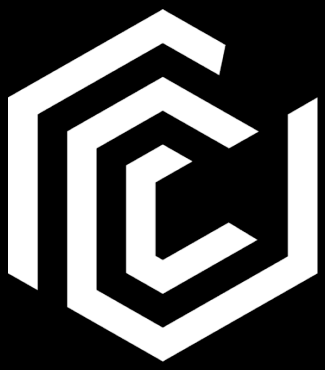


FIRMACHAIN

WHITEPAPER

Version 1.5

Table of Contents

1. Overview

1.1 Importance of License Agreements for Intellectual Property (IP) Rights (Patent Rights, Trademark Rights, Copyrights, etc.)

Development of the internet has introduced an era of borderless information, and the protection of IP rights(such as patent rights, trademark rights and copyrights, etc.) and their commercial utilization through license agreements have become the key to the competitiveness of individuals, companies, and nations.

However, the history of protection and transfer of IP rights cannot be fully traced with the current technology, which have resulted in a wide range of domestic or international (i) IP infringements and (ii) fraud or abuse of rights in the process of executing license agreements. We plan to utilize blockchain technologies to verify IP rights and record the transfer history of IP rights in order to promote the safety of companies' and individuals' IP rights in the course of executing international license agreements.

1.2 Need for Introduction of Electronic Contracts in License Agreements for Intellectual Property Rights

Currently, most contracts are still executed in the form of traditional written contracts. So far, many digital signatures and document-related services have been introduced, and the validity of electronic contracts has been legally recognized. Nonetheless, the majority of companies still continue to use written contracts and many of them are not aware of the usefulness of electronic documents.

'We thought.
Why do we prefer written contracts?'

Even today, written contracts are still preferred over electronic documents and have more credibility within the society, as the original copy of a written contract could serve an evidentiary purpose. Also, as most services that provide electronic contracts are centralized, the intrinsic risks, such as forgery, data loss or leakage of confidential information through hacking of servers, have made electronic contracts seem to be more vulnerable than written contracts. The

higher the transaction price is, the greater the contracting parties' concerns over a potential forgery is. In addition, when it comes to cross-border contracts, taxes, remittance fees, and processing fees required to be received through overseas subsidiaries come as a huge burden to the parties.

Relevant issues can be highlighted in the real-life examples as below.

Example 1.

I recently purchased a license from a user who holds an IP right (patent right). However, I am highly concerned because it is difficult to verify as to whether the seller is a real holder of the patent right, since the seller is a foreigner, and it is difficult to confirm that the seller has never granted an exclusive license to another purchaser. What if a third party uses the patent right I purchased without proper authority or in excess of the scope of the purchased license?

Example 2.

In order to enter into a content publishing contract, Company A and Company B had exchanged word documents with revisions until the day before executing the contract. On the day of signing the contract, Company B brought the draft of contract including an additional provision concerning the copyright protection, which had not been previously discussed between the parties. It was an uncomfortable situation because time was limited and the chairman was out of office. Although the person in charge promptly made the necessary corrections without approval of the chairman and executed the contract, similar situations may arise any time.

As shown in the above examples, the introduction of blockchain-based electronic contracts in the field of license agreements for IP rights will solve the foregoing issues by improving the transparency and the efficiency in contracting process based on their broad application, including the protection and tracing of IP rights.

FIRMACHAIN (also referred as "we"), by using the decentralization of the blockchain, has come up with the reliable decentralized data storage (hereinafter, "Decentralized Data Storage") in order to (i) create an electronic contract management service where we can secure transparency and reliability of the transaction documents in license agreements for IP rights; (ii) fundamentally solve issues of verifying contracting parties and forgery of contracts; (iii) implement a reasonable contract-making procedure between parties using DApp; (iv) reduce

the processing cost for international contracts through contract writing using less resources and simplifying the process; and (v) ultimately create a service that overcomes the limitations of written contracts.

1.3 Decentralization of Data

Millions of personal computers all over the world are constantly operated for considerable time, but not all of their resources, especially in case of storage capacity and network bandwidth, are currently used to the fullest extent. If the remaining storage capacities and network resources could be lent to another person at a certain price, the user could save files at costs lower than other similar file storage services while the provider could generate a profit with previously unused resources.

We have devised a decentralized distributed file storage system to provide reliable storage that protects the integrity and reliability of data. Decentralization means that the system is managed and operated by every participant in the system without the central management of the file storage system.

P2P distributed file sharing systems, such as BitTorrent, also allow individuals to upload and store files by sharing data. The basic idea of these P2P file sharing systems, however, is that an individual downloads as much as he/she uploads. Unfortunately, such system failed to adequately motivate the users maintaining their seeds without any compensations to continue uploading their files. As a result, P2P distributed file sharing systems do not guarantee sufficient availability of files because these files were always at risk of disappearing at any time.

We have adopted a market system where users can buy and sell file storage space upon their individual needs, in order to address the foregoing issues, including the users with files disappearing from the system for various reasons. Further, this system does not require the users to maintain uploading the files in order to download the files from the system.

Further explanation of FIRMACHAIN's key technology, Decentralized Data Storage, are provided in the following pages. Also, a more detailed explanation of Decentralized Data Storage will be covered in FIRMACHAIN's Technical Whitepaper to be disclosed in future.

2. Technology

2.1 Introduction

FIRMACHAIN's features including, contract signing between participants, uploading UID of the file, address monitoring of respective storage spaces and contract status management has been constructed based on the concept of Ethereum's smart contract. However, the resulting data we have obtained from running our service provided us with useful insights and subsequently rooms for improvement. One of the insights was the increase in overall service cost due to an increase in gas fee. Additionally, there was no need for a user to keep the original contract file and the validation history of the contract created based on smart contract. Rather, we reached the conclusion that the aforementioned responsibility can be delegated to the validators for a more efficient and streamlined service.

The insights obtained above renders the traditional agreement mechanism of smart contracts and the fee structure inapt for FIRMACHAIN especially when our mission is to provide a "bang for the buck" service. As a result, we reached the conclusion that either stimulating the use of tokens on another blockchain network or constructing a proprietary main-net would better align with the mission of FIRMACHAIN. Since, additional features down the development pipeline also require the presence of a main-net, FIRMACHAIN came to develop its proprietary main-net based on Cosmos SDK – a framework that utilizes CometBFT(formerly Tendermint BFT) agreement mechanism – and initiate a plan to swap tokens.

2.2 Overview

Following are the specifics of the main-net.

Coin	
symbol	FCT
denom	ufct
decimals	6
initial supply	600,000,000 FCT (600,000,000,000,000ufct)

Networks	
imperium-4	Test-Net
colosseum-1	Main-Net

Environment	
Go	v1.23.4
CometBFT	v0.38.17
Cosmos-sdk	v0.50.12

2.3 Mechanism

Following is a description of how contract signing works on the chain.

1. **Create Contract:** Upload specifics of the contract such as signature of the participants, file UID (hash), endpoint where the file is stored etc. → Start
2. **Nullify Contract**: Check specifics of the uploaded contract → Upload all participant's signature agreeing to nullify the hash value of the contract → Nullification complete
3. **Confirm and Verify Contract**: Confirm whether the contract hash value and the owner's addressmatch and receive contract file path

```
type (
	Keeper struct {
		cdc        codec.BinaryCodec
		storeKey storetypes.StoreKey
		memKey storetypes.StoreKey
	}
)

func NewKeeper(
	cdc codec.BinaryCodec,
	  storeKey,
	  memKey storetypes.StoreKey,
) *Keeper {
	return &Keeper{
```

```
                cdc:      cdc,
                storeKey:          storeKey,
                memKey:            memKey,
        }
}

func (k Keeper) IsContractOwner (
        goCtx context.Context,
        req *types.QueryIsContractOwnerRequest
) (*types.QueryIsContractOwnerResponse, error) {
        ...
        result := contains(val.OwnerList, req.OwnerAddress)
        return &types.QueryIsContractOwnerResponse{Result: result}, nil
}

func (ms msgServer) CreateContractFile (
        goCtx context.Context, msg *types.MsgCreateContractFile
) (*types.MsgCreateContractFileResponse, error) {
          ...
        var contractFile = types.ContractFile{
                FileHash:                  msg.FileHash,
                Creator:                   msg.Creator,
                TimeStamp:                 msg.TimeStamp,
                OwnerList:                 msg.OwnerList,
                MetaDataJsonString:        msg.MetaDataJsonString,
        }

        ms.keeper.SetContractFile (
                ctx,
                contractFile,
        )

        return &types.MsgCreateContractFileResponse{}, nil
}
```

```
func (ms msgServer) AddContractLog (
	goCtx context.Context, msg *types.MsgAddContractLog
) (*types.MsgAddContractLogResponse, error) {
	...
	id := ms.keeper.AppendContractLog (
			ctx,
			contractLog,
	)

	return &types.MsgAddContractLogResponse{
			Id: id,
	}, nil
}

func (k Keeper) ContractFile(
	c context.Context,
	req *types.QueryGetContractFileRequest
) (*types.QueryGetContractFileResponse, error) {
	...
	return &types.QueryGetContractFileResponse{ContractFile: &val}, nil
}

func (k Keeper) ContractLog(
	c context.Context,
	req *types.QueryGetContractLogRequest
) (*types.QueryGetContractLogResponse, error) {
	...
	store := prefix.NewStore(
				ctx.KVStore(k.storeKey), types.KeyPrefix(types.ContractLogDataKey))
		k.cdc.MustUnmarshal(store.Get(GetBytesFromUInt64(req.Id)), &contractLog)

	return &types.QueryGetContractLogResponse{ContractLog: &contractLog}, nil
}
```

Endpoint, in this case, uses a storage blockchain or a tamper and forgery proof IPFS and is accordingly verified. The verified endpoint value is then converted into the following JSON format and is stored in the transaction block.

Additionally, respective data are processed in Merkle tree form for data management. Services that make use of data go through the process of converting the respective data into Merkle tree form. One such example would be Donue(donue.co.kr). We will provide software tools and guides that will aid services like Donue to easily manage data through FIRMACHAIN. One advantage of managing data in a Merkle form is that data can be shared selectively.

The owner of the data records only the root hash of the Merkle tree. Due to the nature of Merkle tree, verification of the authenticity of the complete data is possible by providing Merkle proof that includes the root hash, even if only a portion of the data is made public. Such unique nature of Merkle tree allows the exclusion of certain sensitive personal information when transmitting data. Further on, the authenticity of the data can be verified prior to transaction, by selectively providing information – especially when requested by the receiving party – such as the signature of the contract creator. The converted data is initially saved either on the user's smart mobile device or on a storage space in the user's PC.

Since only the root hash extracted from the original data is recorded on Blockchain the cryptographic algorithm, used especially when saving and sharing data, remains free of any possible restraints. Even if the existing method of encryption becomes obsolete or unstable, possibly from an increase in computing power, we are free to deploy a new encryption method without having to completely overhaul the data already recorded on Blockchain.

```
{
  "tx": {
    "body": {
      "messages": [
        {
          "@type": "/firmachain.contract.MsgCreateContractFile",

    "path":"https://ipfs.infura.io:5001/api/v0/cat?arg=QmTF7NerdGZhnDPJj3Yj51gqH18o8kLtgk
    gtVjMLk1V9tx",
          "hash":
    "790e54e8723d7ad9c05b232498c3341e6f4465ec6db9f0449c2ba52fcf9d0569",
          "owner": "firma1ytleandjvn27kcpsfly3d39amw6n2znfpm5eg7"
        }
      ],
      "memo": ""
    },
    "auth_info": {
      "signer_infos": [
        {
          "public_key": {
            "@type": "/cosmos.crypto.secp256k1.PubKey",
            "key": "AphzfQjmeJtOSczRUmZeqUKMDU4i6BkX9zL7B8HhidV1"     // base64
          },
          "mode_info": {
            "single": { "mode": "SIGN_MODE_DIRECT" }
          },
          "sequence": "REPLACE_WITH_SEQUENCE"
        }
      ],
      "fee": {
        "amount": [],
        "gas_limit": "200000",
        "payer": "",
        "granter": ""
```



```
        },
        "tip": null
      },
      "signatures": [
        "REPLACE_WITH_BASE64_SIGNATURE"
      ]
    }
}
```

2.4 firmachaind User's Guide

Following is the installation method and user's guide for **firmachaind**

Installing Go

1. FIRMACHAIN is based on Cosmos SDK and CometBFT and is written in GO.
2. if you already have GO installed, you can skip this part of the guide.
3. Please install **Go 1.23.4** or a more recent version of GO from the GO Download and Install Guide.
4. We recommend that you install a stable version of GO.
5. Upon installation, you must add the $PATH environment variable as shown in the command line below.

```
..bash
..mkdir -p $HOME/go/bin
..echo "export PATH=$PATH:$(go env GOPATH)/bin" >> ~/.bash_profile
..source ~/.bash_profile
```

Install Binary

1. Once you have successfully installed and set-up your GO environment, you must install the latest version of firmachaind.
2. Clone FIRMACHAIN GitHub and execute build command.

```
..bash
..git clone -b https://github.com/FIRMACHAIN/FIRMACHAIN
..cd FIRMACHAIN && make install
```

3. If an error message shown below appears **LDFLAGS** might be included in the setting.

```
..flag provided but not defined: -L
..usage: link [options] main.o.....
..make: *** [install] Error 2
```

4. Please remove **LDFLAGS** from the setting using the command shown below.

```
LDFLAGS="" make install
```

Copy Binary

1. Once you have installed binary, create Symlink for your convenience.
2. Please create Symlink by referring to the following command. (The object folder might differ based on your GO setting and your operating system.)

```
sudo ln -s ~/go/bin/firmachaind /usr/local/bin
```

3. Once you created your Symlink, please check if the Symlink functions properly.

```
> firmachaind
FIRMACHAIN BlockChain [https://firmachain.org]

Usage:
  firmachaind [command]

Available Commands:
  comet                    CometBFT subcommands
```

```
      config                    Utilities for managing application configuration
      debug                     Tool for helping with debugging your application
      export                    Export state to JSON
      genesis                   Application's genesis-related subcommands
      help                      Help about any command
      init                      Initialize private validator, p2p, genesis, and application
configuration files
      keys                      Manage your application's keys
      module-hash-by-height Get module hashes at a given height
      prune                     Prune app history states by keeping the recent heights and
deleting old heights
      query                     Querying subcommands
      rollback                  rollback Cosmos SDK and CometBFT state by one height
      rosetta                   spin up a rosetta server
      snapshots                 Manage local snapshots
      start                     Run the full node
      status                    Query remote node for status
      tx                        Transactions subcommands
      version                   Print the application binary version information

   Flags:
      -h, --help                help for firmachaind
      --home string             directory for config and data (default "/home/ubuntu/.firmachain")
      --log_format string       The logging format (json|plain) (default "plain")
      --log_level string        The logging level (trace|debug|info|warn|error|fatal|panic|disabled
or '*:<level>,<key>:<level>') (default "info")
      --log_no_color            Disable colored logs
      --trace                   print out full stack trace on errors

Use "firmachaind [command] --help" for more information about a command.
```

Pre-built Binary (before version v0.3.5)

If your environment does not allow building FIRMACHAIN, or if there are other reasons preventing you from doing so, pre-built binaries can be used up to version v0.3.5. These can be found in the release directory of the FIRMACHAIN repository.

1. Ubuntu(linux) and macOS(darwin) are supported as operating systems.
2. The Pre-built Binary is built with Ubuntu 20.04 LTS and macOS 10.15 Catalina.

Starting from FIRMACHAIN v0.3.5, it is recommended to build binaries directly in consideration of platform and architecture compatibility.

2.4.1 Network Participation

FIRMACHAIN is a public blockchain network, and anyone can set up a node and participate in the network.

1. Create a new Node and a Settings file.

```
..# ex: firmachaind init validator --chain-id colosseum-1
..firmachaind init <moniker> --chain-id=<chain-id>
```

2. moniker must be written with **ASCII TEXT**.
3. moniker can be revised later from ~/.firmachain/config/config.toml file.

```
..# A custom human readable name for this node
..moniker = "<new_moniker>"
```

Set Minimum-Gas-Prices

The purpose of this setting is to prevent an attack on FIRMACHAIN.

1. Please set the value of the minimum-gas-prices as 0.01ufct
   from the ~/.firmachain/config/app.toml file.

```
minimum-gas-prices = "0.01ufct"
```

Copy Genesis File

This process is to import the basic information of FIRMACHAIN.

1. The basic information is included in genesis.json file and can be found in FIRMACHAIN Mainnet.
2. genesis.json file should be in ~/.firmachain/config directory.
3. Please refer to the command below.

```
curl https://raw.githubusercontent.com/FIRMACHAIN/mainnet/main/colosseum-1/genesis.json > $HOME/.firmachain/config/genesis.json
```

4. genesis.json download (https://github.com/FIRMACHAIN/mainnet/blob/main/colosseum-1/genesis.json)

Add Seed Node

Blockchain is a network of multiple interconnected Nodes. In order to add the Node that you created to the network; you must find the Peer.

1. Check the list of available seed nodes in the Join a FIRMACHAIN Network – Set Seeds (https://docs.firmachain.org/master/node-and-validators-guide/run-a-full-node/join-a-firmachain-network/syncing-from-genesis#set-seeds) document.
2. You can set-up your Seed Node from ~/.firmachain/config/config.toml file.
3. From config.toml file, choose one of the following items and modify.

```
seeds="<Seed Node1>,<Seed Node2>"
```

```
persistent_peers="<Seed Node1>,<Seed Node2>"
```

Start Node

1. Starting a Node is simple.

```
firmachaind start
```

2. Please check the activated status of the Node.

```
firmachaind status
```

2.4.2 Validator Participation

Participate as FIRMACHAIN's block validator

Role of a Validator

1. Manage transaction log from Node operation
2. Verify the integrity of the block and create block
3. Validate the hash value of the contract file (formed in E-Contract) recorded on the block

Credentials to become a Validator

1. Currently, there are no set of criteria a candidate must satisfy in order to become a validator. However, once the maximum number of validators has been reached, in order to become a candidate, more Firma(FCT) must be bonded than the existing validators to be included in the Active Validator Set.

Validator System Set-up

1. Hardware Requirement (The conditions set out herein are subject to change with the growth of the network. Changes in hardware requirement will be supported by the FIRMACHAIN foundation.)
2. Data center facility that meets the necessary power requirement, networking conditions, firewall settings, hardware security module and a backup server
3. Network with at least 1Gbps bandwidth
4. Storage device of at least 100Gb

Tasks of Validator

1. Software upgrade and bug fixing from regular main network development updates
2. Participation in the FIRMACHAIN community governance and all decision-making processes

Validator Penalty (Slashing)

1. Downtime:
   - This occurs when a validator misses a certain percentage of block signatures (pre-commits).
   - Parameter standard: out of the last 10,000 blocks, **at least 500 signatures (5% or more)** are required, and if this is not met, a downtime penalty is applied.
   - Downtime penalty: **0.01% (1/10,000)** of the validator's tokens and the tokens delegated to that validator are slashed.
   - In addition, the validator will enter a **jail state after 600 seconds (10 minutes)**.

2. Dual Signature
   - This occurs when a validator signs more than one block at the same height (for example, both chain A and chain B).
   - This is considered the most serious violation, and **5% of the validator's and delegators' stake is slashed**.

3. The validator is **permanently removed in a tombstoned state** and cannot return as a validator

Confirm Validator pubkey

```
firmachaind tendermint show-validator
```

Create Validator

Refer the command line below in order to create a validator.

Please check the following items before proceeding.

1. The firmachaind node must be synchronized with all blocks up to the latest state.
2. A key and account must be registered in firmachaind (e.g., firmachaind keys add <keyname>).

3. A validator can be created with a small amount of FCT staked, but to participate in block production, a sufficient amount of staking is required to be included in the Active Validator Set.
4. The transaction fee for validator registration will be deducted from the account specified with --from.
5. When submitting a transaction via CLI, it is recommended to use --gas auto along with a --gas-adjustment of 1.7 or higher. (If sent via a wallet or a public LCD, this is handled automatically and requires no manual adjustment.)

```
firmachaind tx staking create-validator ₩
--pubkey $(firmachaind tendermint show-validator) ₩
--amount <staking-amount>ufct ₩
--moniker <moniker-name> ₩
--details <description> ₩
--website <website-url> ₩
--security-contact <email-address> ₩
--commission-rate 0.10 ₩
--commission-max-rate 0.20 ₩
--commission-max-change-rate 0.1 ₩
--min-self-delegation 1 ₩
--identity <keybase-64bit-code> ₩
--chain-id colosseum-1 ₩
--fees 20000ufct ₩
--from <key_name>
```

Checking My Reward

FIRMACHAIN utilizes the DPoS mechanism where individuals or entities can receive reward by staking their coin to a registered validator.

1. Please refer to the command below in order to check my reward.

```
firmachaind q distribution rewards <my_address>
```

2. With the above command, you can check the quantity of your reward and the list of all validators that you voted for.

3. Please refer to the command below in order to check your reward gained from voting for a specific validator.

```
firmachaind q distribution rewards <my_address> <validator_address>
```

Claiming My Reward

You can claim your reward gained from staking a specific validator or from directly participating in the network.

You cannot specify the quantity of the reward that you would like to claim and instead, the total reward quantity will be paid out.

```
.. firmachaind tx distribution withdraw-rewards <validator_address> ₩
--from <name_of_privakey> ₩
--chain-id <chain_id> ₩
--fees <fees_to_pay>
```

2.4.3 Use as Command-line

Using a Command-line Interface called **firmachaind**, FIRMACHAIN can look up information registered on the network or send transactions. In other words, using firmachaind, users and participants can check the balance of their wallet and can send Firma to other users or participants.

1. After building FIRMACHAIN, **firmachaind** is created in the ~/go/bin/ directory.
2. Please refer to the Binary section for a more detailed guide on installing and building FIRMACHAIN.
3. 1-depth commands that can be used in **firmachaind** are as follows.

comet	CometBFT subcommands
genesis	Application's genesis-related subcommands
module-hash-by-height	Get module hashes at a given height
prune	Prune app history states by keeping the recent heights and deleting old heights
rollback	rollback Cosmos SDK and CometBFT state by one height
snapshots	Manage local snapshots
config	Create or query an application CLI configuration file
debug	Tool for helping with debugging your application
export	Export state to JSON
help	Help about any command
init	Initialize private validator, p2p, genesis, and application configuration files
keys	Manage your application's keys
query	Querying subcommands
rosetta	spin up a rosetta server
start	Run the full node
status	Query remote node for status
tx	Transactions subcommands
version	Print the application binary version information

By inserting '-h' or '—help' at the end of each command, you can see a brief description of the functions of each command and a short user guide of the respective command.

Wallet Creation

To send or receive FCT on FIRMACHAIN, you must create a wallet.

1. You can create a wallet by inserting the command below.

```
firmachaind keys add <key_name> --coin_type 7777777
```

2. Once you enter your password (8 characters or more) your wallet creation process is complete. You can also check the Mnemonic Phrase which can be used when you forget your password or when your firmachaind key storage has been reset.
3. Please store your Mnemonic Phrase in a secure offline location.
4. Wallet recovery procedure by utilizing Mnemonic Phrase, please refer to the below.

```
firmachaind keys add <key_name> --coin_type 7777777 --recover
```

5. For other wallet related commands, please refer to the list below.

```
..firmachaind keys show <key_name>   // Check the address of a specific wallet.
..firmachaind keys delete <key_name>   // Delete wallet from the storage space.
..firmachaind keys list   // Look up all list of wallets on the storage space.
```

Sending FCT

Following is a simple guide on sending Firma using **firmachaind**

```
firmachaind tx bank send <from_key_or_address> <to_address> <amount> [flags]
```

The user must be in possession of the following information in order to send FCT: the key name or address of the wallet used to send FCT, and the quantity of FCT to be sent. When entering the amount, you must put in the amount in the form of **1000000ufct** (withoud comma). (Conversion between FCT and ufct is as follows.)

- **1FCT** is equal to **1,000,000ufct** (decimals: 6)

LCD (REST API) Activation

1. You can enable the REST API by editing app.toml:

```
vim ~/.firmachain/config/app.toml

[api] # Enable defines if the API server should be enabled.
enable = true

# Swagger defines if swagger documentation should automatically be registered.
swagger = false

# Address defines the API server to listen on.
address = "tcp://0.0.0.0:1317"
```

2. After modifying the options and starting the chain, you can access the API via port 1317. To check the open port after starting firmachaind, run:

```
netstat -tnlp
```

3. You can also change the API port by modifying the address field.

Search Signed Contract (File)

The authenticity of the file can be determined using the hash value of the file only if the file if registered on FIRMACHAIN.

1. To determine the authenticity of the file, please use the command listed below after retrieving the hash value of the file.

```
firmachaind query contract show-contract-file <file-hash>
```

More commands are awaiting you.

For commands not listed in this guide, please insert '-h' or '--help' at the end of each command for a more detailed explanation and user guide.

2.4.4 Use as RPC

LCD HOST Information
Main-net : https://lcd-mainnet.firmachain.dev:26657
Test-net : https://lcd-testnet.firmachain.dev:26657
API List

GET /firmachain/firmachain/contract
Contract information can be queried using either the contract hash or the contract log ID.

```
func (k Keeper) ContractFile(c context.Context, req *types.QueryGetContractFileRequest)
(*types.QueryGetContractFileResponse, error) {
        if req == nil {
                return nil, status.Error(codes.InvalidArgument, "invalid request")
        }
        ctx := sdk.UnwrapSDKContext(c)

        val, found := k.GetContractFile(ctx, req.Index)
        if !found {
                return nil, status.Error(codes.InvalidArgument, "not found")
        }

        return &types.QueryGetContractFileResponse{ContractFile: &val}, nil
}

func (k Keeper) GetContractFile(ctx sdk.Context, index string)
(val types.ContractFile, found bool) {
        store := prefix.NewStore(ctx.KVStore(k.storeKey),
types.KeyPrefix(types.ContractFileKey))

        b := store.Get(types.KeyPrefix(index))
        if b == nil {
                return val, false
        }
```

```
        k.cdc.MustUnmarshal(b, &val)
        return val, true
}
```

GET /cosmos/bank/

Used to query FCT, token supply, and related information.

GET /cosmos/staking/

Used to query validator or delegation status information.

GET /cosmos/distribution/

Used to query delegation rewards, accumulated fees, and reward amounts **available to users.**

GET /cosmos/base/node/v1beta1/status

Used to check node-level operation and status.

GET /cosmos/base/tendermint/v1beta1/blocks/latest or {height}

Used to query block information.

GET /cosmos/mint/

Used to query token issuance policies and the current state.

> For more details on RPC, refer to https://docs.cosmos.network/api.

2.5 Token Economy

Staking	
Bond Denom	ufct
Unbonding Time	21 DAY(S)
Max Entries	7
Historical Entries	10,000
Max Validators	60

Slashing	
Downtime Jail Duration	600 SECOND(S)
Min Signed Per Window	5%
Signed Block Window	10,000
Slash Fraction Double Sign	5 / 100
Slash Fraction Downtime	1 / 10,000

Minting	
Blocks Per Year	5,111,183
Goal Bonded	67%
Inflation Max	15%
Inflation Min	8%
Inflation Rate Change	25%
Mint Denom	ufct

Distribution	
Base Proposer Reward	1%
Bonus Proposer Reward	4%
Community Tax	3%
Withdraw Address Enabled	TRUE

Gov	
Min Deposit	5000.000000 FCT
Max Deposit Period	7 DAY(S)
Quorum	33%
Threshold	50%
Veto Threshold	33%
Voting Period	7 DAY(S)

For further detailed figures and facts about the token economy, please refer to the following links.

[Explorer URL]
https://explorer.firmachain.dev/params

3. FIRMACHAIN DApp : E-Contract

3.1 Problems of Existing License Agreements for Intellectual Property Rights and Solutions Based on Blockchain Technologies

Because written international contracts require an execution in-person, one of the contracting parties has to spend a lot of time and costs for traveling abroad.

The current IP license agreements are conducted by transferring electronic contracts online prior to revising and concluding them. However, there have been issues of possible forgery and security breaches due to the centralized structure of the server. Further, there has been no way of verifying the counterparty's identity, authorities or rights when contracts are sent back and forth via email and messengers. However, the advent of blockchain technologies will solve all these problems.

Thus, **FIRMACHAIN** and **E-Contract** combine the fundamental elements of a contract with blockchain technology to achieve our goal of creating a smooth process of contract execution and implementation between parties. Also, **FIRMACHAIN** is doing its best in tackling the aforementioned social problems.

The advantages of **FIRMACHAIN**'s E-contract based on blockchain can be maximized in license agreements for IP rights such as patents, trademarks and copyrights (games, characters, animation, etc.). Therefore, such IP license agreements will be the first target of the new platform to be established by **FIRMACHAIN**.

The problems of the current license agreements are as follows:

It is difficult for a licensee who intends to execute an agreement to verify the actual holder (including exclusive licensees) of IP rights (patent, trademark, etc.). Their names or addresses can be identified in the official publication of patents issued by the Korea Intellectual Property Office. In case of cross-border contracts, where an IP right has been transferred to a third party or licensed to an exclusive or non-exclusive licensee, it is more challenging to confirm the identities of those licensees and trace the actual licensor.

Licensors, too, are exposed to risks of fraud because they cannot confirm the identity of a person who intends to execute a license agreement. Further, it was difficult for a third party to obtain information on the duration of a patent or trademark and the full information of the licensor (including exclusive licensee).

For example, the purchasers of a product for which a patent right or a trademark right is registered are not able to verify whether the product had been manufactured by a person legitimately holding the right.

Even if there was a known IP right holder, it requires the vast amount of time and cost required to sign a written agreement. An IP right holder also faced a wide range of practical problems (time and cost) in finding a person who desires to use his or her IP in another country. The process of cross-border remittance of fees and payment of taxes, etc. was at all times exposed to risks of fraud and caused inconveniences and nuisances.

In order to address the above-mentioned problems, FIRMACHAIN will offer a solution as follows:

1. As long as accessible to the internets, the users can confirm the details of IP rights, including the type of IP rights, the titleholder, and the coverage (geographic coverage).

2. The introduction of blockchain-based electronic contracts in the entire process of contract execution will enable the users to record and verify the entire contracting process, such as negotiations and transaction history, etc.
3. Verified licensor and licensee can execute a cross-border contract (e.g., IP license agreement) online rapidly and free from any risk of fraud using the electronic contract platform (E-Contract) without physically meeting each other through blockchain
4. Various useful functions, e.g., dashboards, provision of standard contract forms, matching service for legal counseling and review by third-party professionals, will be provided to facilitate rapid and convenient execution of contracts.
5. FIRMACHAIN platform will allow the IP holders to easily locate the potential licensees and thereby facilitate the execution of diverse license agreements at lower costs.

FIRMACHAIN's solution will expand the international license market and improve the transparency in relevant transactions.

3.2 Need for E-contracts and Process Control

There are many problems in our society due to people's preference for written contracts. Written contracts create inconvenience in keeping contractual documents separately. At the outset, each party share one (1) copy each of the written contract, but it is difficult to synchronize any subsequent revisions, and it can also easily give rise to fraud issues. Numerous companies try to follow the content modification timeline by using external elements such as emails and voice recordings, but this is difficult to manage. Even if the problem of forgery in writing is a huge problem that may lead to a legal battle, there is no way to prevent it. In order to solve these problems, electronic contracts emerged in our society.

Electronic contracts are a way to digitize contractual agreements between companies. Electronic documents of a similar concept (Electronic Transactions Act) are recognized as having the same legal effect as paper documents. In domestic and overseas laws related to commercial transactions, it is stipulated that electronic signatures (Digital Signature Act) have a legal effect. As a result, electronic contracts have also become legally valid.

Currently, the efficiency of electronic contracts is superior to written contracts. However, it is not preferred over written contracts because certain problems are unavoidable, such as contracts by unauthorized people, burdens that come from transmission risks due to system failures, and so on. In addition, companies that have yet to advance are taking the position to adhere to these traditional methods, so the position of the technology of electronic contracts is still under-estimated and is regarded as an unnecessary technology.

FIRMACHAIN has the goal of making electronic documents and contracts transparent and reliable by using the characteristics of the blockchain, and thereby solving the current problems.

3.3 Why E-Contract?

<Create and implement a rational contract with e-contracts>

From an advanced modern society perspective, we are using fairly primitive methods when making and implementing large and small contracts. For example, we go through several email exchanges to send and receive contracts, or sometimes we would exchange contracts on the same day. Some do not check the contents of the contract properly before signing it, use legally inaccurate seals or stamps with no information, or even try to proceed with work without making a contract at all because it costs time to create one.

In addition, many companies undergo contracts with large transaction costs and long contract period, and by doing so, they only manage the contents, such as the contract's progress, status, additional work, modifications to the contract, etc. in writing, so the timeline becomes difficult to manage.

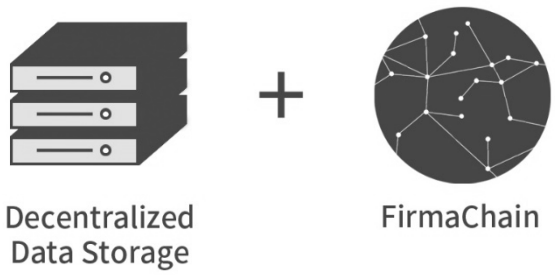
The **E-Contract (DApp)**, which uses **FIRMACHAIN**, provides a trans-parent ledger through a smart contract and public chain, which means both legality and stability can be assured. The use of convenient and necessary functions for managing the contract progress allows efficient business operation. In addition, it can reason-ably solve the problem on transaction fees by replacing the currency used for the contract with cryptocurrency. In particular, it can solve problems when creating multinational contracts such as double taxation, overseas corporation establishment problems, overseas remittance, etc., so it can allow people to carry their business plans efficiently.

As described in the service structure, E-Contract will provide several functions. (Enforced security parameters for electronic contracts, form presets for standard contracts, contract edit and management)

4. Structure of E-Contract

E-Contract is divided into: **1) The core layer** where encrypted contract data and the contract transaction are saved; **2) The application layer** which creates and manages the contracts using DApp; **3) The service layer** which verifies and processes electronic contracts and connects the core layer and application layer.

4.1 Core Layer (FIRMACHAIN)



FIRMACHAIN is used to transfer and collect transaction prices, distribute the finite-state for the entire contract procedure, verify the integrity of electronic documents, and protect the contract data from forgery. The contract will have a finite-state for each phrase, and the details are as follows. The states that will actually be implemented are going to be broken down further**.**

Establishment of contract

In order to confirm the payment ability of the party paying at the time of drafting contract, a certain percentage of the initial transaction price shall be set as the deposit under the agreement of the parties. The transaction price will be in local currency or **FIRMACHAIN Token (i.e., FCT)**. If the transaction price is in local currency, the foregoing deposit will not be necessary.

After the contract is written, the contract will be written in the Decentralized Data Storage once the parties have reviewed and confirmed its details. In this "waiting to upload" stage, the paying party should have more money than the deposit amount in their wallet, and they must remit the money in case they need to pay for certain fees in advance, such as a deposit. Once this process is complete, the status is changed to "in progress." Once the contract is in this stage, the transaction history containing the ***Hash String** is uploaded in the Smart Contract. All parties involved can now implement the contract. When using local currency as the transaction price, the party must create a transaction in the Smart Contract without FCT; and include a proof of transaction in the electronic documents of the corresponding contract, such as a passbook transaction history or transfer document.

Progress of contract

The contract will be processed, and the transaction amount will be remitted either in FCT or local currency depending on the agreement. In the blockchain and service layer. The transaction of the remittance can be reviewed to determine the progress of the contract in the blockchain and service layer

Completion of contract

When the payment of the transaction amount written in the contract is completed, the status of the corresponding contract is changed to "waiting for completion." Once the contents of the contract are verified and confirmed between the parties, the status is changed to "completed" and the transaction cost will be given to the party that receives the contract.

Cancellation of contract

The contract may be cancelled or terminated due to circumstances mutual to both parties while the contract is in progress. A contract that has already been uploaded cannot be deleted, and can only be cancelled by creating an additional contract to override the original. In this case, the information of the cancelled contract will be entered on the E-Contract, and a settlement agreement between both parties, or a refund or additional payment request according to the contract will be settled by creating a new payment contract based on the cancelled contract.

When the contract is cancelled due to certain reasons between the parties, the E-Contract service actively supports the technical part so that the data stored in the Decentralized Data Storage regarding all the details that took place in the contract process can be easily browsed.

Modification of contract

If there is a sudden problem unforeseen at the time of the contract process, the parties may change the contents of the contract through a special contract. Once the parties create a special contract and all persons involved agree to such, the corresponding special contract will be attached as a subcontract of the main contract. In addition, the Hash String of the subcontract will be uploaded to the Smart Contract, and the contents of the subcontract will be uploaded in the Decentralized Data Storage.

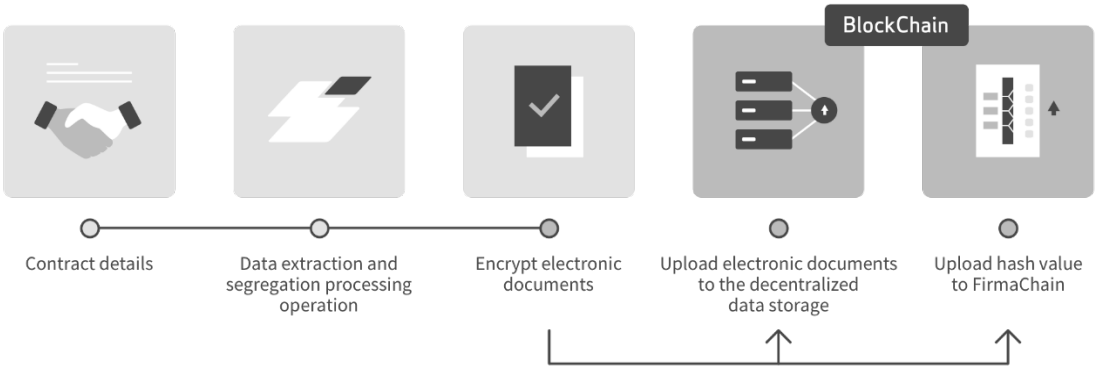
If there are any changes to the transaction amount when amending the contract, the amount of the new deposit will be additionally remitted or refunded depending on the deposit amount set previously.

***Hash String**

A **Hash String** uses a cryptographic hash function to map a data of arbitrary length to a string of fixed length. This function is a unidirectional function, so it cannot obtain the original data from the Hash String. Even a slight modification to the original will create a completely different Hash String, so it can check the integrity of the data and is used as the unique identification value of electronic documents at FIRMACHAIN. For cryptographic hash functions, proven algorithms such as SHA256 or SHA512 are used.

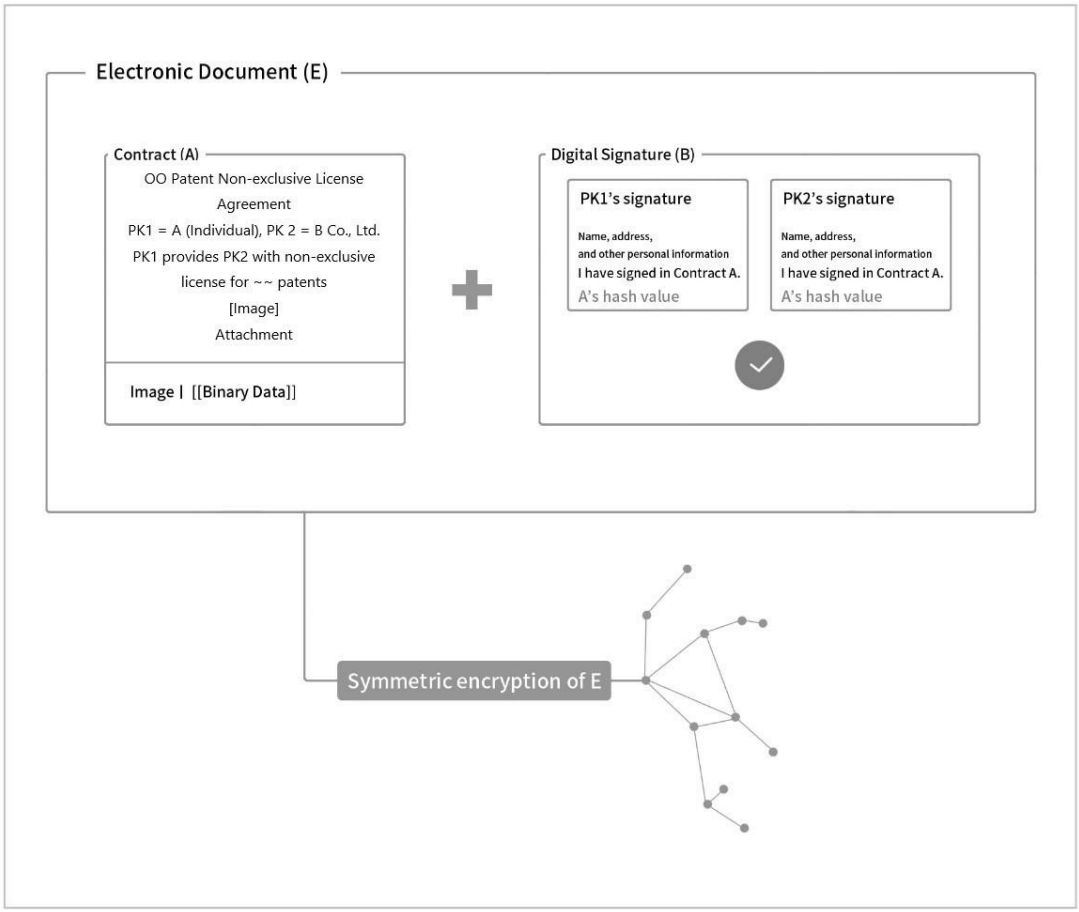
4.2 Service Layer (Firma Network)

The Firma Network acts as a processor and inspector between the E-Contract service of the application layer and the core layer. The contract is created through the E-Contract, and it needs to undergo a processing operation in the middle before it can be uploaded on the **FIRMACHAIN**.



The processing operation refers to processing the text data and other data (such as images, music, recordings, etc.) found in the electronic contract document and uploading it to the Decentralized Data Storage. Generally, users are recommended to make the contract data composed of a text data only.

However, there are contacts in which non-text contents are necessary. For these types of contracts, if the electronic documents produced using the Markdown syntax, which is supported by the E-Contract, are transferred to the Firma Network, the images and other files part of the contract are included in the electronic document. Also, in the case of electronic signatures, they are replaced with ***digital signatures** (using a public key cryptographic method, e.g. RSA, Merkle, Signature, etc.). With this, a unified document is uploaded to the Decentralized Data Storage once the processing operation is finished.



The contracting parties will receive a public key (PK) and a secret key (SK) created by the RSA method upon signing up on the E-Contract service, and each contracting party will have one key pair.

In the contract section (A), the contracting parties' PK are included. Before we jump into the explanation, let us assume that there are 2 contracting parties, and we will refer to each pair of keys (SK and PK) as (SK1, PK1) and (SK2, PK2). In the digital signature section (B), the message that includes the personal or company information as well as the agreement to fulfill the contents of Contract A are encrypted with their own SK for both contracting parties. The Hash String of Contract A is included in the message in order to identify Contract A.

An electronic document, E, containing both Contract A and Digital Signature B is created, and the keys are issued only to the contracting parties using a symmetric password cryptographic system. This is uploaded to the Decentralized Data Storage. The Hash String of

the document is uploaded to the Smart Contract of FIRMACHAIN, and the contract is implemented.

Patent Right Licensing Agreement (for Exclusive License)

This Agreement is made and entered into by and between A Co., Ltd. (“Company A”) and B Co., Ltd. (“Company B”) as follows:

Article 1 (Purpose)
Company A shall grant an exclusive license for the patent right held by Company A as specified below (the “Patent”) to Company B:

Patent Number	No.
Title of Invention	

Article 2 (Registration of License)
Upon execution of this Agreement, Company B may register the establishment of the license indicated in the preceding Article at its own expense. Company A shall cooperate therefor.

Article 3 (Coverage of License)
The coverage of Company B’s use of the Patent is as follows:

1. Region: Republic of Korea
2. Period: X years from X X, 20XX
3. Type of use: Manufacturing and sale

Article 13 (Non-refund of Licensing Fee)
In no case shall Company B return the licensing fee that it has already received.

Article 14 (Termination)
Upon the occurrence of one of following events, Company A may terminate this Agreement immediately without giving notice to Company B:

1. Company B fails to pay the licensing fee in a timely manner;
2. Company B fails to use the Patent within X months from the date of execution of this Agreement without a justifiable reason; or
3. Any of the notes or checks that Company B has issued or endorsed is in default.

…

Attachment. Contract Contents
[[image::Binary Data…]]

Digital Signature of Company A:
[[Digital Signature::0GCSqGSZKjeGcjDlb3D…]]

Digital Signature of Company B
[[Digital Signature::DOL5Ulsuulb3DQEISaC…]]

<Example of an electronic document before encryption after the processing is complete>

The example shown above is an electronic document that has been processed. This electronic document consists of a text data that includes the contents of the contract; a binary or base64-encoded data, such as images, music, recordings, etc.; and a Public Key that can verify the digital signature of the parties at any time.

The above example may be subject to some revisions after reviewing it with our partner law firm to ensure the effectivity of legal evidence of the electronic documents and electronic contracts.

$A = Contents\ of\ a\ contract$ $E_K(M): Encrypt\ M\ by\ using\ key\ K$

$HASH_A = SHA256(A)$ $S = Secret\ key\ of\ A$

$SK, PK = KEY\_GENERATE()$

$M1 = "Information\ about\ PK1,\ I\ agree\ with\ this\ contract(HASH_A)"$

$M2 = "Information\ about\ PK2,\ I\ agree\ with\ this\ contract(HASH_A)"$

$S1 = E_{SK1}(M1)$

$S2 = E_{SK2}(M2)$

$B = S1||S2$

$W = A||B$

$C_W = E_S(W)$

$HASH_W = SHA256(C_W)$

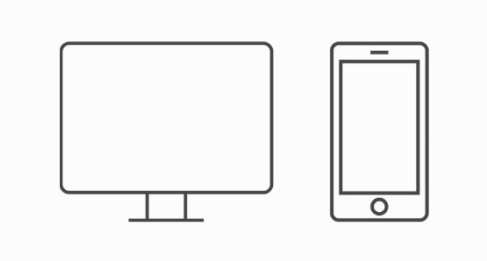
$HASH_W \rightarrow Smart\ Contract$

$C_W \rightarrow Decentralized\ Data\ Storage$

The above formula illustrates the process of creating an electronic document that is uploaded to the Decentralized Data Storage by combining the contents of the contract and the digital signature. As E-Contract development progresses, changes may occur if a more efficient and more secure algorithm is discovered.

These types of processing operations are only used in E-Contracts. Other DApps using the Firma Network can create various processing algorithms to suit the nature of the service. This allows us to create a variety of services through the efficacy of the contract, and this will become the basis for producing various electronic document-based services.

4.3 Application Layer (DApp)



The basic role of the **E-Contract (DApp, Decentralized Application)** is to write contracts, make necessary modifications under the agreement of the parties, receive confirmation from all contracting parties, and upload this state to the blockchain. In addition, all core tasks required for the contract such as confirming and changing the status will be carried out in the E-Contracts, by connecting the Smart Contract code of the Ethereum or CosmWasm. The parties may check the contract before signing, and all of the contract processes after signing can be managed using the E-Contract. In addition, as mentioned in the introduction, many functions are available to assist in the contract writing and implementation process, some of which are described below.

Markdown and Visual Editor that help in writing contracts

You can create a contract using DApp. The content creation should be done according to the Markdown syntax as defined by the E-Contract in order to textualize the data. Of course, it supports Visual Editor (WYSIWYG) for those users who have difficulties in using Markdown syntax. In addition, it also provides a conversion function to enable the use of existing contract formats such as doc and hwp.

Security enhancement system for digital signatures

Most electronic signature services are written directly on the digital canvas in the contract. However, this can easily be done by someone else as a proxy, and one cannot expect to have the same non-repudiation effect as an authorized certificate. Signatures affixed in written contracts are also exposed to such risks. Even if this may have legal effect, it is difficult to determine who actually affixed the signature. E-Contract allows users to use a **digital signature**

registration system provided by Firma Network after signing up. This system makes it easier to have proof when a legal dispute arises. The details are given below.

Standard contract preset support

You may receive various standard contracts used in the industry that were reasonably prepared based on legal advice before the time of writing. If the contract is not significantly different from the standard contract, users can immediately create a contract by changing only the parties to the transaction, contracting entities, project name, transaction amount, date, etc. In addition, users may edit the standard contract and save the contract they have created.

Identifying progress and revision history of contract

Users can determine the progress of their agreement through the E-Contract. In addition, when the contents of the contract are changed, users can add DiffTool to compare which parts have been modified or deleted and they will be able to see the changes at a glance. This tool will help the contracting parties recognize the modifications that took place in the contract.

Matching Service for legal advice on cross-border contracts

There may be cases wherein it is difficult to draft cross-border contracts due to differences in customs and laws between countries. Upon comparing and analyzing such cases, Tooltip for legal advice from third-party professionals will be provided when creating contracts. In addition, we are also planning to provide a matching service for one-on-one legal advisory services from third-party professionals for contracts with large or frequent transactions.

Besides this, various convenience functions will be added to make it easier to proceed with the contract.

For the E-Contract web services, we are planning to build a server with Node.js Framework using JavaScript (ES7 standard). For the web, we plan to apply the ReactJS library. We have chosen ReactJS since it is a library optimized for creating a view that is easy to see and understand so that the parties may implement the contract in an easier way.

The mobile services are in the planning stage. The main service will be done via web, and we are planning to provide various functions such as chatting between the contracting parties, notifications of the contract progress, etc., on mobile. We will be using React Native, or build it using the native language of the platform (iOS and Android).

The technology to be used in the service development has been chosen to meet our goal: to develop as quickly as possible while allowing us to have a stable and efficient development.

In addition, we will create and distribute an SDK, which will allow users to use electronic contracts and signatures, one of the core functions of the E-Contract service, in a modular format for all web and app services that require contracts. We are also planning to produce various electronic document services using FIRMACHAIN.

5. Roadmap

Further information on **FIRMACHAIN**'s roadmap can be found at the following websites.

[FIRMACHAIN Official Site]
https://firmachain.org/roadmap/

[FIRMACHAIN Medium]
https://medium.com/firmachain

6. Token Status

Information on **FIRMACHAIN** token can be found on Xangle's public announcement channel.

[Xangle URL]
https://xangle.io/en/assets/FCT2

7. Team

Further information about the main members of **FIRMACHAIN** can be found on the official website.

[FIRMACHAIN Official Site]
https://firmachain.org/about/

8. Advisor

Han Jong Lee

CEO

Goodtimewith.me

FIRMACHAIN's vision is to reform the basis of our modern society, the written contract, by eliminating its various complications through the decentralization, transparency and credibility that block chains offer.

Especially in the case of multinational contracts, issues of conflict such as country-by-country double taxation, overseas incorporation, remittance abroad, and fee arrangement can be resolved transparently and effectively with our technical skills that are basd on a framework of economic growth. With hopes to materialize such vision, along with our prolonged teamwork, and quick, flexible executions, Firma team invites you to join us on a challenge that seeks authenticity.

Hyeonwook Jeong

CEO / Founder

beSUCCESS

There are still lots of spaces that can be improved in the blockchain-based data storage, especially in the form of electronic documents and contracts. I have seen and worked with the FIRMACHAIN team from the early stage.

Based on my personal experience, I believe FIRMACHAIN will keep growing and will remain strong in the future, because it is handled by a solid team with a realistic road map. Due to its strong development team, FIRMACHAIN also has a high potential for producing solutions that can bring more innovation to the transaction and can add even more speed to it. Personally, I am excited to be joining as an adviser and am happy to support the global expansion of this project.

Guho Son

CEO

Monument Company

Former Managing Director of

SoftBank Ventures

Starting with the financial industry, blockchain has been leading the 4th industrial revolution and is believed to be the leading technology. The numerous count of devices and the skyrocketing trade volume has caused traditional cloud based centralised systems various problems such as system maintenance, and security.

FIRMACHAIN's solution will create a more transparent and secure resolution not only for the financial industry, but in retail, manufacturing, and in resolving social-cultural issues, ultimately bringing a positive impact to our economy.

Jiwook Kim

Attorney at law

Partner at Yoon & Yang LLC

Blockchain technology, based on the responsibility of the participants within the network, verifies transactions and decentralizes encrypted information allowing for better transparency and security. FIRMACHAIN utilizes these aspects of the blockchain and has formulated a blockchain-based electronic contract platform. This allows for simplified contract procedures (drafting, negotiating, closing) and by uploading to the blockchain network this contract can be verified by those participating in the network, eliminating the risks of forgery and emphasizing transparency for safe contract management. FIRMACHAIN is the solution to the disadvantages we experience with traditional contracts.

9. Partnership

Strategic Partners

Ecosystem Partners

Press

10. Disclaimer

Please read this entire section carefully. If you are in any doubt as to the action you should take, please consult your legal, financial, tax or other professional advisor(s).

1.1 Legal Statement

(a) This Whitepaper ("**Whitepaper**"), in its current form, is circulated for general information purposes only in relation to the platform and applications described in the Whitepaper ("**Platform**") as presently conceived and is subject to review and revision. Please note that this Whitepaper is a work in progress and the information in this Whitepaper is current only as of the date on the cover hereof. Thereafter, the information, including information concerning FIRMACHAIN Pte Ltd (the "**Company**") business operations and financial condition may have changed. We reserve the right to change, modify, add or delete parts of this Whitepaper or website without notice for any reason or at any time.

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(c) This Whitepaper does not constitute or form part of any opinion on any advice to sell, or any solicitation of any offer by the issuer/distributor/vendor of the Tokens to purchase any Tokens nor shall it or any part of it nor the fact of its presentation form the basis of, or be relied upon in connection with, any contract or investment decision.

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(f) This Whitepaper or any part hereof may not be reproduced, distributed or otherwise disseminated in any jurisdiction where offering coins/tokens in the manner set out this Whitepaper is regulated or prohibited.

(g) No regulatory authority has reviewed, examined or approved of any of the information set out in this Whitepaper. No such action has been or will be taken in any jurisdiction.

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(a) The Tokens, the Platform and related services provided by the Company and its affiliates are provided on an "as is" and "as available" basis. The Company and its Affiliates do not grant any warranties or make any representation, express or implied or otherwise, as to the accessibility, quality, suitability, accuracy, adequacy, or completeness of the Tokens, the Platform or any related services provided by the Company and its Affiliates, and expressly disclaim any liability for errors, delays, or omissions in, or for any action taken in reliance on, the Tokens, the Platform and related services provided by the Company and its Affiliates.

(b) The Company, its Affiliates and its directors, officials and employees do not make or purport to make, and hereby disclaim, any representation, warranty or undertaking in any form whatsoever to any entity or person, including any representation, warranty or undertaking in relation to the truth, accuracy and completeness of any of the information set out in this Whitepaper.

(c) To the maximum extent permitted by the applicable laws and regulations, the Company and its Affiliates shall not be liable for any indirect, special, incidental, consequential or other losses of any kind, in tort, contract or otherwise (including but not limited to loss of revenue, income or profits, and loss of use or data), arising out of or in connection with any acceptance of or reliance on this Whitepaper or any part thereof by you.

1.4 Cautionary Note on Forward-Looking Statements

(a) Certain information set forth in this Whitepaper includes forward-looking information regarding the future of the project, future events and projections. These statements are not statements of historical fact and may be identified by but not limited to words and phrases such as "will", "estimate", "believe", "expect", project", "anticipate", or words of similar meaning. Such forward-looking statements are also included in other publicly available materials such as presentations, interviews, videos etc., information contained in this Whitepaper constitutes forward-looking statements including but not limited to future results, performance, or achievements of the Company or its Affiliates.

(b) The forward-looking statements involve a variety of risks and uncertainties. These statements are not guarantees of future performance and no undue reliance should be placed on them. Should any of these risks or uncertainties materialize, the actual performance and progress of the Company or its Affiliates might differ from expectations set by the forward-looking statements. The Company or its Affiliates undertake no obligation to update forward-looking statements should there be any change in circumstances. By acting upon forward-looking information received from this Whitepaper, the Company or its Affiliates' website and other materials produced by the Company or its Affiliates, you personally bear full responsibility in the event where the forward-looking statements do not materialize.

(c) As of the date of this Whitepaper, the Platform has not been completed and is not fully operational. Any description pertaining to and regarding the Platform is made on the basis that the Platform will be completed and be fully operational. However, this paragraph shall in no way be construed as providing any form of guarantee or assurance that the Platform will eventually be completed or be fully operational.

1.5 Potential Risks

By purchasing, holding and using the Tokens, you expressly acknowledge and assume the risks set out in this section if any of these risks and uncertainties develops into actual events, the business, financial condition, results of operations and prospects of the Company or its Affiliates may be materially and adversely affected. In such cases,

you may lose all or part of the value of the Tokens. Such risks include but are not limited to the following:

Risks Relating to the Tokens

(a) **There may not be a public or secondary market available for the Tokens**

I. The Tokens are intended to be native tokens to be used on the Platform, and the Company and its Affiliates have not and may not actively facilitate any secondary trading or external trading of Tokens. In addition, there is and has been no public market for the Tokens and the Tokens are not traded, whether on any cryptocurrency exchange or otherwise. In the event that the Tokens are traded on a cryptocurrency exchange, there is no assurance that an active or liquid trading market for the Tokens will develop or if developed, be sustained. There is also no assurance that the market price of the Tokens will not decline below the purchase amount paid for the Tokens, which is not indicative of such market price.

II. A FCT Token and/or FIRMA Token is not a currency issued by any central bank or national, supra-national or quasi-national organisation, nor is it backed by any hard assets or other credit. The Company and its Affiliates are not responsible for nor do they pursue the circulation and trading of the Tokens on the market. Trading of the Tokens merely depends on the consensus on its value between the relevant market participants, and no one is obliged to acquire any Tokens from any holder of the Tokens, including the purchasers of the Tokens, nor does anyone guarantee the liquidity or market price of the Tokens to any extent at any time. Accordingly, the Company and its Affiliates cannot ensure that there will be any demand or market for the Tokens, or that the price upon which the Tokens were purchased is indicative of the market price of the Tokens if they are made available for trading on a cryptocurrency exchange.

Risks Relating to the Company, its Affiliates and the Platform

(a) **Limited availability of sufficient information**

The Platform is still at an early development phase as of the date of this Whitepaper. Its governance structure, purpose, consensus mechanism, algorithm, code, infrastructure design and other technical specifications and parameters may be updated and changed frequently without notice. While this Whitepaper contains the key information currently available in relation to the Platform, it is subject to adjustments and updates from time to time, as announced on the Company's website. Purchasers will not have full access to all the information relevant to the Tokens and/or the Platform. Nevertheless, it is anticipated that significant milestones and progress reports will be announced on the Company's website from time to time where deemed necessary in the Company's sole discretion.

(b) **The digital assets raised in the sale of the Tokens are exposed to the risks of theft.**

Whilst the Company and its Affiliates will make every effort to ensure that any cryptocurrencies received from the sale of Tokens are securely held through the implementation of security measures, there is no assurance that there will be no theft of the cryptocurrencies as a result of hacks, mining attacks, sophisticated cyber-attacks, distributed denials of service or errors, vulnerabilities or defects on such blockchain addresses, or any other blockchain, or otherwise. Such events may include, for example, flaws in programming or source code leading to exploitation or abuse thereof. In such event, even if the sale of Tokens is completed, the Company and its Affiliates may not be able to receive the cryptocurrencies raised and the Company and its Affiliates may not be able to utilize such funds for the development of the Platform, and the launch of the Platform might be temporarily or permanently curtailed. As such, the issued Tokens may hold little worth or value. The Tokens are uninsured, unless you specifically obtain private insurance to insure them. In the event of any loss or loss of value of the Tokens, you may have no recourse.

(c) **The blockchain address(es) may be compromised and the digital assets may not be able to be retrieved.**

The blockchain address(es) are designed to be secured. However, in the event that the blockchain address(es) for the receipt of purchase amounts or otherwise are, for any reason, compromised (including but not limited to scenarios of the loss of keys to such blockchain address(es), the funds held at such blockchain address(es) may not be able to be retrieved and disbursed, and may be permanently unrecoverable. In such event, even if the sale of the Tokens is successful, the Company and its Affiliates will not be able to receive the funds raised and the Company and its Affiliates will not be able to utilize such funds for the development of the Platform, and the implementation of the Platform might be temporarily or permanently curtailed. As such, distributed Tokens may hold little worth or value.

(d) **There is no assurance of any success of the Platform and the Company and its Affiliates may cease the development, launch and operation of the Platform.**

I. The value of, and demand for, the Tokens hinges heavily on the performance of the Platform. There is no assurance that the Platform will gain traction after its launch and achieve any commercial success. The Platform has not been fully developed, finalized and integrated and is subject to further changes, updates and adjustments prior to its launch. Such changes may result in unexpected and unforeseen effects on its projected appeal to users, and hence impact its success. There are no guarantees that the process for creating the Tokens will be uninterrupted or error-free.

II. While the Company has made every effort to provide a realistic estimate, there is also no assurance that the cryptocurrencies raised in the sale of Tokens will be sufficient for the development and integration of the Platform. For the foregoing or any other reason, the development and integration of the Platform may not be completed and there is no assurance

that its systems, protocols or products will be launched at all. As such, distributed Tokens may hold little or no worth or value.

III. Additional reasons which may result in the termination of the development, launch or operation of the Platform includes, but is not limited to, (aa) an unfavorable fluctuation in the value of cryptographic and fiat currencies, (bb) the inability of the Company and its Affiliates to establish the Platform or the Tokens' utility or to resolve technical problems and issues faced in relation to the development or operation of the Platform or the Tokens, the failure of commercial relationships, (cc) intellectual property disputes during development or operation, and (dd) changes in the future capital needs of the Company or its Affiliates and the availability of financing and capital to fund such needs. For the aforesaid and other reasons, the Platform may no longer be a viable project and may be dissolved or not launched, negatively impacting the Platform and the potential utility and value of issued FCT Tokens and/or FIRMA Tokens.

(e) **There may be lack of demand for the Platform and the services provided, which would impact the value of the Tokens.**

I. There is a risk that upon launching of the Platform, there is a lack of interest from consumers, merchants, advertisers, and other key participants for the Platform and the services, and that there may be limited interest and therefore use of the Platform and the Tokens. Such a lack of interest could impact the operation of the Platform and the uses or potential value of the Tokens.

II. There is a risk of competition from alternative platforms that may have been established, or even from existing businesses which would target any segment of the potential users of the Platform fulfilling similar demands, e.g. corporations targeting advertisers seeking purchase consumer data and market analysis. Therefore, in the event that the competition results in a lack of interest and demand for the Platform, the services and the Tokens, the operation of the Platform and Tokens' value may be negatively impacted.

(f) **The Company and its Affiliates may experience system failures, unplanned interruptions in its network or services, hardware or software defects, security breaches or other causes that could adversely affect the Company or its Affiliates' infrastructure network, or the Platform.**

I. The Company and its Affiliates are unable to anticipate or detect when there would be occurrences of hacks, cyber-attacks, mining attacks (including but not limited to double-spend attacks, majority mining power attacks and "selfish-mining" attacks), distributed denials of service or errors, vulnerabilities or defects in the Platform, the Tokens, or any technology (including but not limited to smart contract technology) on which the Company, its Affiliates, the Platform, the Tokens, rely on or the Ethereum Blockchain or any other blockchain. Such events may include, for example, flaws in programming or source code leading to exploitation or abuse thereof. The Company and its Affiliates may not be able to detect such issues in a timely manner, and may not have sufficient resources to efficiently cope with multiple service incidents happening simultaneously or in rapid succession.

II. Although the Company and its Affiliates will be taking steps against malicious attacks on its appliances or its infrastructure, which are critical for the maintenance of the Platform and its other services, there can be no assurance that cyber-attacks, such as distributed denials of service, will not be attempted in the future, and that any of such security measures will be effective. Any significant breach of security measures or other disruptions resulting in a compromise of the usability, stability and security of the Company and its Affiliates' network or services, including the Platform.

Risks Relating to the Participation in the Sale of Tokens

(a) **You may not be able to recover the purchase amount paid for the Tokens.**

Except as provided under any applicable terms of sale or prescribed by applicable laws and regulations, the Company is not obliged to provide you

with a refund of the purchase amount. No promises of future performance or price are or will be made in respect to the Tokens, including promises of inherent value or continuing payments, and there is no guarantee that the Tokens will hold any particular value. Therefore, the recovery of the purchase amount may be impossible or may be subject to applicable laws and regulations.

(b) **You may be subject to adverse legal and/or tax implications as a result of the purchase, distribution and use of the Tokens.**

I. The legal character of cryptocurrency and cryptographic assets remain uncertain. There is a risk that the Tokens may be considered securities in certain jurisdictions, or may be considered to be securities in certain jurisdictions in the future. The Company and its Affiliates does not provide any warranty or guarantee as to how the Tokens will be classified, and each purchaser will bear all consequences of the Tokens being considered securities in their respective jurisdictions, and bear the responsibility of the legality, use and transfer of the Tokens in the relevant jurisdictions.

II. Further, the tax treatment of the acquisition or disposal of such cryptocurrency or cryptographic assets might depend on whether they are classified as securities, assets, currency or otherwise. As the tax characterization of the Tokens remains indeterminate, you must seek your own tax advice in connection with the purchase, acquisition or disposal of the Tokens, which may result in adverse tax consequences or tax reporting requirements for you.

(c) **The loss or compromise of information relating to the purchaser wallet and your method of accessing the Platform may affect your access to and possession of the Tokens.**

There is a risk that you may lose access to and possession of the Tokens permanently due to loss of unique personal ID created on the Platform, and other identification information, loss of requisite private key(s) associated with

the purchaser wallet or vault storing the Tokens or any other kind of custodial or purchaser errors.

(d) **Blockchains may face congestion and transactions may be delayed or lost.**

Most blockchains used for cryptocurrency transactions (e.g. Ethereum) are prone to periodic congestion during which transactions can be delayed or lost. Individuals may also intentionally spam the network in an attempt to gain an advantage in purchasing cryptographic tokens. This may result in a situation where block producers may not include your purchase of the Tokens when you intends to transact, or your transaction may not be included at all.

Privacy and data retention issues.

As part of the Tokens sales, the verification processes and the subsequent operation of the Platform, the Company may collect personal information from you. The collection, use and disclosure of such information is subject to applicable laws and regulations, and privacy policies provided by the Company All information collected will be used for purposes of the Tokens sales and operations of the Platform, thus it may be transferred to contractors, service providers and consultants worldwide as appointed by the Company. Apart from external compromises, the Company and its appointed entities may also suffer from internal security breaches whereby their employees may misappropriate, misplace or lose personal information of purchasers. The Company may be required to expend significant financial resources to alleviate problems caused by any breaches or losses, settle fines and resolve inquiries from regulatory or government authorities. Any information breaches or losses will also damage the Company's reputations, thereby harming its long-term prospects.

Macro Risks

(a) **General global market and economic conditions may have an adverse impact on the Company and its Affiliates' operations and the use of the Platform.**

I. The Company and its Affiliates could be affected by general global economic and market conditions. Challenging economic conditions worldwide have from time to time, contributed, and may continue to contribute, to slowdowns in the information technology industry at large. Weakness in the economy may have a negative effect on the Company and its Affiliates' business strategies, results of operations and prospects.

II. Suppliers on which the Platform relies for servers, bandwidth, location and other services could also be negatively impacted by economic conditions that, in turn, could have a negative impact on the Company and its Affiliates' operations or expenses.

III. There can be no assurance, therefore, that current economic conditions or worsening economic conditions or a prolonged or recurring recession will not have a significant adverse impact on the Company and its Affiliates' business strategies, results of operations and prospects and hence the Platform, which may in turn impact the value of the Tokens.

(b) **The regulatory regime governing blockchain technologies, cryptocurrencies, Tokens, offering of Tokens, and the Platform remain uncertain, and any changes, regulations or policies may materially adversely affect the development of the Platform and the utility of the Tokens**

I. Regulation of the Tokens, the offer and sale of Tokens, cryptocurrencies, blockchain technologies, and cryptocurrency exchanges is currently undeveloped or underdeveloped and likely to rapidly evolve. Such regulation also varies significantly among different jurisdictions, and is hence subject to significant uncertainty. The various legislative and executive bodies in different jurisdictions may in the future adopt laws, regulations, guidance, or other actions, which may severely impact the development and growth of the Platform, the adoption and utility of the Tokens or the issue, offer, and sale of the Tokens by the Company. Failure by the Company and its Affiliates or users of the Platform to comply with any laws, rules and regulations, some of which may not exist yet or are subject to interpretation and may be subject to change,

could result in a variety of adverse consequences against the Company and its Affiliates, including civil penalties and fines.

II. Blockchain networks also face an uncertain regulatory landscape in many foreign jurisdictions. Various jurisdictions may, in the near future, adopt laws, regulations or directives that affect the Platform, and therefore, the value of the Tokens. Such laws, regulations or directives may directly and negatively impact the operations of the Company and its Affiliates. The effect of any future regulatory change is impossible to predict, but such change could be substantial and could materially adverse to the development and growth of the Platform and the adoption and utility of the Tokens.

III. To the extent that the Company and its Affiliates may be required to obtain licenses, permits and/or approvals (collectively, the "Regulatory Approvals") to carry out its business, including that of the creation of the Tokens and the development and operation of the Platform, but are unable to obtain such Regulatory Approvals or if such Regulatory Approvals are not renewed or revoked for whatever reason by the relevant authorities, the business of the Company and its Affiliates may be adversely affected.

IV. There is no assurance that more stringent requirements will not be imposed upon the Company and its Affiliates by the relevant authorities in the future, or that the Company and its Affiliates will be able to adapt in a timely manner to changing regulatory requirements. These additional or more stringent regulations may restrict the Company and its Affiliates' ability to operate its business and the Company and its Affiliates may face actions for non-compliance if it fails to comply with any of such requirements.

V. Further, should the costs (financial or otherwise) of complying with such newly implemented regulations exceed a certain threshold, maintaining the Platform may no longer be commercially viable and the Company and its Affiliates may opt to discontinue the Platform and/or the Tokens. Further, it is difficult to predict how or whether governments or regulatory authorities may implement any changes to laws and regulations affecting distributed ledger technology and its applications, including the Platform and the Tokens. The Company and

its Affiliates may also have to cease operations in a jurisdiction that makes it illegal to operate in such jurisdiction, or make it commercially unviable or undesirable to obtain the necessary regulatory approval(s) to operate in such jurisdiction. In scenarios such as the foregoing, the distributed Tokens may hold little or no worth or value.

(c) **There may be risks relating to acts of God, natural disasters, wars, terrorist attacks, riots, civil commotions widespread communicable diseases and other events beyond the control of the Company and its Affiliates**

The sale of the Tokens and the performance of the Company, its Affiliates and/or the Platform's activities may be interrupted, suspended or delayed due to acts of God, natural disasters, wars, terrorist attacks, riots, civil commotions, widespread communicable diseases and other events beyond the control of the Company and its Affiliates. Such events could also lead to uncertainty in the economic outlook of global markets and there is no assurance that such markets will not be affected, or that recovery from the global financial crisis would continue. In such events, the Company and its Affiliates' business strategies, results of operations and outlook may be materially and adversely affected, and the demand for and use of the Tokens and the Platform may be materially affected. Further, if an outbreak of such infectious or communicable diseases occurs in any of the countries in which the Company, its Affiliates, and the participants of the Platform have operations in the future, market sentiment could be adversely affected and this may have a negative impact on the Platform and its community.

(d) **Blockchain and cryptocurrencies, including the Tokens are a relatively new and dynamic technology. In addition to the risks highlighted herein, there are other risks associated with your purchase of, holding and use of the Tokens, including those that we cannot anticipate. Such risks may further materialize as unanticipated variations or combinations of the risks discussed herein.**

1.6 No Further Information or Update

No person has been or is authorized to give any information or representation not contained in this Whitepaper in connection with the Tokens, the Platform, the Company or its Affiliates and their respective businesses and operations, and, if given, such information or representation must not be relied upon as having been authorized by or on behalf of the Company or its Affiliates.

1.7 Language

This Whitepaper may be translated into other languages. If any disagreement should arise due to different language translations, the version in English will prevail.

1.8 Advice

No information in this Whitepaper should be considered to be business, legal, financial or tax advice regarding the Tokens, the Platform, the Company or its Affiliates. You should consult your own legal, financial, tax or other professional advisor(s) regarding the Tokens, the Company or its Affiliates and their respective businesses and operations. You should be aware that you may be required to bear the financial risk of any purchase of the Tokens for an indefinite period of time.