}
```

Error (Exceeds numberOfSignatures)

```
{
    "jsonrpc": "2.0",
    "id": 1,
    "error": {
        "code": 0,
        "message": "NUMBER_OF_SIGNATURES_REACHED"
    }
}
```

Lisk-claim-backend:DB Schema

PostgreSQL DB will be used to store signatures submitted by multisig key holders. Currently there is one table: **Signatures**

Signatures	
Column	**Description**
lskAddress	LSK Address of Multisig Account

destination	Target L2 ETH Address to claim the tokens
signer	Public Key of the signer, should match one of the `mandatoryKeys` or `optionalKeys`
isOptional	A flag to show if the above signer is belongs to `optionalKeys`
r	r-component of the signature
s	s-component of the signature
Indexes	
lskAddress,destination	Only one `lskAddress-destination` combination allowed

Design

Prepare Stage (In Blue)

1. Retrieve list of address and balance in key-value pair from Lisk Chain, aka snapshot
2. Prepare Merkle Tree and generate **root** and **proof** using snapshot
3. Set up LSK Claim Backend (Server), which stores Merkle data and balances upon request
4. Deploy LSK Claim Contract
5. Send sufficient LSK Token to LSK Claim Contract

Claim Stage (In Red)

Regular Account

1. User access to Lisk Portal
2. User enquiries eligibility from Server by submitting LSK Address
3. Server returns claim amount (if any) with array of **proof**
4. User connect to Metamask to retrieve destination L2 address
5. User sign ED25519 using Lisk Desktop (Proof of existence)
6. User submit transaction using Metamask
7. Eligible amount are sent to user address

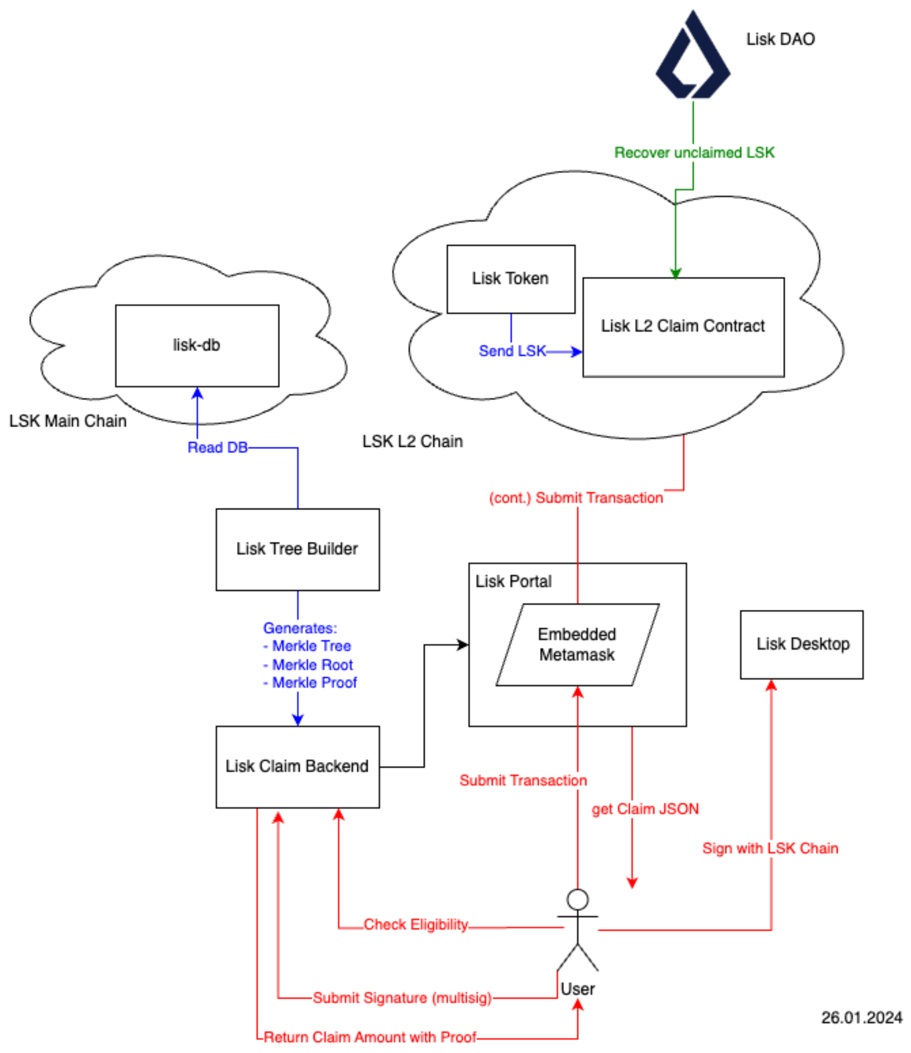
Multisig Account

1. User access to Lisk Portal
2. User enquires eligibility from Server by submitting **signer** LSK Address
3. Server returns claim amount (if any) with array of **proof**, and array of **signatures**.
4. User choose destination L2 address that is set by previous signers, or set a new L2 destination address.
5. A claim JSON is created by Lisk Portal
6. User sign ED25519 using Lisk Desktop by providing the above JSON
7. User submit signature to backend
8. Once number of signatures have reached, user can submit transaction using Metamask
9. Eligible amount are sent to **destination address**

Completion Stage (In Green)

1. Admin of the contract could, after a pre-defined period of time, recover all unclaimed LSK
2. All unclaimed LSK are sent to admin address

Visual Graph of Claim Process


Lisk DAO
Recover unclaimed LSK
Lisk Token
Lisk L2 Claim Contract
Send LSK
lisk-db
LSK Main Chain
LSK L2 Chain
Read DB
(cont.) Submit Transaction
Lisk Tree Builder
Lisk Portal
Embedded Metamask
Lisk Desktop
Generates:
- Merkle Tree
- Merkle Root
- Merkle Proof
Lisk Claim Backend
Submit Transaction
get Claim JSON
Sign with LSK Chain
Check Eligibility
Submit Signature (multisig)
User
Return Claim Amount with Proof
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