AI Blockchain Emotional Intelligence

[Whitepaper_ENG.ver]

Elamachain
[v1.54]

0. Prologue

"… the Godelian strange loop that arises in formal systems in mathematics (i.e., collections of rules for churning out an endless series of mathematical truths solely by mechanical symbol-shunting without any regard to meanings or ideas hidden in the shapes being manipulated) is a loop that allows such a system to "perceive itself," to talk about itself, to become "self-aware," and in a sense it would not be going too far to say that by virtue of having such a loop, a formal system *acquires a self.*"

"… If we look from the top, the loops will be invisible, just as nowadays the current-carrying electrons are invisible to most programmers. When we create a program that passes the Turing test, we will see a "heart" even though we know it's not there."

"Godel, Escher, Bach:
An Eternal Golden Braid"

*Formal System: A series of rules to endlessly produce the mathematical truth through complete mathematical signal control, without considering meanings or ideas hiding under the controlled shape

0.
Prologue
ELAMACHAIN CI

*M.C Escher : (Waterfall , 1961)

Elamachain

World-renowned cognitive scientist Douglas R. Hofstadter published 40 years ago in 1979 “Godel, Escher, Bach: An Eternal Golden Braid,” a widely-read classics in the field of studying intelligence itself. He mentions the “Strange Loop” found in meaningless symbols. While describing the formation of meaningful recognition through this “Strange Loop”, he used the work of M.C Escher as an example. In the CI of ELAMACHAIN, which aims to build the artificial intelligence that truly understands human emotion, it conveys the meaning of both “realization of impossibility,” illustrated by Escher, and the “Strange Loop” described by Douglas R. Hofstadter.

ELAMACHAIN WHITE PAPER

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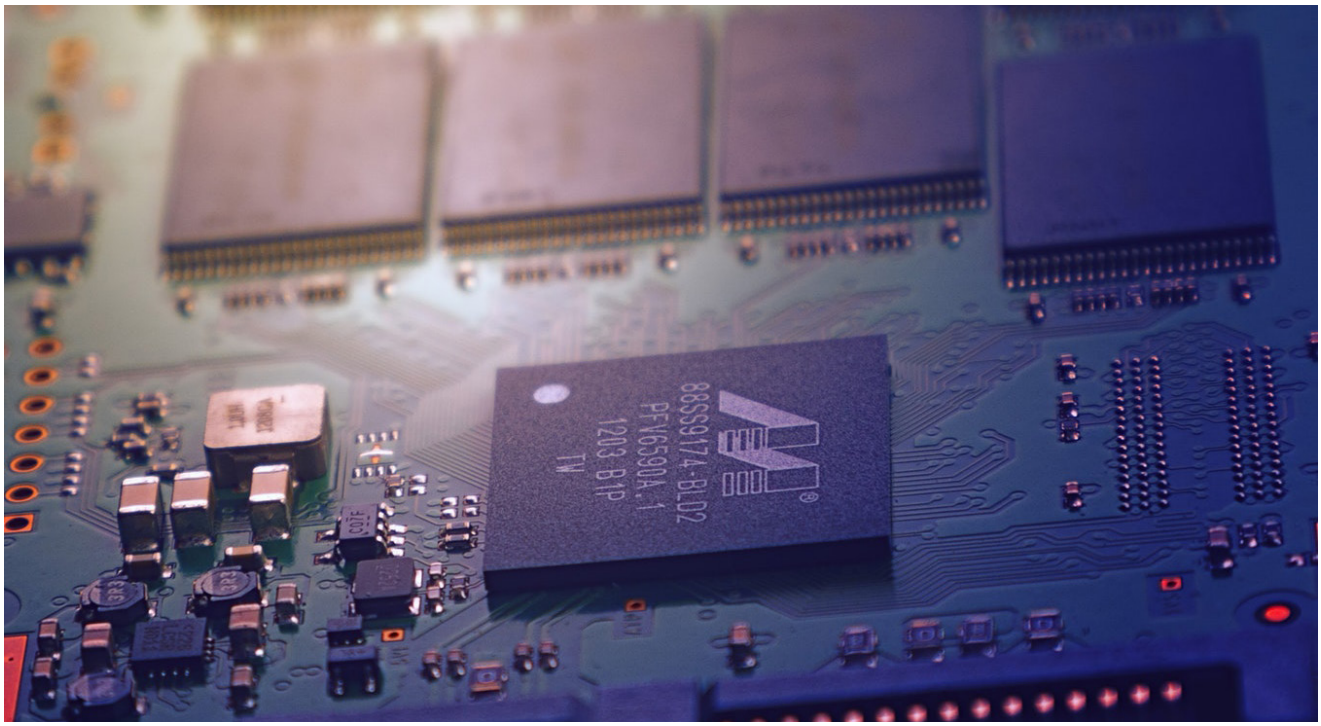
1. AI Trend & Market



1.1 Introduction

Artificial Intelligence(AI) was a concept first introduced by Prof. John McCarthy at the Dartmouth Seminar in 1956. For the past 60 years, AI has geometrically extended its influence and become a core technology of 4th industrial revolution. Now we can easily find AI technology and big-data based informational services aiding personal life at every corner of our daily lives. While it is serving as an essential part of technology industry, public attention on AI and its related technology has never been more vigorous. Hence, many industries do not hesitate any more when investing in AI, the field which is highly praised for wider potential applications than any other. McKinsey's most recent report says the world's top 2 search engine companies Alphabet(a parent company of Goolge) from US and Baidu from China had respectively spent 30 billion and 20 billion dollars in 2017 alone. Moreover, the New Yorker stated in its article on May 2018 that the Chinese government is aggressively working on developing AI technology as the utmost factor to take initiative in future technological innovation. A glance at China's investment in AI technology leaves us with astonishment. AI start-ups of China in 2017 received almost half of total fund invested to AI related start-ups worldwide. For the field of deep-learning technology, China has applied 6 times more patents than the United States. Likewise, lots of governments and larger corporations of the world have started to pour their resources in developing AI technology. As the quantity of big data is exploding and IoT so rapidly spreading, visual and voice recognition have improved drastically in a short period of time. Such change in the environment is accelerating the AI market day by day. AI technology is building its influence over every field of industry from autonomous vehicles, drones, smart-homes, medicine, and even to asset management.

1.2 Trend

The official theme of 2018 CES (Consumer Electronics Show), one of the world's largest home electronics events, was "Smart City." It was one-step evolved concept of the official theme of previous year, "Smart Home." Along with 5G and IoT, AI was highlighted as a core factor required to establishing "Smart City." At around 2010, innovations in algorithm, computing and big-data technology made a huge leap. Fusing these technologies, AI, which was only reserved for theory or expected very few limited functions in the past, can now perform specific tasks in real life. AI of today is the outcome of surprising technological advancement particularly from recent 5 years. It is applied to solve different problems in the real world successfully demonstrating its performance. AI, which is now able to recognize and study external information to assume and behave like humans, is broadly researched in wide range of business. These researches contributed to realizing AI performance to go beyond human capability. Improvements in visual and auditory intelligence enabled AI to identify different objects with higher accuracy than humans and comprehend natural language in human level. Thanks to the rise of such cognitive technology AI can recognize vast amount of external data, understand them, and finally covert them into "intellectualized information." This shows how big data accumulated over years served as a key ingredient to allow machines to learn by themselves. Especially, studies in reinforcement learning, relation networks, and prediction-based behaviors are energetically conducted both in academic and business fields only to bring AI one step closer to human intelligence. The following are 5 trends in AI expected to get the most spotlight in near future.

1) Consumers will talk more with AI

Conversation between consumers and AI is gradually increasing. By 2017 over 20 million consumers have purchased AI-embedded Amazon speaker Echo. With services like Google Home and Apple Siri vastly available at every inch of daily lives, millions of consumers are becoming more and more accustomed to vocal interactions with AI. Smart assistants are maximizing consumer convenience by integrated voice-based interface which connects computers, televisions, and other smart devices.

2) Efficiency in logistics system will be greatly increased

One of the fields that can benefit the most from explosive synergy effect from AI and advanced robot technology is the field of distribution and logistics. Kiva Systems, acquired by Amazon at 775 million dollars, produces learning robots that can effectively search and transport items in the warehouse. Such learning robots are already utilized in the field, and they are expected to serve significant roles that cannot be replaced in the logistics system as they show unprecedented level of efficiency operating 24 hours with no stop.

3) AI will aid knowledge workers

Many are concerned that wider use of AI will result in rise of unemployment rate. On the contrary, AI is aiding workers of all kinds starting from simple service laborers to sophisticated knowledge workers. AI-based tools like Gong, Chorus, and Jog which are available in market right now enable more effective customer services by utilizing machine learning algorithms for sales and customer management. Likewise, AI market for maximizing office utility is expected to grow consistently.

4) Curing diseases will meet a breakthrough with AI

Introduction of AI can bring an entirely new paradigm for curing diseases, one that is completely different from the past. AI may end unresolved challenges of the health industry by collecting and analyzing molecular and cellular data via P2P (peer-to-peer) network. A lot of AI start-ups are using the two core technologies, blockchain and AI, in their projects including disease prediction, development of new drugs, etc. Rewards via specific cryptocurrencies are used as a mean to encourage users to

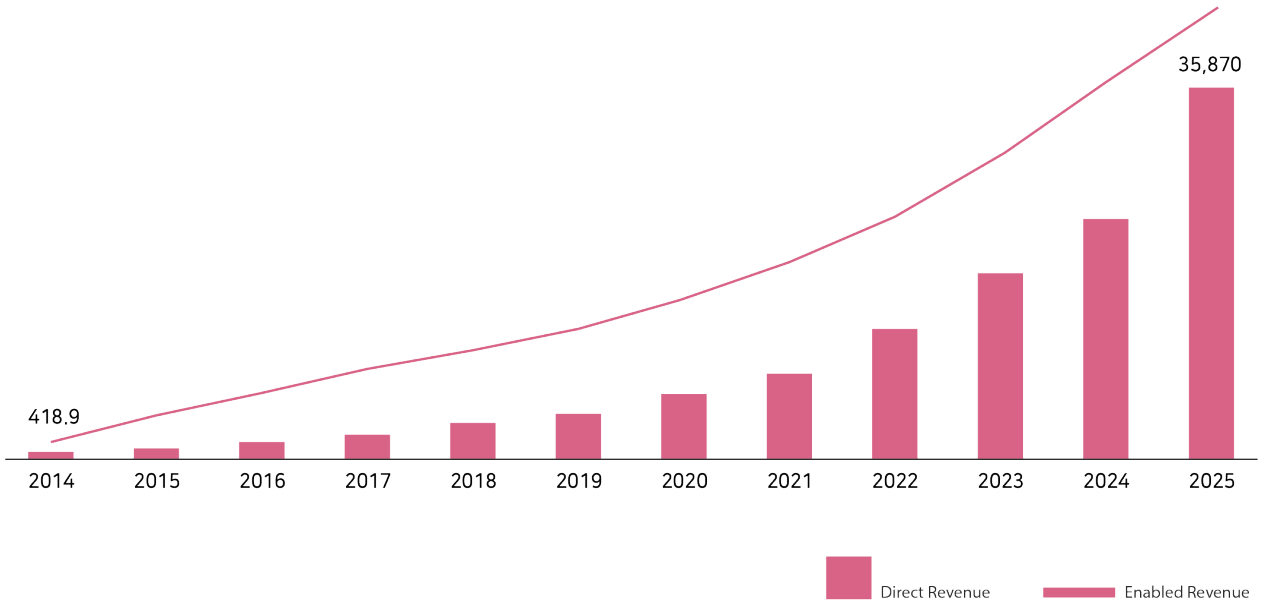
participate in the program, and through data provided by the users, programs that accumulate such user data may identify and distinguish diseases through machine learning. New drugs and treatments, which promise high efficacy at lower cost are being developed based on this innovative system.

5) AI will create more contents

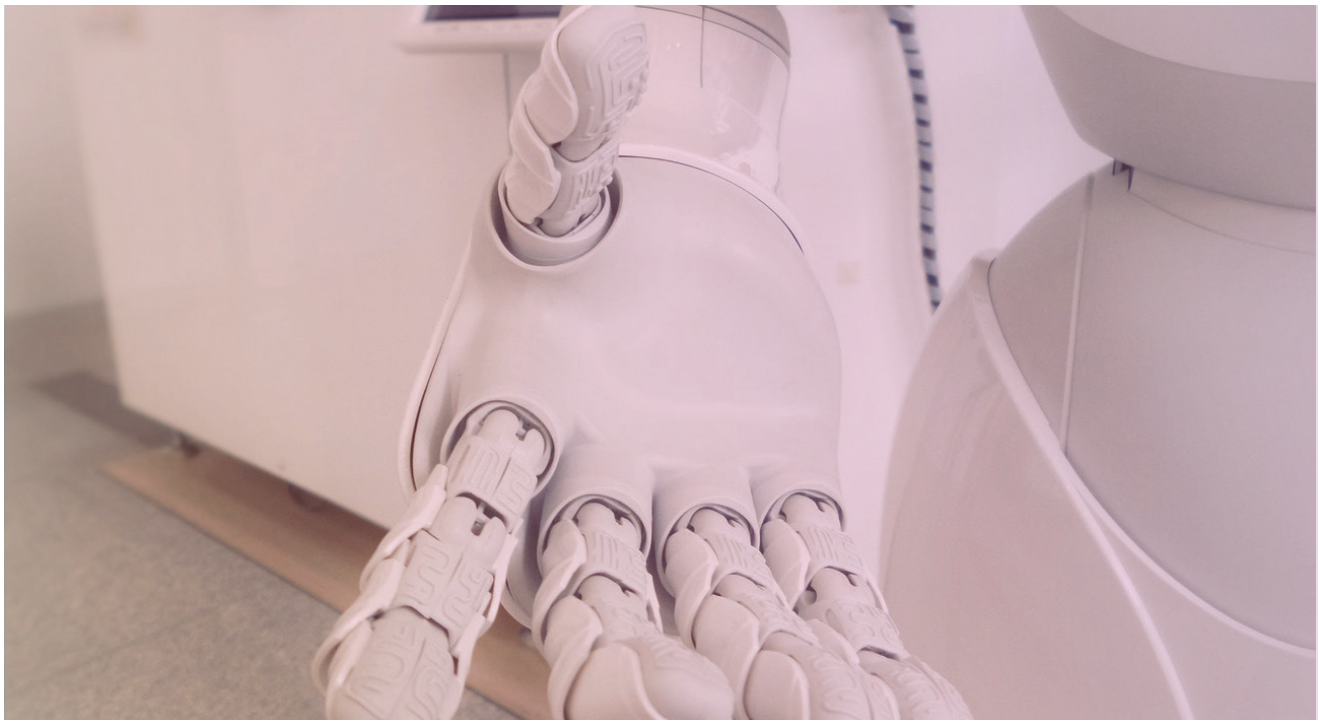
AI that writes and publishes articles is not imaginary any longer. Well-known media brands like USA Today, CBS, and Hearts are already generating news contents with AI technology. AP(Associated Press) uses Wordsmith, an AI tool produced by Automated Insights, that can write news articles based on data collection by applying natural-language generation. Moreover, tools like Wibbitz are providing SaaS (software-as-a-service) platforms that convert documents posted by publishers into video contents. As AI advances, more and more companies are expected to adopt these technologies.

1.3 Market Status

Global AI market is expected to show annual growth rate of approximately 57.2% from 2017 to 2025. In 2025 the direct sales of the AI market are expected at approximately 35.87 billion dollars, and the gross value added (GVA) incurred from AI application is expected to be approximately 58.97 billion dollars. AI market of China, which government unstintingly supports AI industry, is showing annual growth rate of over 30% every year since 2015. Chinese AI market size, which has grown by 51.2% compared to that of 2017 accounting up to 15.21 billion yuan, is expected to grow more than 2.2 times larger than 2017's level by 2019 and is speculated to be at 34.43 billion yuan. As world market recovers its vitality from the setback of 2008 US sub-prime mortgage crisis, investments are flowing back to AI industry and AI start-ups are quickly picking up the pace.



2. Problems



2.1 Limitation in Usage

1) Slow Transaction Speed

Ethereum, the second most traded cryptocurrency worldwide, generates a new block every 16 seconds. However, on average, it takes about 20 seconds to actually generate a block on the main net in reality. This speed is converted to 10 transactions per second. Despite ongoing performance enhancement through consistent upgrades, the current transaction speed of most conventional blockchain systems stays in limited level, leaving them unfavorable for commercial use.

2) Difficulties with Building Infrastructure

Significant level of developed infrastructure is required for any cryptocurrency to properly function in economy tied with real life. It is because the cryptocurrency must be linked with industry of physical presence in order to perform better or at least equally compared to conventional economic system while securing stable price volatility and high efficiency. Truly “usable cryptocurrency,” in that sense, only comes when both software and hardware for usage are up and running. Cryptocurrencies lack that very infrastructure that allows them to directly come in contact with their users. In addition, financial and institutional difficulties that has to be overcome to install such infrastructure in the first place comes at a bigger challenge.

2.2 Challenges in Data Management

1) Vulnerability to DB Security

A lot of companies these days are using users' personal information in various fields such as providing customized services or advertising to targeted audience. Global users using Google, Amazon, Facebook, Naver, etc. often experience wonders through unexpected contents these companies offer as these companies are actively collecting and analyzing personal information to best present customized services to each user through data process. The more users use the service the more data is accumulated, and more accumulated data means more articulate results. However, these corporate practices do not always work in favor of users. Risk from information leakage or abuse increases in proportion to the increase in amount of collected user information. As operating base of Internet users is rapidly shifting from PC to mobile and clouds, channels of security breach are diversifying. Potential damage of information leak has become larger than ever before as more information are transmitted in diverse environment. Thus, personal information security is called for with bigger importance every day.

Concerns on personal information are drawing strong public attention under the context mentioned above. Countries throughout the world are implanting stricter regulations on personal information. Notable case is EU's GDPR(General Data Protection Regulation), which is a codified regulatory policy of EU implemented on May 25th, 2018. GDPR is based on 7 core values including storage limitation and responsible use of information. Its value system conflicts with some of the characteristics that blockchains generally share. Furthermore, contents like 'right to be forgotten' stated in certain articles, for example, Article 17 of GDPR, require innovative approach to blockchain-based projects.

2) Data Acquisition and Analysis

Statistical modeling based on machine learning is largely used in many companies to decide when and what content to show. To properly produce intended results the model needs an enormous amount of data. However, large amount of data does not necessarily lead to meaningful results. Both quantity and quality of data are critical to the success of analytic models. A lot of corporations are facing difficulties in obtaining data of having both high quality and large number. On top of such dilemma, market research institutions speculate that wider use of mobile devices, IoT, and social medias would cause the data to dramatically increase in 2020, the entire data of the world will mark 44 zetta bytes(44.4 trillion giga bytes). Out of this immense amount of data, approximately 80% of the data are thought to be informal, which are difficult to be categorized and analyzed. In this era of a data flood, we must deal with both data size and irregularity when acquiring and analyzing data.

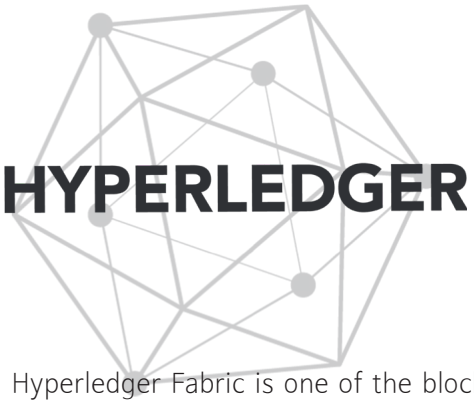
3) Data Transparency

There is no doubt user data is used on every aspects of our life. Nevertheless, users are not well informed of who their data is processed and delivered. As Scott Galloway from Stern Business Graduate School of New York University stated in his book "The Four: The Hidden DNA of Amazon, Apple, Facebook, and Google," Google practically has a control over approximately 2 billion users' decision making process through its relevant services for every days and nights. However, rarely any users completely understand how Google decides which contents to show.

3. Solution

3.1 Hyperledger-based ELAMACHAIN Platform

Hyperledger Fabric vs Other Blockchains			
	Bitcoin	Ethereum	Hyperledger Fabric
Network	Public	Public or Private	Permissioned
Transaction	Anonymous	Anonymous or Private	Public or Confidential
Consensus Algorithm	Proof of Work	Proof of Work	SOLO, Kafka, PBFT
Smart Contracts (Business Logics)	X	O (Smart Contract)	O (Chaincode)
Language	C ++	Solidity	Golang, java, Node.js



1) What is Hyperledger?

Hyperledger is a worldwide open-source collaborative project led by The Linux Foundation for improving blockchain-based industry. Over 130 members of finance, banking, IoT, supply chain, manufacturing and technology are joined together to work on 10 different projects including Hyperledger Fabric and Hyperledger Composer. The project aims to develop standardized framework of open source distributed ledgers and code-base for corporate use. ELAMACHAIN is a part of this. Hyperledger Fabric is one of the blockchain projects within Hyperledger community. The project is about improving blockchain platform with modularized structure that can efficiently support the development of various applications for authorized participants. Hyperledger Fabric is secure, scalable and capable of up to 3.6 million transactions per hour enabling enterprises to implement fast and reliable blockchain technology. Not only that, through independently operable channel, data safety and reliability are guaranteed. Also, the functions can be increased easily by its modularized system.

2) Features of Hyperledger Fabric

Hyperledger Fabric is not a public blockchain, but a permissioned blockchain where it manages the identity of network participants and creates multiple policies including network access authority. Hyperledger Fabric also supports multi-blockchain and replaceable module structure.

① Permissioned Blockchain

Unlike Bitcoin and Ethereum-based blockchain which allows anyone to join the network, Hyperledger Fabric only allows authorized participants to access the network through membership management services. Participants' access authority to blockchain network can be controlled in a multi-layered way. Since only authorized participants get to build networks, consensus algorithm can be created with better efficiency in contrast to the traditional method of proof-of-work based algorithm such as mining.

☐ ID: Identity Services

Every participant accessing blockchain, either as a client or peer, is allocated an ID based off a certain digital certificate. Participants' authority to access the network or to use certain applications within the network vary depending on the type of ID. Hyperledger Fabric manages all participants' identity through the Membership Service Provider (MSP). It also manages the objects in blockchain, such as assets or chaincode, as well as system components such as networks, servers, and execution environments.

② Flexible Consensus

Existing blockchain systems such as Bitcoin and Etherium contains a large number of unidentified anonymous participants. This makes it extremely difficult to reach a consensus from the majority of network members. Therefore, it is safe to say changing even a fraction of transactional data, not to mention consensus algorithms, is practically impossible once stored in blockchain. Driven by the chain of trust among authorized members, Hyperledger Fabric can flexibly respond to changes in policies and transactional process and data such as personal information.

ⅰ) Policy Configuration

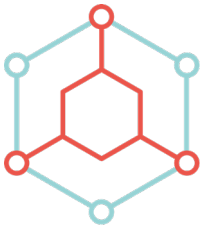
Hyperledger Fabric's flexible consensus process allows more powerful optimization over configuration and management for variety of system policies, including network access control, member entry/exit, ID registration, confidentiality and management responsibility policies. This comes in handy for business as it also enables each business deploying Hyperledger network to easily comply with the requirements of regulatory measures. (ex. Personal Information Protection Act (PIPA))

ⅱ) Modularized Architecture

Entire system of Hyperledger Fabric is designed in modules. The definition of modularized architecture, like bringing pieces together for ready-to-assemble furniture, is a system that allows you to replace certain components (modules) with something compatible. Specific algorithms for identity, consensus and encryption, for example, can be plugged into any Hyperledger Fabric network as needed. (Modularized Plug-and-Play Consensus)

③ Multi-Blockchain

Hyperledger Fabric divides the entire system into multiple channels and treats each channel as independent. The definition of channel is an individual network for communication between two or more specific network members for the purpose of conducting private and confidential transactions. Participants can join a certain channel and select, share a blockchain. Participants can also join multiple channels.



Permissioned Network

Modularized Architecture

Channels

3.2 Solution

ELAMACHAIN platform employs a Hyperledger Fabric to solve many of the problems previously encountered in the field of blockchain and AI

1) Solution I : Security

① Network created by reliable participants

Typical blockchain is where everyone can participate in the network without pre-authorization procedure. Every transaction is exposed on the distributed ledger so participants cannot store information that is difficult for them to disclose. These ordinary transactions were handled only by the centralized information security system. With ELAMACHAIN and its permissioned blockchain platform, only the relevant authorities can control the degrees of information, hence creating a secure network.

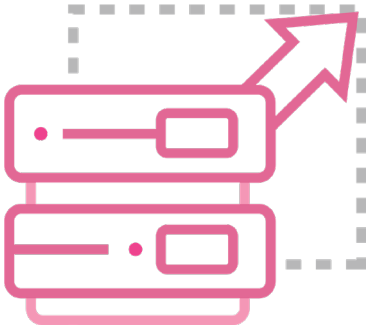
② DPKI (Decentralize Public Key Infrastructure)

In traditional Public Key Infrastructure (PKI) system, personal information can be only accessible through trusted 3rd party institution. ELAMACHAIN with its Hyperledger Fabric technology replaces this old system with Decentralized Public Key Infrastructure(DPKI) which provides authentication in upper-chain level, securing anonymity for transactions stored in blockchain.

③ Independently Operable Channels

Any groups can create their own private channels in ELAMACHAIN platform. Private channel can allow only selected users to enter into the network. Unauthorized parties will not be able to access, thus ensuring transaction confidentiality.

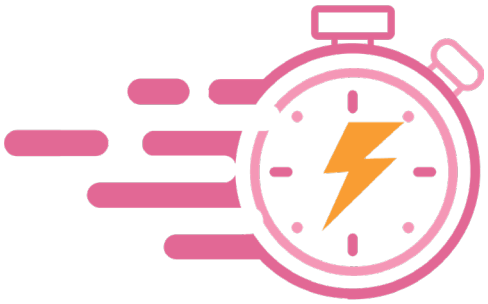
2) Solution II : Scalability and Flexibility



ELAMACHAIN platform is built on Hyperledger Fabric which is designed to assemble different policies and systems appropriate for ever-changing situations. Modules can be added or replaced, programs can be upgraded adapting to the right environment.With this flexibility, not only AI technology but also other various projects can be carried out. With its unlimited scalability, new applications that developers crave for can be created and run on the platform on demand. In addition, the platform can adapt to external policies such as regulatory authorities which significantly lower the legal risk.

3) Solution III : Transparency

ELAMACHAIN's AI service is an open-source project. Through a consensus among authorized network members, all policies on ELAMACHAIN platform are oriented towards transparency. We especially respect the rights of information providers to know the policy for data processing such as personal information and confidential contracts. Also, we ask for consent and permission to use data, and disclose details of data usage. Therefore, users of ELAMACHAIN platform are able to see how their data is processed and utilized.



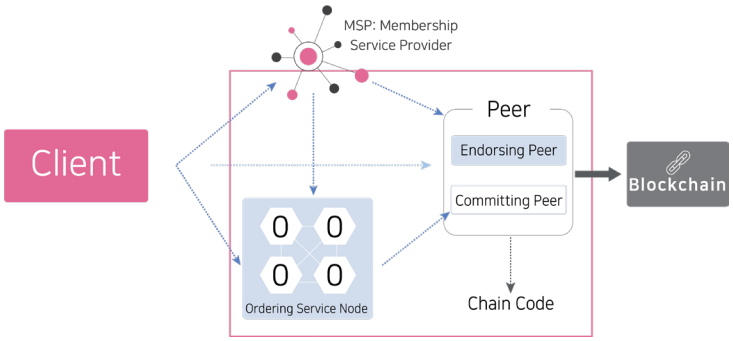
4) Solution IV : Speed

What delayed the transaction speed of conventional blockchain network was complicated and inefficient approval process for each transaction. Built on Hyperledger Fabric, ELAMACHAIN Platform can streamline trasaction processes by optimally directing the data flow. On top of that, ELAMACHAIN-developed Lightning Network in ELAMACHAIN Platform opens separate transaction channels between interacting partners to process large amount of transactions at once. These data are not directly uploaded to blockchain network but stored for the time being, which mitigate the network burden signficantly. Lightning Network only stores last transaction in blockchain which leads to increased efficiency and speed of transaction process.

4.

ELAMACHAIN's Blockchain
Hyperledger Fabric

Hyperledger Fabric is permissioned blockchain that allows access to only authorized participants via Membership Service Provider (MSP), which is different from public blockchain where anyone has access. Authorized participants become an integral part of Hyperledger Fabric system and share roles of endorsing, ordering, and committing of transactions. These series of transaction processes that occur in Hyperledger network, or all the policies that are necessary to run the system, are implemented by program known as chaincode.



4.1 Configuration of Hyperledger Fabric

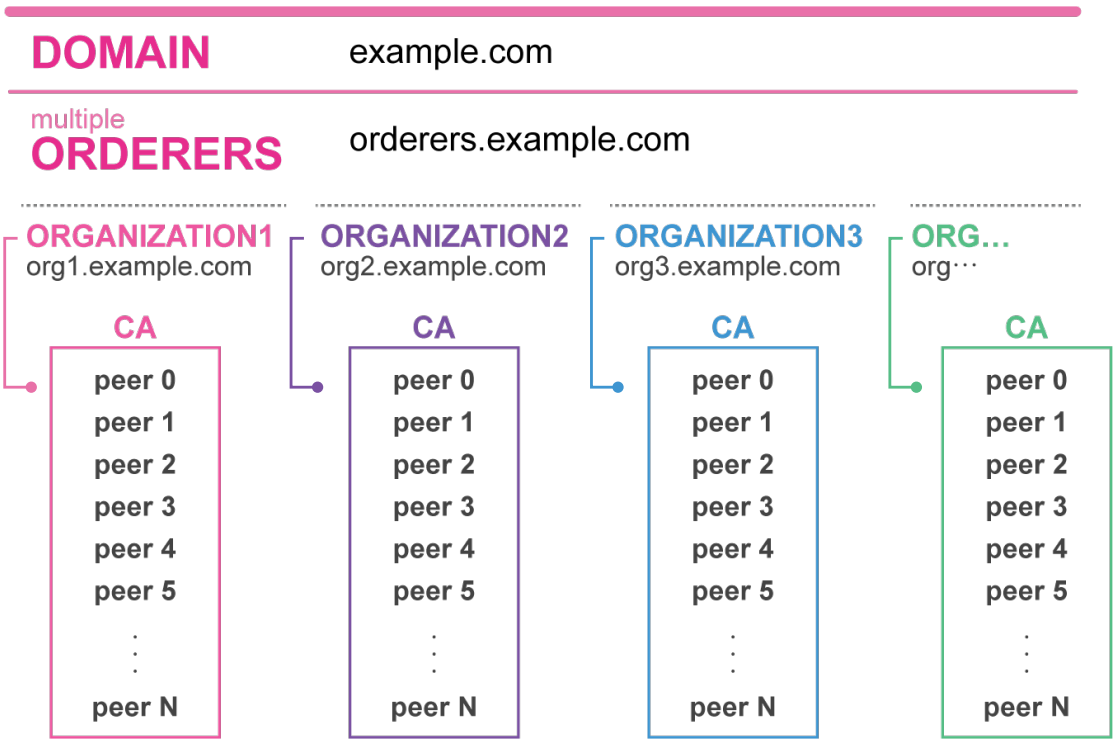
1) Chaincode

Chaincode is Smart Contract program of Hyperledger Fabric and it forms the backbone of consensus algorithm or policy. Smart Contract, developed by Ethereum, is a program that enables contracting and transaction processing in free form, designing easy-to-use mediator-free contract based on blockchain technology. Chaincode runs

separately from blockchain. When a particular program needs to comply with blockchain, chaincode is called up by the application at client's request out of blockchain. Smart Contract was first introduced by Ethereum. This program needs to use specific deterministic programming language called Solidity that has been developed to ensure that the results of contracts executed in blockchain are always the same. However, chaincode has the advantage of being supported by various existing programming languages. Currently, chaincode languages supported by Hyperledger Fabric are Goland, Java, Node.js, etc. Additional support for other languages will be added in future releases.

2) Domain

ELAMACHAIN platform's service are allocated an each domain. All components of Hyperledger Fabric compose one project unit. Domain represents separate channel and is responsible for operating unit project. Each domain is divided into unit called network organization.



① Ordering Service node

Ordering service node, also known as Orderer, delivers transactions submitted by clients in chronological order to all peers securely. Peer also manages the addition and update new blocks in accordance with transaction information on blockchain network. Ordering method is based on consensus algorithm. Since consensus algorithm is modularized in Hyperledger Fabric, selecting a suitable consensus algorithm for various situations is feasible.

☐ Types of consensus algorithms

i) SOLO - A consensus algorithm that determines the order of transactions through a centralized ordering service.

ii) Kafka - A consensus algorithm that can provide normal ordering service of distributed system even when node is stopped by systematic crash. (Crash fault)

iii) PBFT(Practical Byzantine Fault Tolerance) - A consensus algorithm that can provide normal ordering service of distributed system even in case of Byzantine fault and malicious or arbitrary node behavior.

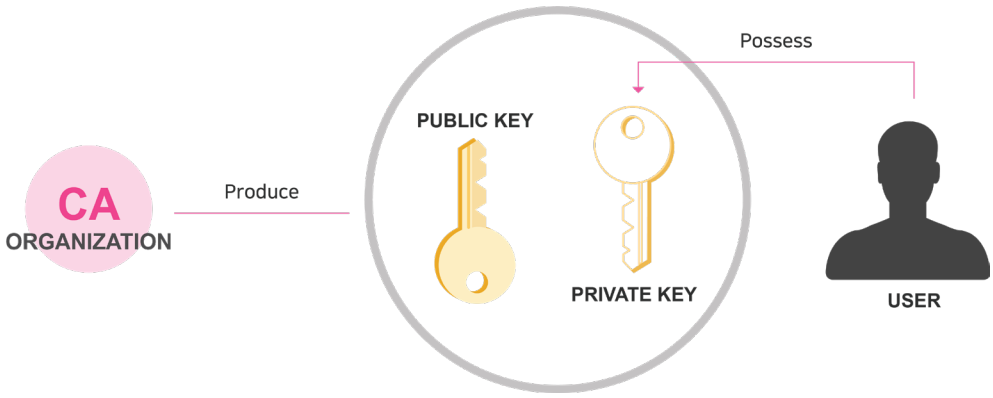
② Organization

Network of Hyperledger Fabric is divided into organization units. Each organization has MSP authority and goes through Certificate Authority (CA). Organization provides not only peer management, but also authorization, assurance policies, and hub systems which function as a gateway for clients to enter the network. ELAMACHAIN platform constitutes organization optimized for the number and characteristic of the projects in network. Clients of ELAMACHAIN will sign up at an organization keyed to a certain service they use. However, there is no limit for the use of other services provided by ELAMACHAIN.

i) MSP(Membership Service Provider)

MSP identifies all participants and controls their access to Hyperledger Fabric. After verifying their identities, Enrollment Certificate will be issued to participants which indicates authority to access network. Each time an authenticated participant requests transaction, Transaction Certificate is issued. Identity of participant is not exposed as it's not same certificate that will be issued each time transaction is requested, but different certificate is issued each time ensuring secure service running.

ii) CA(Certificate Authority)



CA is server-client technology that provides authentication key to client. When client's authentication request is granted by MSP, CA provides public/private authentication key and stores client's information in the server database. One CA is allocated per organization in a network of organization units. Clients who have completed membership registration will have private key. Clients who have both private key and password can securely use the service. Client's information registered in CA server is registered in World State database, which records and reflects entire status of blockchain network. Therefore, changes in authentication info is restricted without permission of the user.

③ Peer Node

Peer node, also known as Peer, has the role of maintaining the state of network. Peer handles proposals and responses of transactions and manages ledger and chaincode. Peer has the latest blockchain database and keeps it updated whenever transaction occurs or blocks are added. Peer is divided into Endorsing Peer (Endorser) and Committing Peer (Committer). When a client (Service user) generates and requests transaction, endorsing peer examines the requested transaction in accordance with endorsing policy, and sends it back to client with endorsing signature attached to it. Committing peer verifies transaction result issued by endorsing peer. Unless there's a problem, committer confirms transaction and updates its contents in blockchain.

4.2 ELAMACHAIN platform's transactions

1) Process of Hyperledger Fabric

① Endorsing

Client requests transaction to corresponding endorsing peer according to endorsing policy. Endorsing peer runs the transaction prior to tranferring to other parties and checks following conditions with MSP.

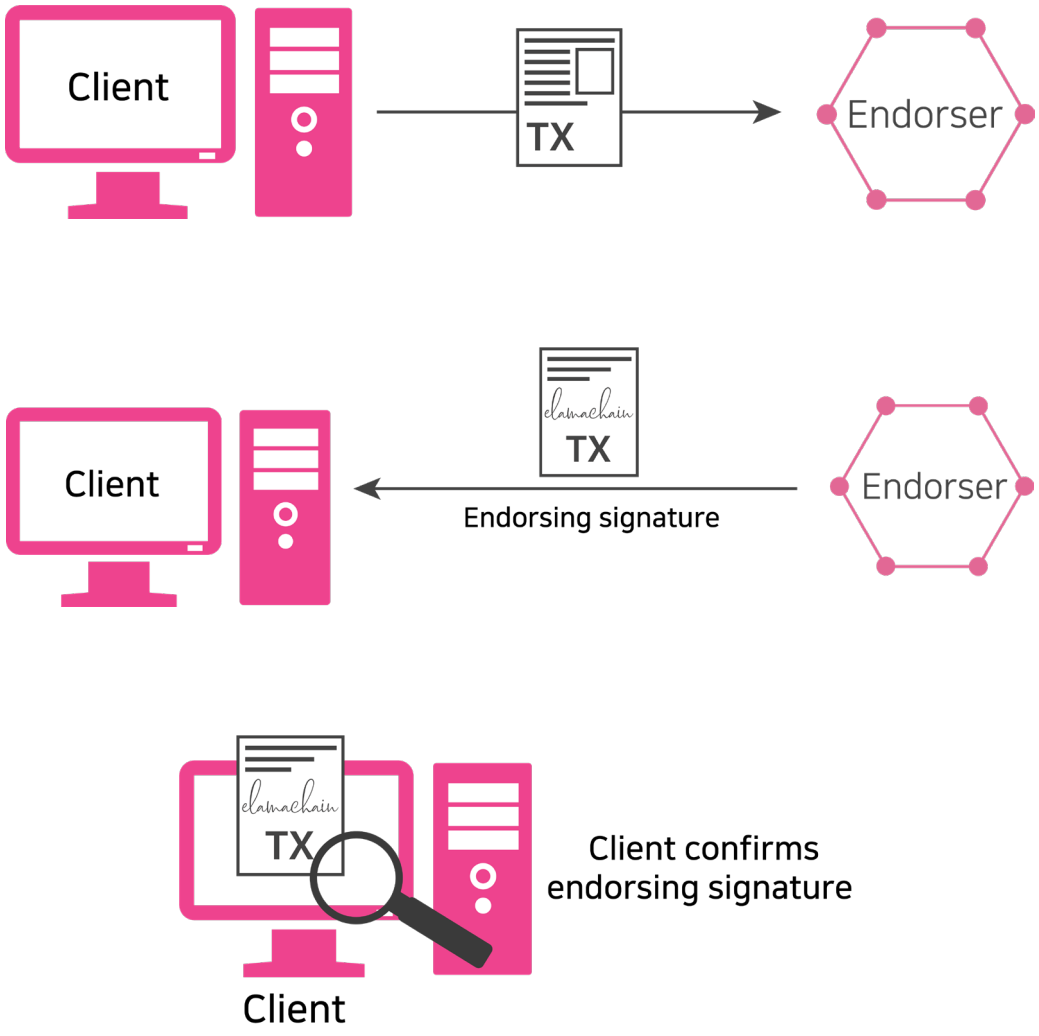
i) Validity of transaction request

ii) Duplication of transaction request

iii) Validity of digital signature

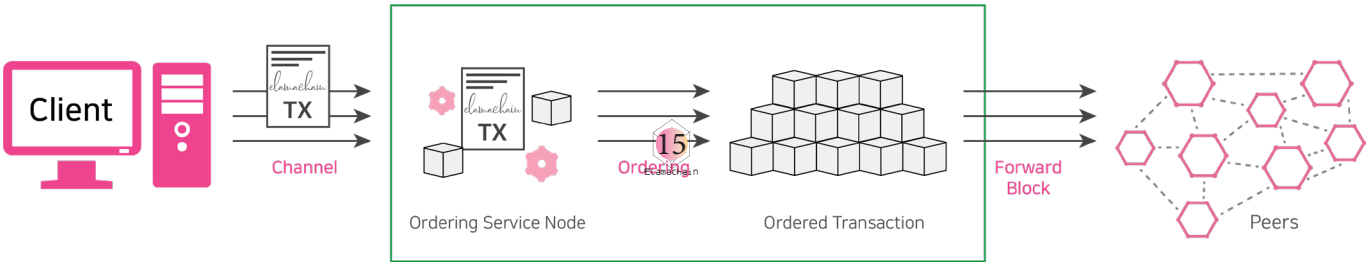
iv) Client's compliance with authority and policy

When everything checks out, endorser attaches endorsing signature to the transaction in certain data (Readset, Writeset) and sends the transaction back to the client.



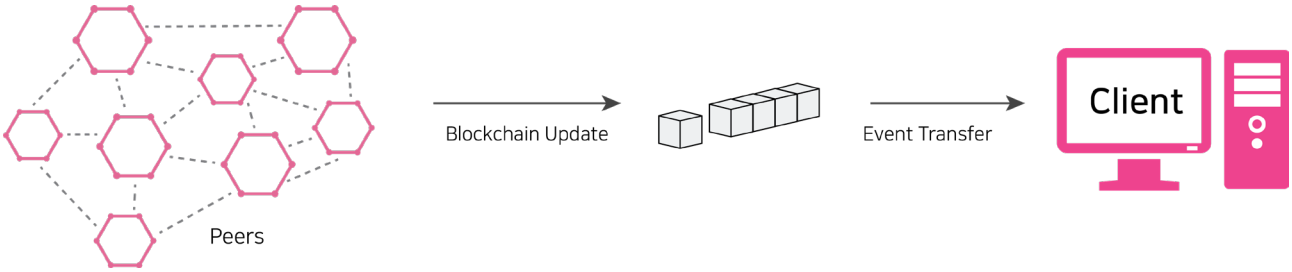
② Ordering

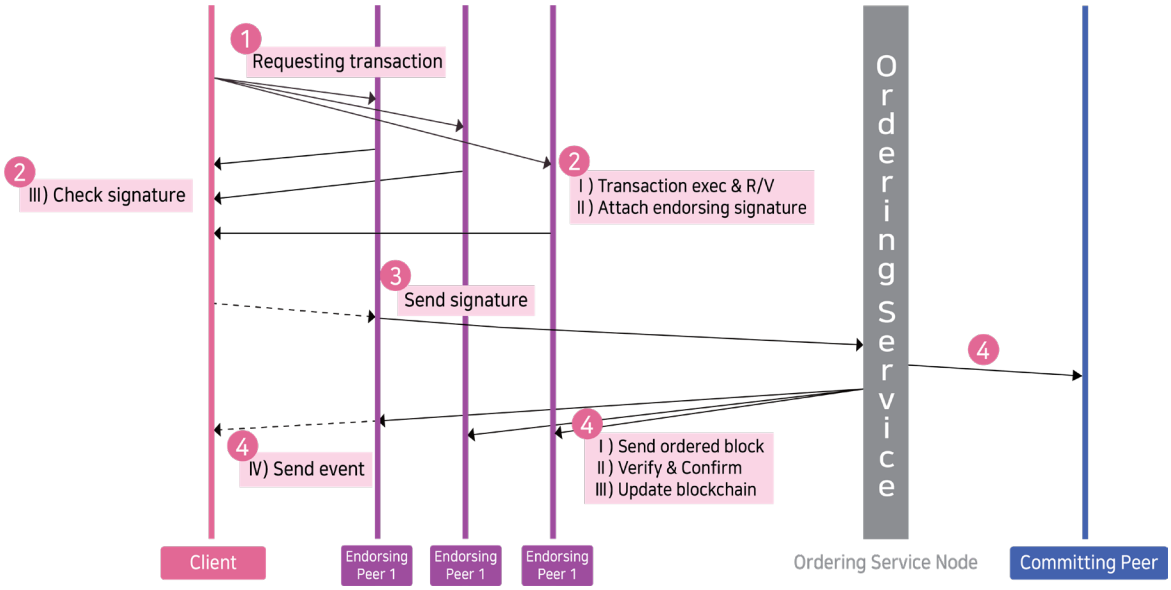
After confirming endorsing signature, client sends the transaction to ordering service node using a channel made just for ordering. Ordering service node organizes the transactions received from client in chronological order and then creates transaction block for each channel. Examining contents of specific transaction or chaincode isn't necessary. As soon as endorsing signature checks out, block is added. As a result, block update rate is superior to typical public blockchain where its method is to check every transaction and then adds them to block.



③ Committing

Ordering service node delivers updated transaction block to all peers in a secure manner. Delivered committing peer verifies if the transaction satisfied the endorsing policy and then confirms the transaction by storing it in blockchain. All peers return the event to client after completing blockchain update.



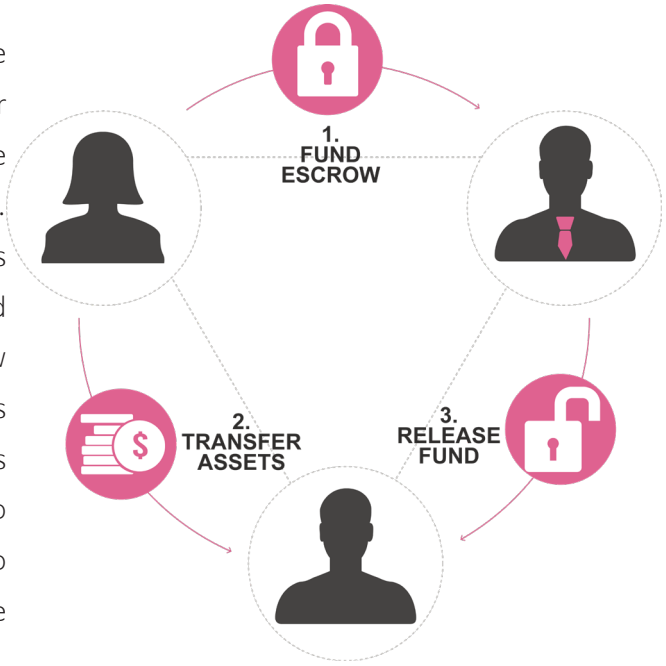


④ Difference

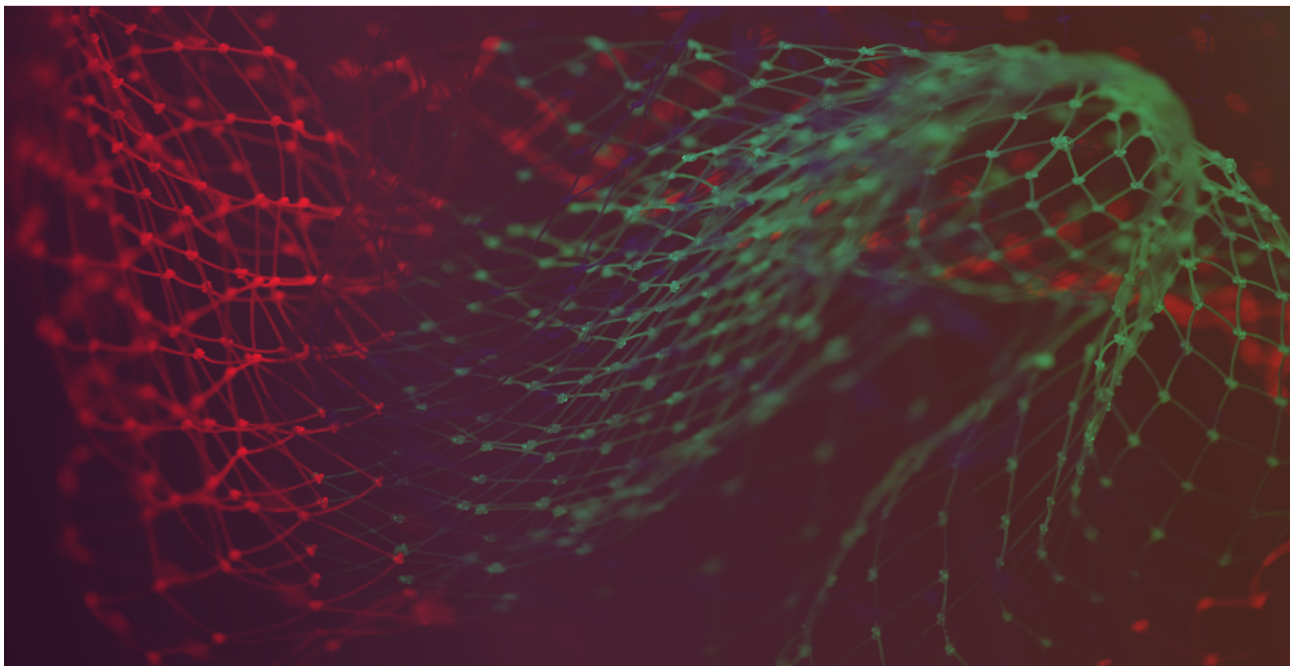
Hyperledger Fabric is different from traditional blockchains such as Ethereum, Bitcoin, etc. What makes this platform stand out is that it executes chaincode before adding transaction information to the block; a way to ensure security and authentication process. By the way its verification process is done separately from blockchain, the entire blockchain network is safe. In other words, even if there is a security or logic problem in chaincode, network still cannot be damaged as it acts separately from blockchain. The user's account is also kept securley in blockchain, even in the event of bad inputs.

2) ELAMACHAIN Escrow

In E-commerce service, transactions are made through 3rd party contracts. Buyer pays seller on condition that goods are delivered after the payment is made in ELAMACHAIN escrow service. If seller does not deliver the goods or delivers the wrong products, transaction will be void and the payment will be returned to buyer. Escrow contracts will be in effect when transaction occurs not only in ELA Pay platform but in coins or tokens as well. Hyperledger's consensus attempts to execute before transaction information is added to the block. It takes advantage of escrow chaincode to process transactions faster and more securely.



5. ELAMA CHAIN Platform



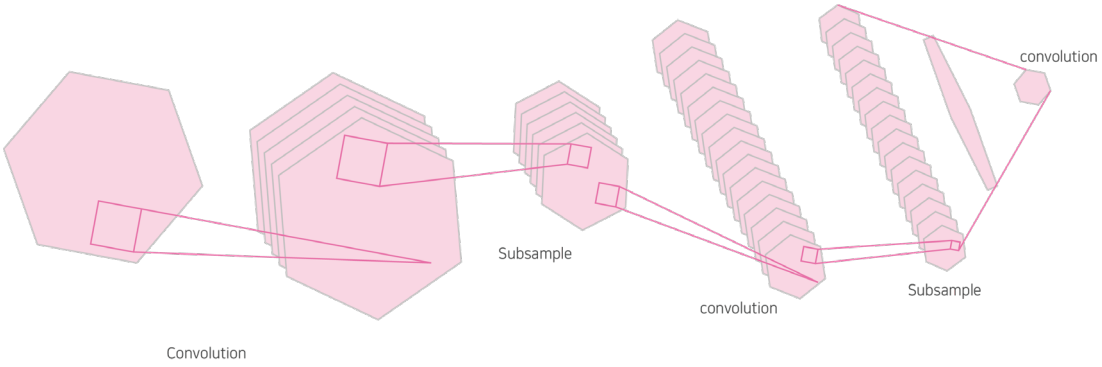
5.1 AI ELA Core-engine

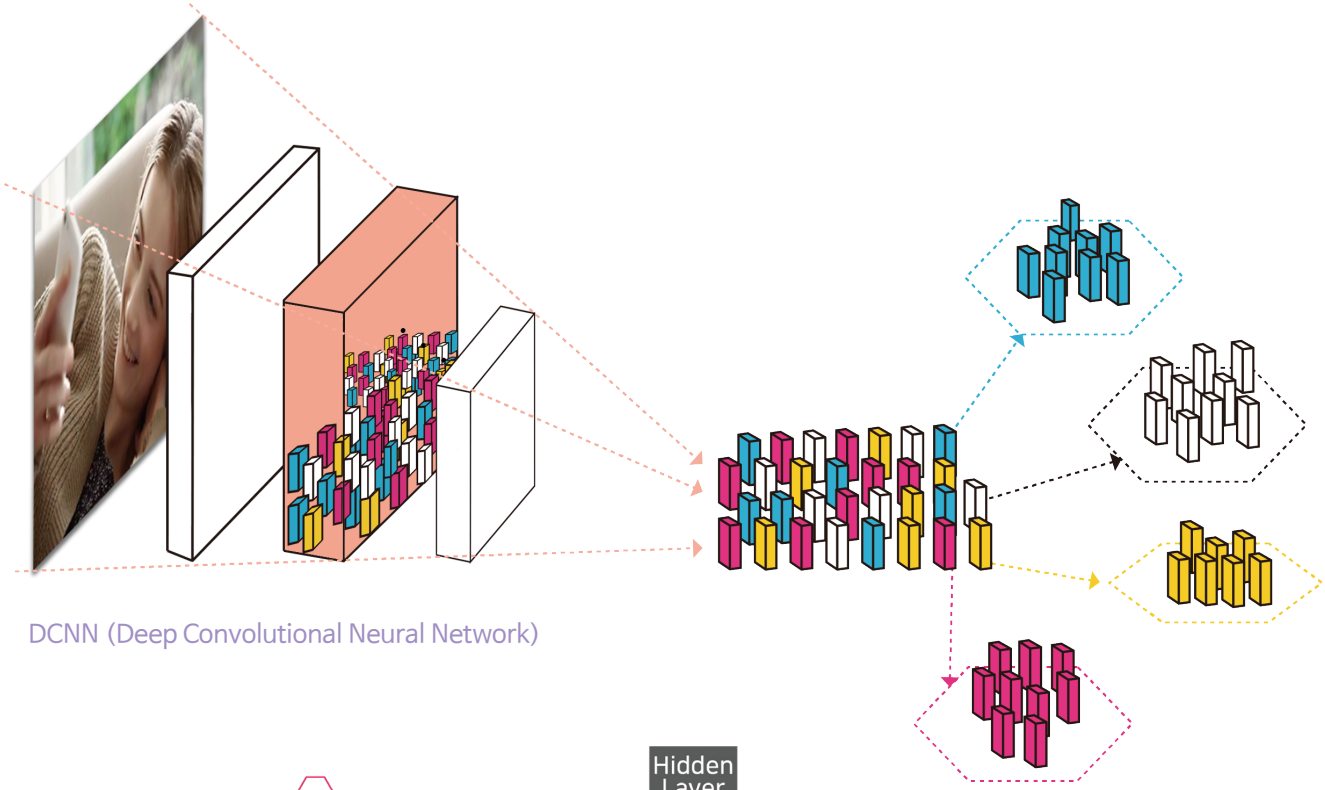
1) Need for AI

Potential of cryptocurrencies is that they are not just another means of payment but can create and spread life styles that are different from the past by embedding new functions. However, if we must define all functions to be included in cryptocurrencies in advance, we would not be able to reflect trends devised from continuously inflowing new data. Furthermore, devising the further optimized result by improving algorithms would inevitably be restricted. In this perspective, introducing AI, which can flexibly lead to the most optimized result by self-learning the big data, would be the best direction that ELAMACHAIN platform should go toward.

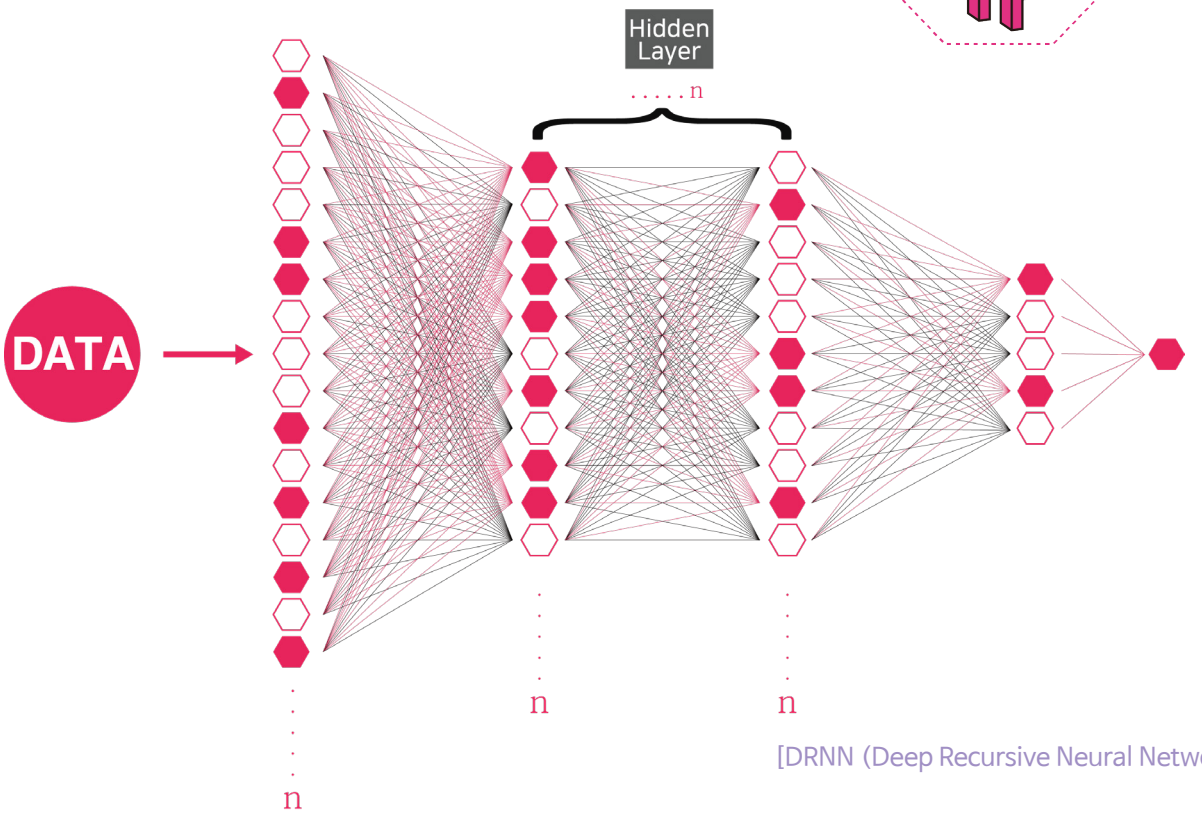
2) Multilayer Neural Network (Deep learning network)

There are different types of artificial intelligence, but the multi-layer neural network is known to behave most like human brains. Results found through such deep learning, a procedure to layer up neural networks, are known to be most similar to those from human mind. This method was used for developing Alpha-go, the AI which beat Lee Se-dol, a world-class Go-player, and Google's autonomous vehicles. If we compose these neural networks more elaborately, we can get more accurate results. We can create more complete artificial intelligence by adjust the weights of 2 networks in AI algorithm, one which is DCNN(Deep Convolutional Neural Network), a method that aggregates to analyze partial results obtained through mathematical filtering, and another which is DRNN(Deep Recursive Neural Network) which specializes in distinguishing different properties by flow or order of time.





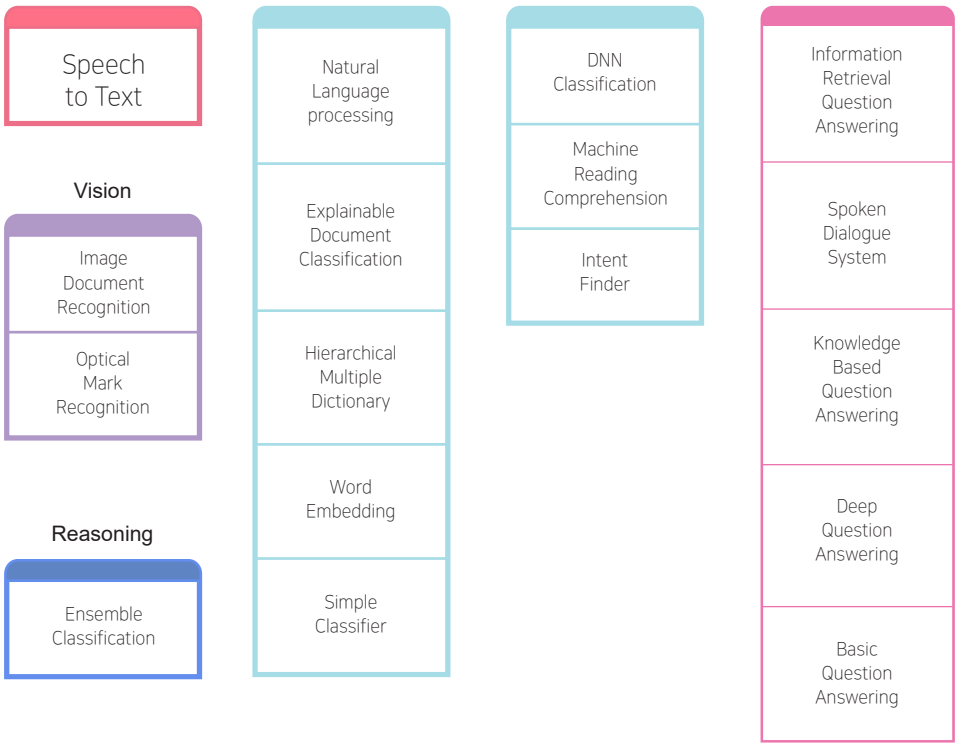
DCNN (Deep Convolutional Neural Network)



[DRNN (Deep Recursive Neural Network)]

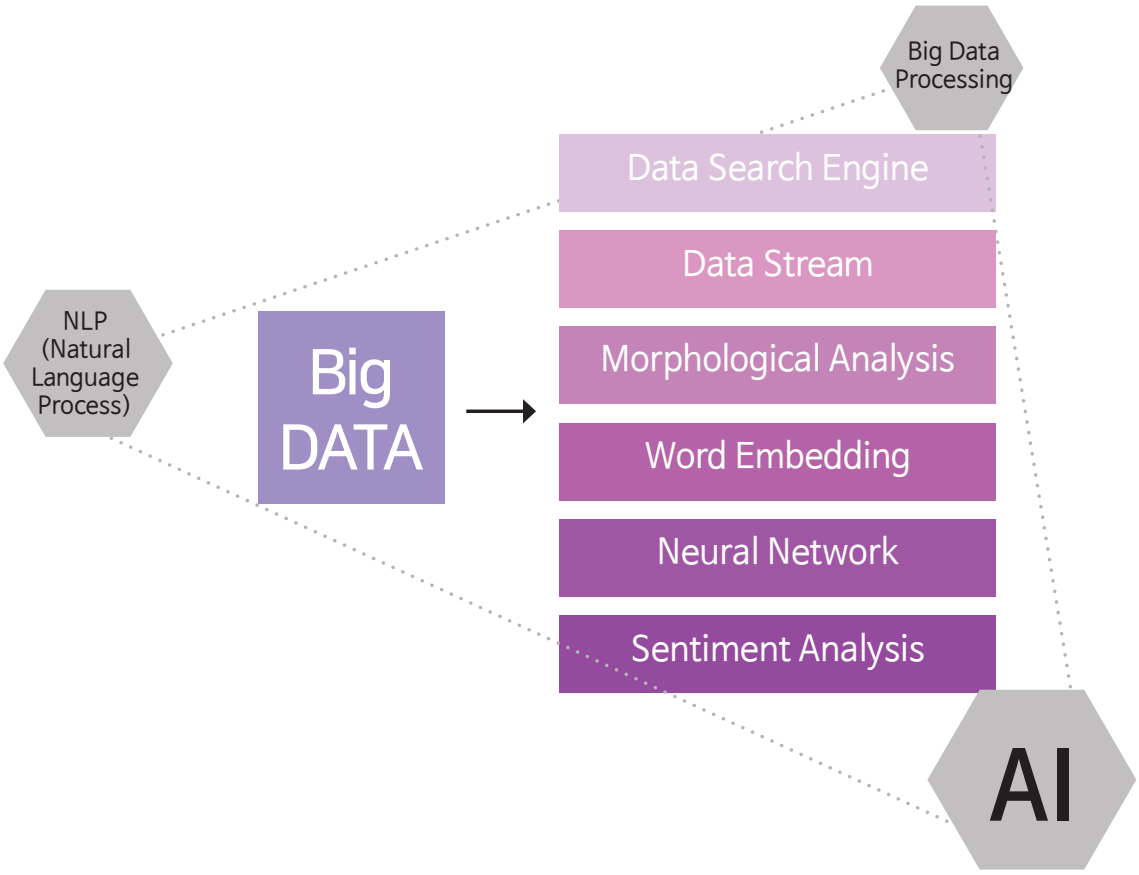
① ELA AI Service

ELA AI is equipped with latest AI engines and ELAMACHAIN is consistently and swiftly upgrading AI engines up to date. Because AI engines of ELA AI Brain modules are packaged to operate independently, integrity of the entire solution is not interrupted. Thus, their performance can be improved by upgrading individual engines. These days, AI technology is being developed in two shakes. ELA AI's engine structures are optimal to apply such cutting-edge technologies. Hence, through ELA AI, it can create plug-and-plug AI services that can meet specific needs and purposes as if we assemble blocks.



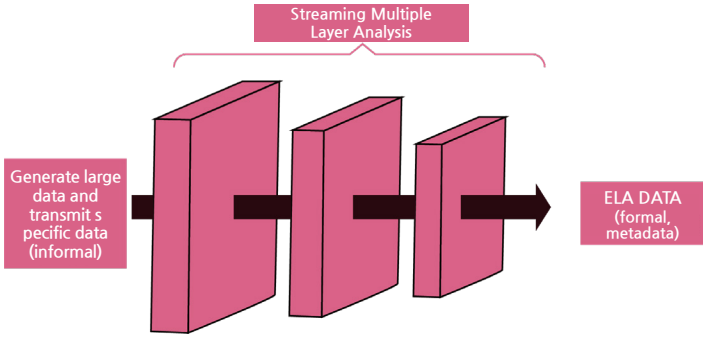
② Data Machine Learning

AI solutions and products evolve through endless learning. It holds various machine learning data structured by functions such as voice recognition, emotion analysis, domain categorization, Q&A, and conversation processing. A numerous data from Internet web-crawling, Facebook, Twitter, YouTube, and Instagram are initially texts made of human language. Emotion analysis is the technology that can identify what people think about certain topics by extracting human's emotion from such texts.



ⅰ) ELA Analysis System: Big Data Analysis Engine

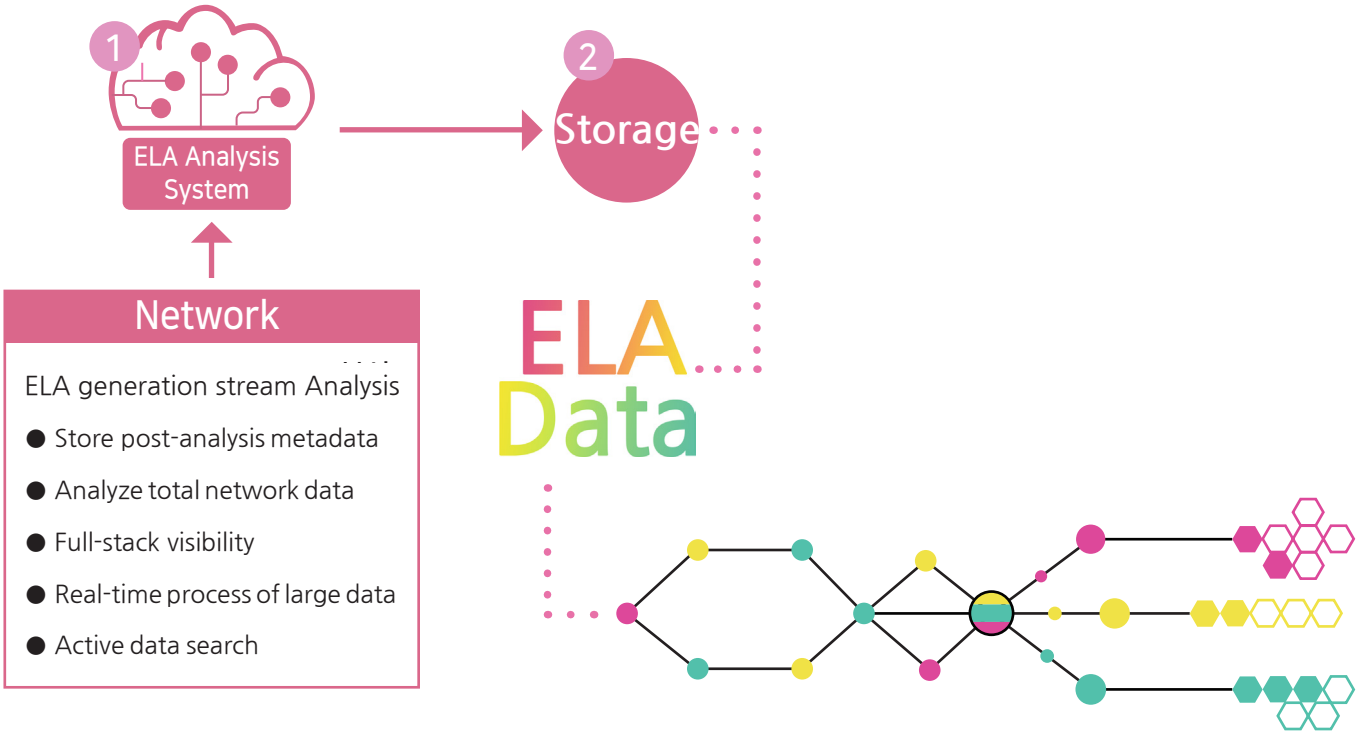
Many data flowing into machine learning are informal, which contains unusable data in part. These data that are difficult to process and analyze are dark data. ELA AI service collects large data with dark data and refine them into ELA DATA through ELA Core-engine's streaming layer analysis.

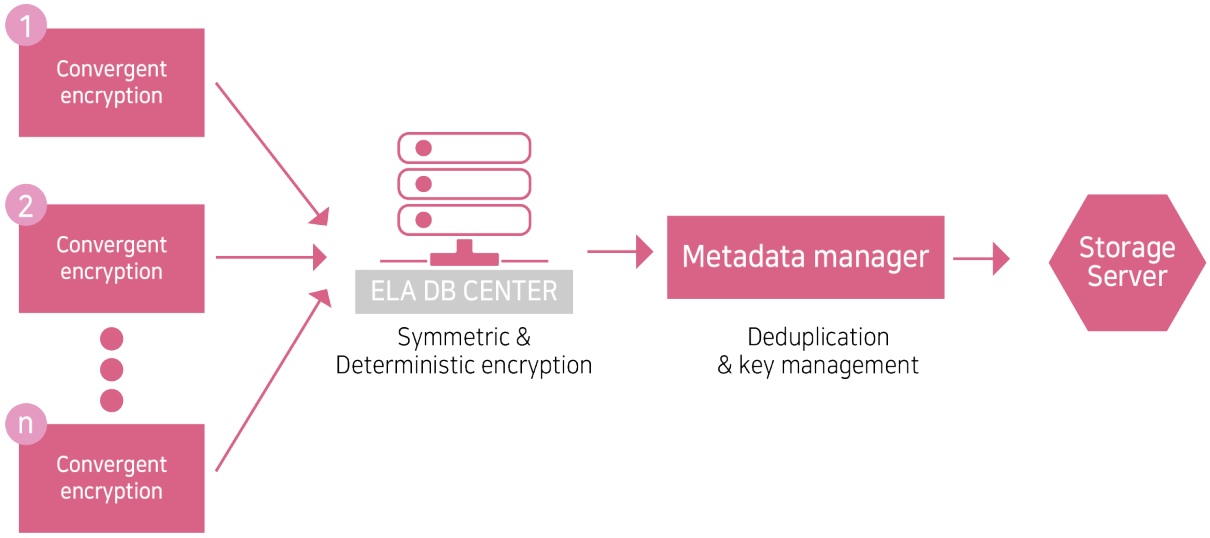


[ELA Analysis System]

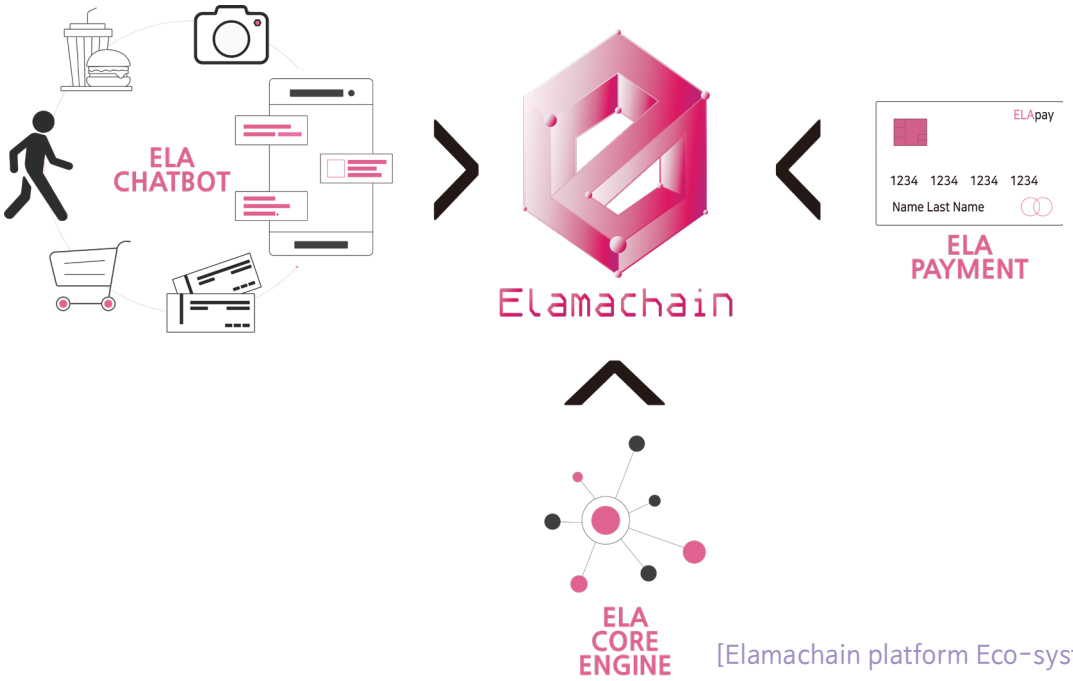
ii) ELA DB Discover: Data Process Engine

ELA AI service prevents data duplication and ensure data integrity through combination of real-time stream process and full-stream (ELA DB Discover). This next generation architecture can easily process large volumes real-time, allowing each node to give and take necessary data close to the real-time by automated analyzing and storing. Data connected to learning and reasoning in ELA Analysis System is then formalized and loaded on the blockchain network.





5.2 ELA Eco-system



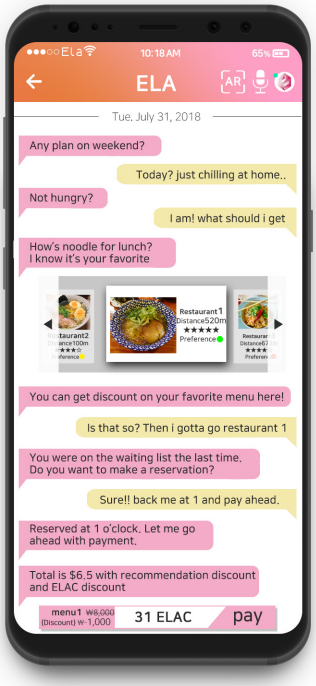
[Elamachain platform Eco-system]

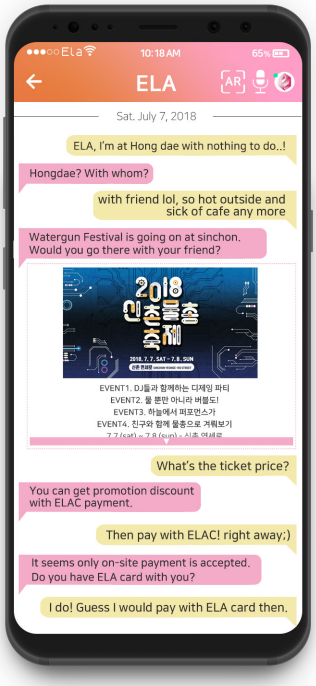
Below is the process of ELAMACHAIN platform ecosystem.

First, ELA utilizes El Chatbot, an emotion intelligence-based conversation tool, to form a friendly relationship with users and obtain various information. Collected information are converted into big data through deep learning and reasoning. Second, it proceeds with "ELA mission" to increase AI aptitude to users' cognitive needs and emotional preference. Based on initial big data obtained on the previous stage, AI ELA provides various missions to users for deeper reasoning. Users complete missions some through ELAMACHAIN's cryptocurrency transaction system and others through daily conversation missions with ELA. Mission data are used to build stronger big data through ELA's unique emotion intelligence deep learning. As "ELA mission" continues data collected, studied and generated at ELA Core-engine's deep learning process further advances ELA's emotion intelligence learning capability. Through these continued chains of ELA missions, AI ELA enhances its understanding on users' cognitive and emotional preferences, and user satisfaction and trust on AI ELA improves as well. Users receive ELA Coin(ELAMA) as a reward for providing ELA their information, and they also receive ELAMA as a reward for completing missions that ELA provides. ELAMA can be used in a variety of fields such as shopping, travelling, healthcare, etc.

1) Rewards System

ELA Mission is a product of inter-communication between users and ELA. AI ELA actively engages in conversation to better understand user behavior while recommending various types of missions. Missions recommend users to easily find their favorite food, activity, or travel option. Some missions linked to promotion program give out mission-related coupons or other incentives. Examples of ELA Missions are as below. When users pay for goods and services with ELAMACHAIN's virtual currency payment system (which is a card or application) through ELA Mission, it counts as completing a mission. Amount of ELA Mission rewards is accounted according to the paid amount of ELAMA and discount rate for the service. Detailed policy on rewards structure will be available on official release of ELAMACHAIN Platform. Another source of rewards is emotional conversation with ELA. Depending on quantity and quality of conversation contributing to AI ELA experience points are given, which leads to increasing affinity level with ELA. Higher affinity level returns bigger "conversation rewards." ELA Missions will be categorized into smaller groups such as daily missions, weakly missions, hot-time missions, etc. ELAMACHAIN Platform studies and learns user pattern, possibly time pattern or preference pattern, and designs corresponding rewards structure.

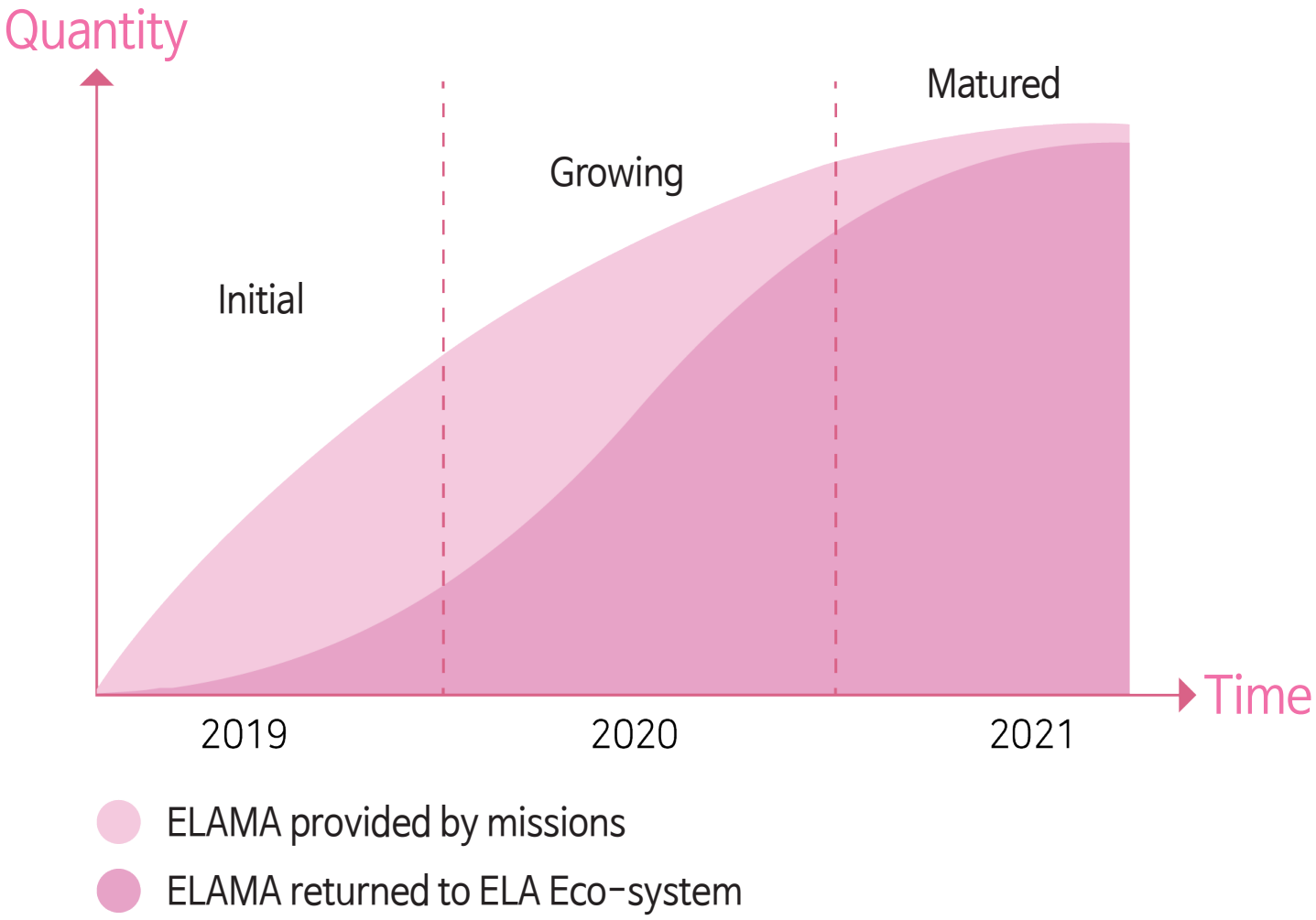




Category	Food	Activity	Events
Previously studied user behavior	Prefers Japanese restaurants	Prefers experimental activities	Prefers special events
Key Word	I'm hungry	I'm bored	What should I do for the weekend?
ELA Mission	How's XX Japanese food?	How about going to a VR cafe near here?	Do you want to go to □□?
Complete Mission	Pay for □□ Japanese restaurant	Pay for □□ VR cafe	Purchases □□ event tickets

☐ Rewards and ELA Eco-system

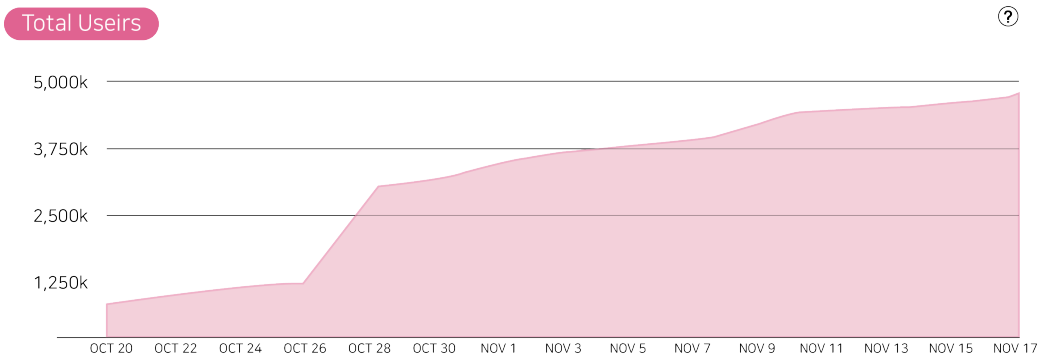
Since the quantity of ELAMA provided to users as rewards and ELAMA returned to the ELA Eco-system are not balanced in earlier stages, new users receive relatively more valuable event-type rewards. The gap between rewards and returned volumes by relatively passive use of ELAMA by initial users are minimized through various business models. As user pool increases and user friendliness grows over time with maturing ELA Eco-system, corresponding reward systems will be established, and ELAMA Eco-system will be completed through heightened utility rate of ELAMA and the expansion of token circulation.



2) Business Model(BM)

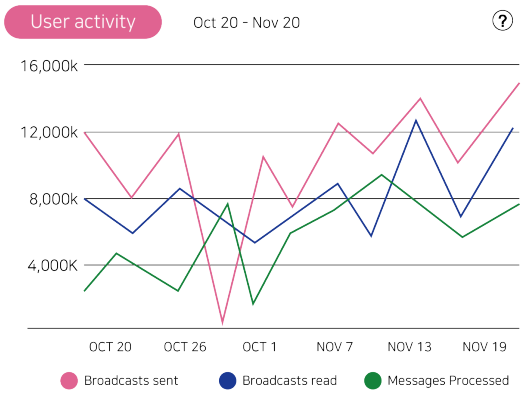
① AI Big Data Curation

ELAMACHAIN provides an AI big data curation. Curation services refers to providing ELAMACHAIN's API to AI-based start-ups and other businesses in need of AI solution. Thus, AI developing companies and AI service companies pay big data curation fee with ELAMA. Big data curation service offers more opportunity for ELAMACHAIN project to maintain, repair, supplement, develop, and strategically advance AI consistently as part of its operation. ELAMACHAIN's AI big data curation tool provides basic data analysis such as AI activation, total user number, active user number, and user interaction as well as information for accuracy and target achievement rate of AI comprehending user intent, and user insights that can show user interests. Moreover, by aligning and sorting scattered documents and comprehending collected data in depth, such data can be provided to interested parties using the curation tool.



User retention

DATE	USERS	DAY1	DAY2	DAY3	DAY4	DAY5	DAY6	DAY7
TOTAL	1037	25.1%	10.7%	10.7%	9%	5%	2%	6%
OCT 20	91	24%	5%	8%	19%	5%	5%	3%
OCT 21	67	52.5%	5.4%	3.7%	2.8%	2%	2%	2%
OCT 22	92	13%	5.2%	6%	6%	20%	3%	2%
OCT 23	5	1%	2%	4.7%	9%	0%	0%	0%
OCT 24	47	27.4%	10%	12%	10%	9%	11%	1.9%
OCT 25	39	47.7%	11%	26.5%	11.4%	6.8%	4.6%	0%
OCT 26	51	12%	2%	1%	29%	21%	0%	0 %
OCT 27	60	20.9%	17.4%	17.4%	17.4%	17.4%	1.7%	0%
OCT 28	59	59.6%	21%	21%	21%	21%	0%	
OCT 29	57	57.3%	19.6%	19.6%	15%	19.6%		
OCT 30	4	4%	10%	4%	5%			
OCT 31	7	69%	15%	7%				
NOV 1	2	8%	7%					
NOV 2	1	6%						

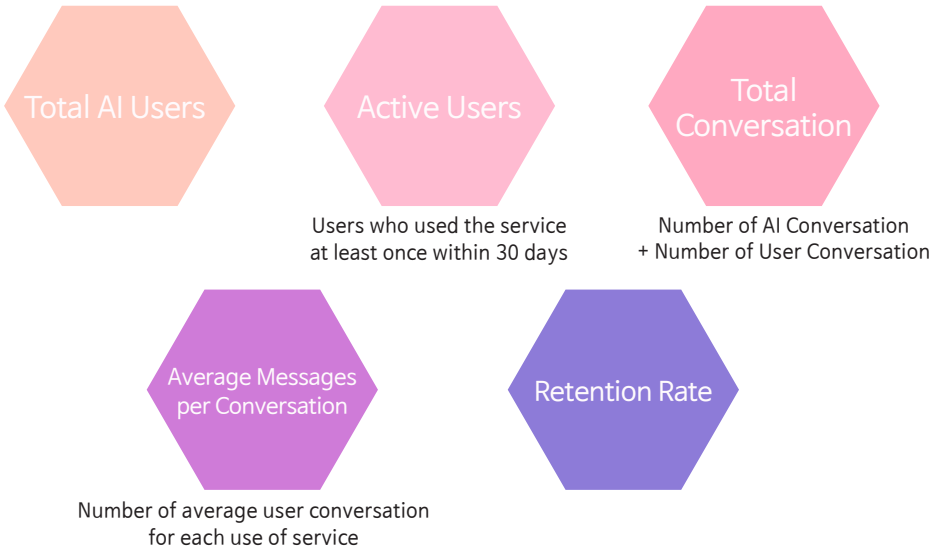


Popular blocks Oct 20 - Nov 20

BLOCK	RATE
Menu	16,165,757
Contacts	36,747
Hot dael of the day	647
Default	563
Messags us	71
Francisoco amonio shuppa-ruppa!	36
The most interesting fact about George Bush	2
Truth about Kraken	1

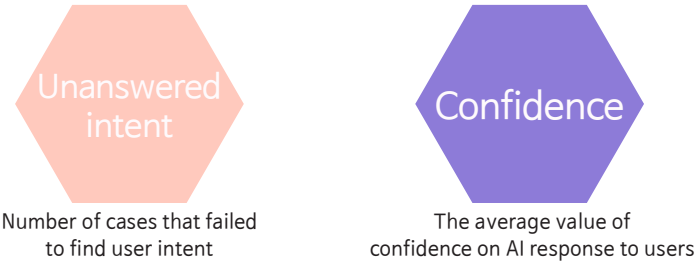
ⅰ) AI Activation Level

Most fundamental analysis data, AI activation level services cover data on total users, retention rate, etc., which gives valuable information on how activated the AI or the chatbot is.



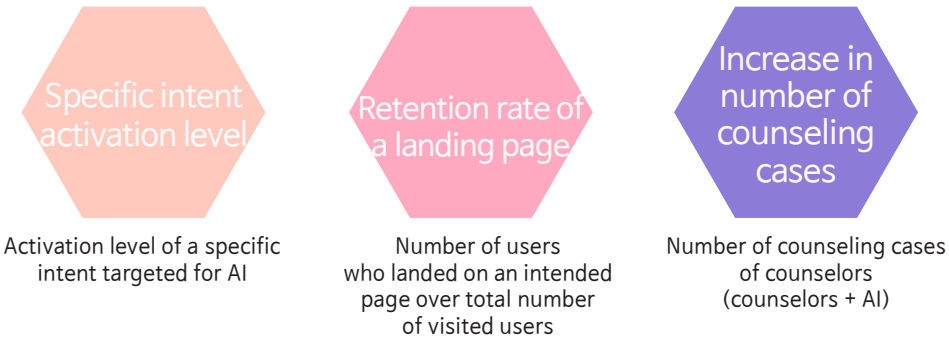
ⅱ) AI Performance

Though the goal of AI development is to accurately acknowledge user intent and respond to it, there comes many realistic challenges for AI to achieve such perfection. If an AI can numerically assess its degree of failure to meet users' original intent for every question it can avoid making same mistakes on similar questions and environments. AI still can end up with number of un-intended results even when the AI engine is configured for over 80% confidence in KPI(Key Performance Indicator), and that is why quantitative analysis on AI performance works as a valuable step to enhance its ability to respond to different circumstances correctly based on objective data results.



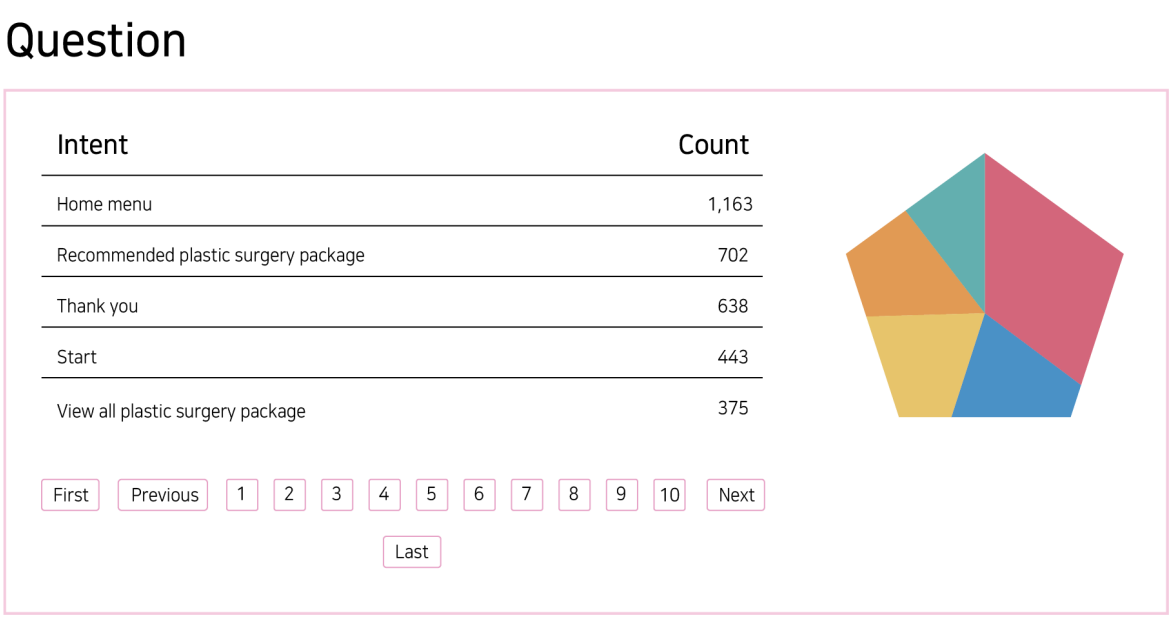
ⅲ) Goal Completion Rate(GCR)

GCR works as an index of assessing the goal of AI development itself. If a chatbot's intent activation level comes out low for services with purpose of "recommending cosmetic surgery packages," it may be about the time to re-construct the scenario. Likewise, we also need to check the retention rate if its goal is to make users land on a certain page. For a counselling chatbot, it can check the status of goal completion based on indexes like increase in counseling cases.



iv) User Insight

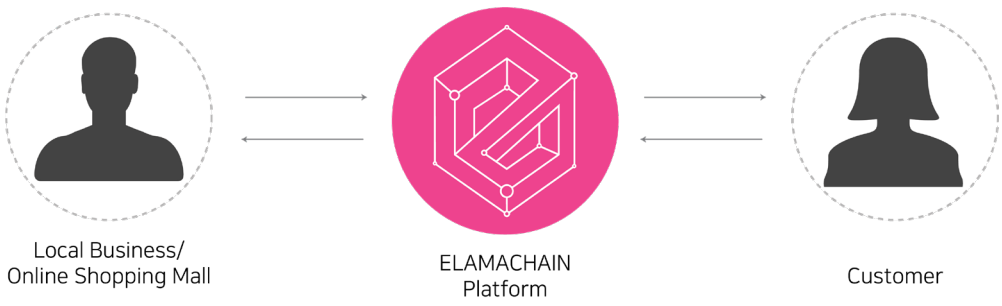
Contents of user insight consist of different features that can identify chatbot users' interests. Other than specific intent, which usually comes in form of questions, user insight can be derived from various sources. Look on change of trend in certain group's behavioral change may tell us how their interest is shifted to a certain 'product' or 'service'. We can collect such data individually or in group for entire users. Also, for actual data extraction, we can take differentiated approach depending on whether we would extract specific subjects from a natural language or specific behaviors like clicking buttons.



[Example]

② Advertisement Fee

AI service users can use customized products and services recommended by AI at discounted prices. Meanwhile, local businesses and online shopping malls can attract customers and promote their goods and services. Sponsored advertisers benefit for increase in number of exposure of services and products as AI recommend to users. All fees in processing advertisements on Elamachain platform are paid in ELAMA.



3) Payment System

① Market Status

Market for easy payment, which provides customer-friendly convenience in payment services by simplifying long and complicated process of conventional payments, has constantly grown every year. According to 2017 South Korea electronic payment census, daily volume for easy payment is 2.8 million cases with revenue of $123 million, which was increased 189.1% and 212.0% respectively compared to 2016.

② Problems of Conventional Payment System

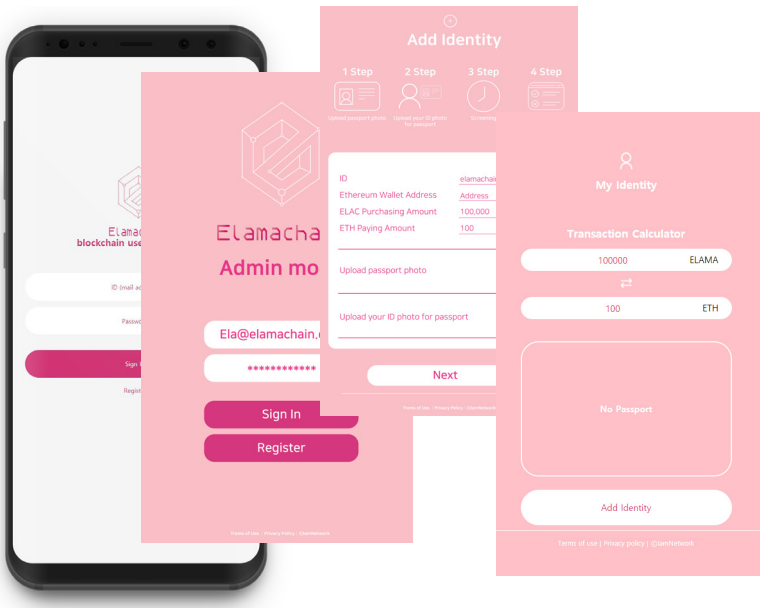
Conventional easy payment system relies heavily on intermediate parties such as acquires, PGs, security services, etc. which leads to high operation and maintenance cost. Also, damage from systematic incidents at service providers can be irresponsibly passed on to service users. Though decentralized easy payment system with blockchain technology can minimize the size of connected system which can achieve cost reduction and transparent operation, most existing blockchain services lacks transaction speed to fully support fluent flow of commercial activities.

③ ELAMACHAIN Payment System : ELA PAY

ELA PAY is ELAMACHAIN Platform's Hyperledger-based payment system designed to solve the problems of old payment systems. ELA PAY's payment infrastructure includes Cashbee pre-paid card, POS clients, kiosk system, and ELA PAY App. Hyperledger Fabric and Lightning Network empower ELA PAY to process transactions far faster than conventional blockchain platforms. ELA Pay App allows users easier crypto-payment than any other payment solutions. All transactions within ELAMACHAIN Platform goes through authentication process verifying security and credibility for participating parties. Moreover, ELAMACHAIN Platform provides escrow service using Hyperledger chaincode to prevent malicious transactions at the source.

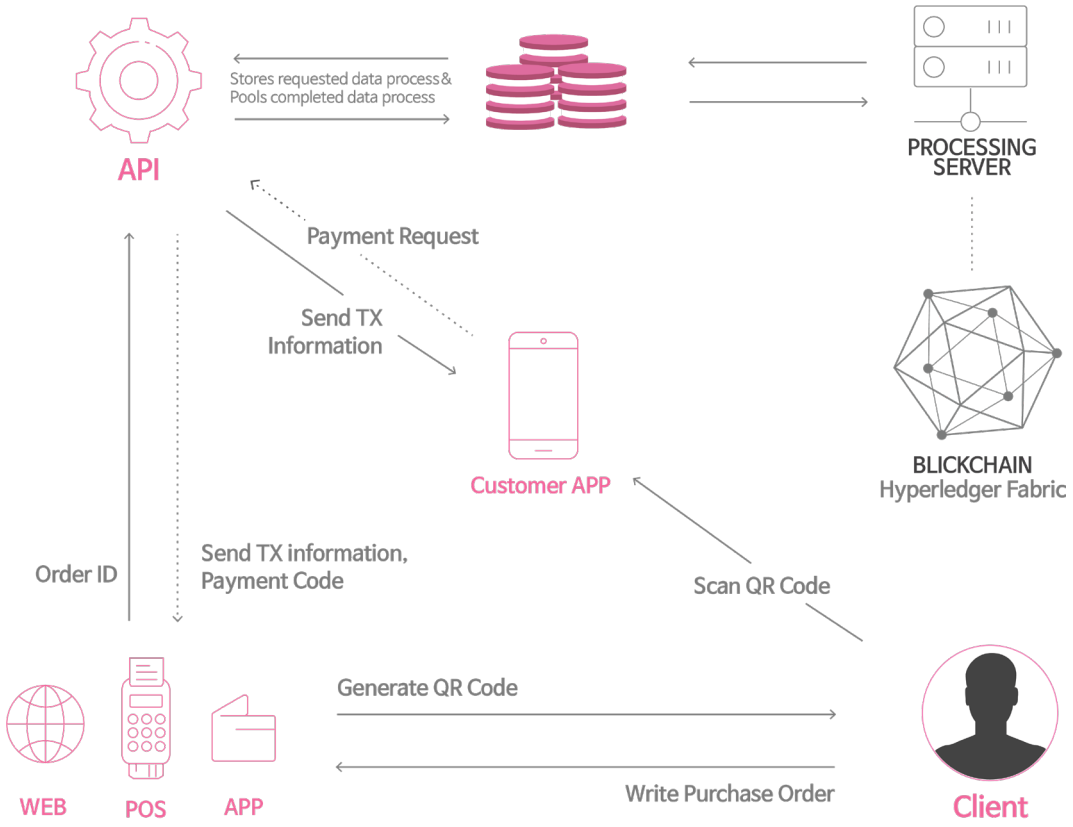
ⅰ) KYC Verification

ELA PAY is designed in a way that a user does not need to sign up for each service independently but can gain access to all services through single integrated KYC verification process.



ⅱ) Payment Process

When a customer requests a purchase at franchised stores or online markets, the vendor writes a purchase order via POS or APP and sends the purchase information to API (Application Programming Interface), which is a program that allows users to easily use simple commands on Elamachain database. API stores the order information (payment request) in database. Then Processing Server generates a payment code for the payment request and sends it back to vendor's POS or APP. Upon receiving the payment code, the vendor prints QR code corresponding to the payment code with APP, POS, or receipt printing device to transfer it to the customer. Customer who has received the QR code can scan the QR code to request API the payment in cryptocurrency or point. API stores balance query transaction in database while Processing Server checks user's balance and stores its information back in the database. API checks balance information from Processing Server and now stores payment request for the order in database. Processing Server generates a transaction for the payment request, stores generated transaction ID in database and sends it to API. API delivers payment result to customer (APP) and vendor (POS or APP) to complete the payment process.

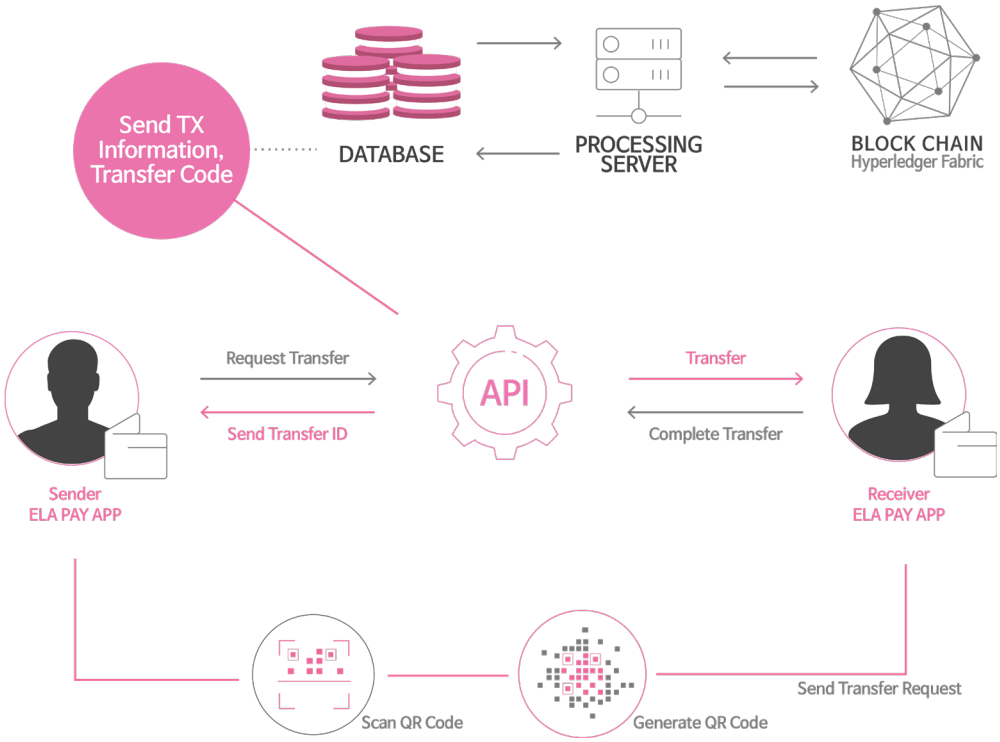


ⅲ) Transfer Process

Receiver of a transfer generates a QR code with APP and sends it to sender via messenger service or e-mail. Sender scans the QR code with APP and requests a transfer to API. Sender does not need to make a separate transfer request during the process; information scanned from QR code is sufficient enough to make a transfer to the receiver.

API generates a transfer request ID, stores the information in database, and sends the ID to the sender. API stores balance query transaction in database while Processing Server checks user's balance and stores balance information back in the database.

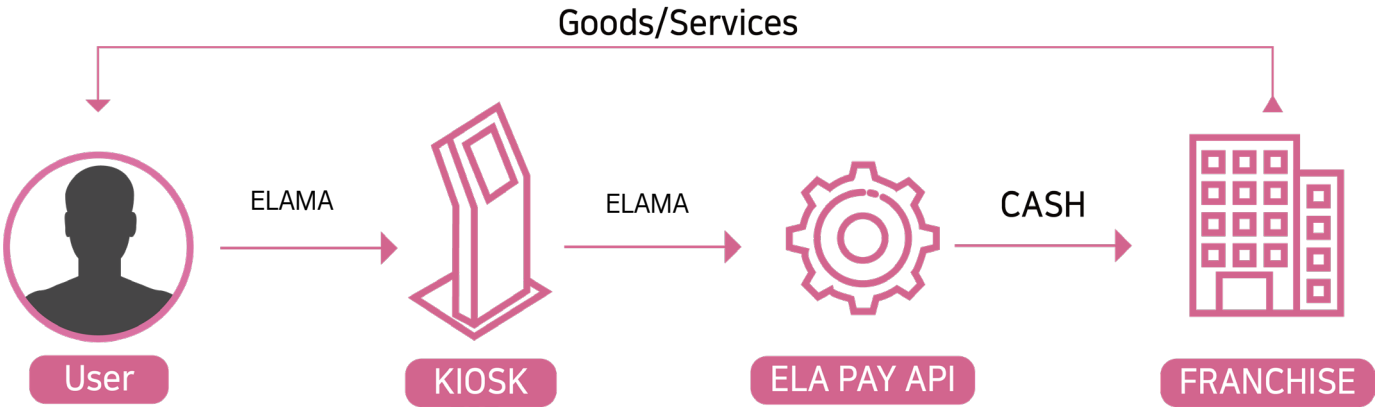
API checks balance information from Processing Server and then stores transfer request for the order in database. Processing Server generates a transaction for the transfer request, stores generated transaction ID in database and sends it to API. API delivers transfer result to sender and receiver to complete the payment process.



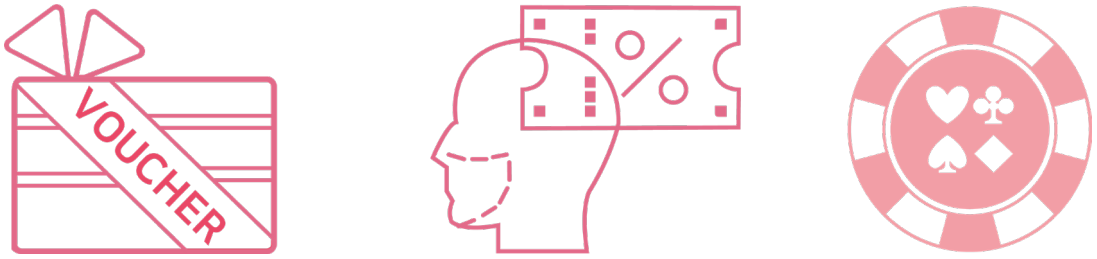
iv) Payment Use Cases

• Kiosk Payment

Elamachain provides easy crypto-payment solution from kiosks. Elamachain's kiosk is linked to Processing Server of ELAMACHAIN Platform and provides real-time price information of the cryptocurrency. Users can purchase any goods or services with ELA Coin wherever the kiosk is installed. Business areas which have high added value but were traditionally limited to apply crypto-payment, such as casinos and cosmetic surgery clinics, can benefit from kiosk payment system.



[Kiosk Payment Flow]

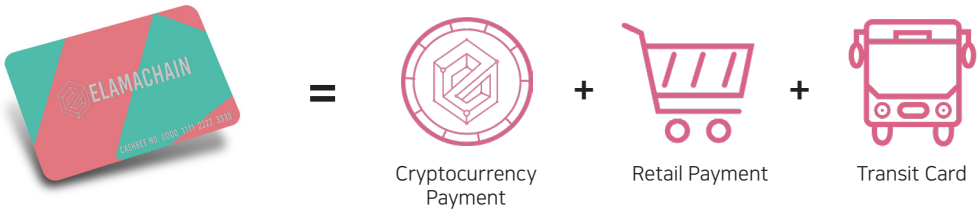


Duty Free Shop | Cosmetic Surgery Clinic | Casino

[Kiosk Business Application]

• Pre-paid Card Payment

Elamachain is in VAN cooperation which has nationwide payment service network in South Korea. ELA PAY users can pay for goods and services franchisees with ELA Coin. ELA Coin and points are inter-convertible at ELA PAY and users can pay with either one of them in payment network.

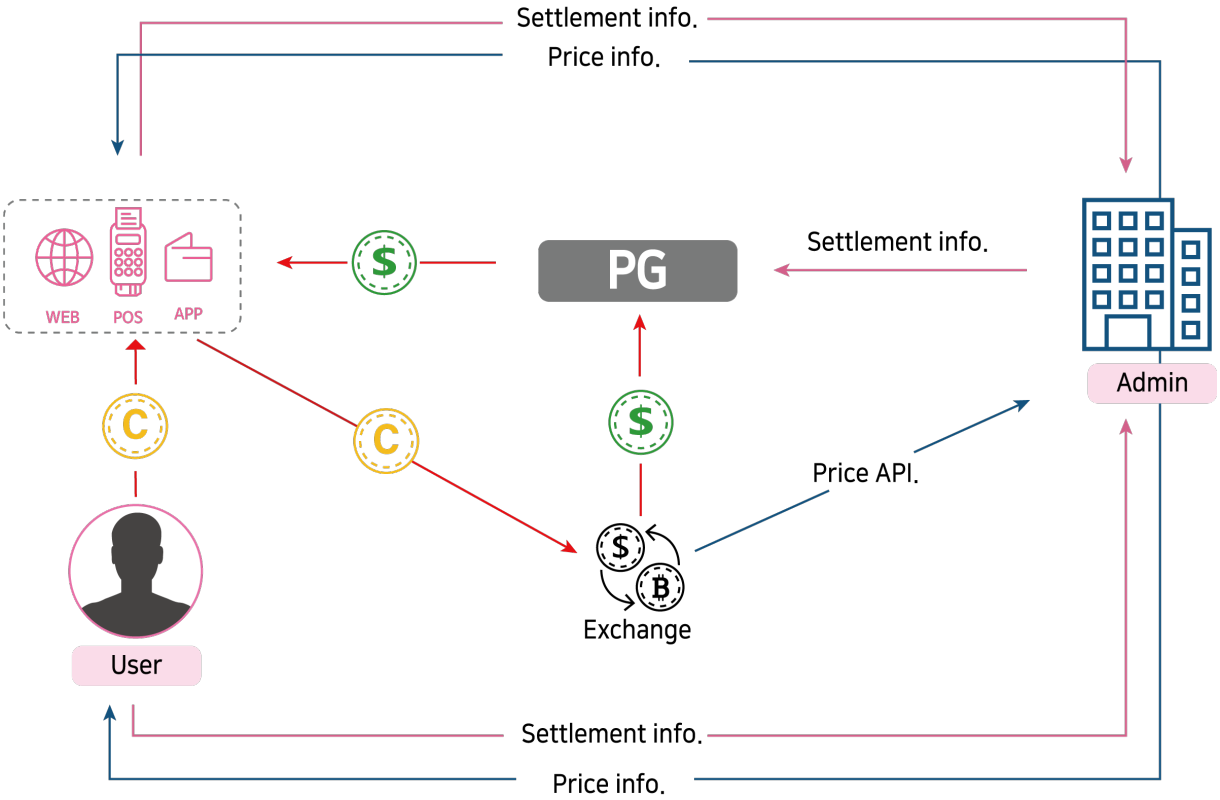


Transportation	Convenient Store	Shopping	Entertainment	F&B
TAXI	CU	LOTTE super	LOTTE WORLD	Angel-in-us Coffee, GONG CHA
	GS25	LOTTE Mart	LOTTE CINEMA	Krispy Kreme DOUGHNUTS, DUNKIN' DONUTS
	buy the way		MEGABOX	BR baskin robbins, Nàtuur
	7-ELEVEN	LOTTE DEPARTMENT STORE		CAFFÉ PASCUCCI, LOTTERIA
	MINI STOP	LOHB'S 롭스		

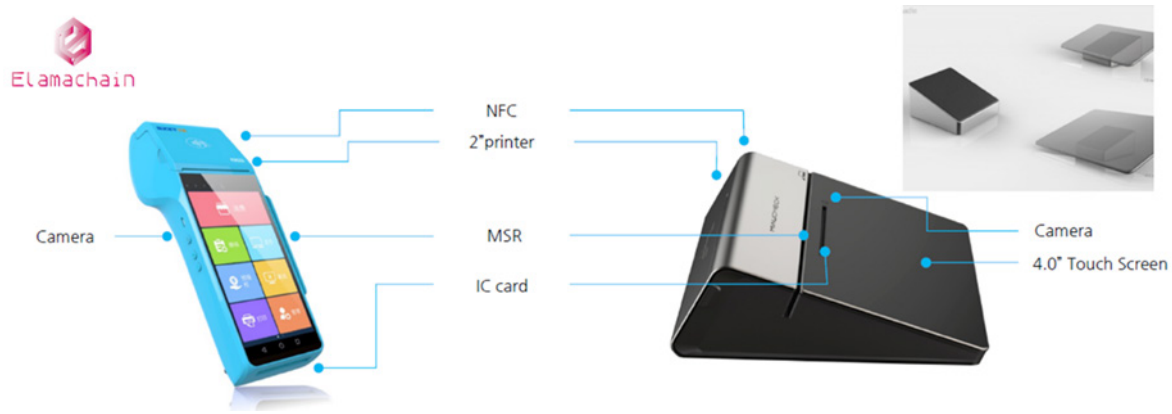
We have has more than 100,000 franchises nationwide, with sales of 110 billion KRW in retail business and more than 2 trillion KRW in transportation sector. So far, over 100 million cards have been issued and the use of card infrastructure has been constantly expanding over the years.

- POS

Elamachain has linked POS terminal system and ELA PAY App to API. Not only that, the platform employs POS system, which enables cryptocurrency payment, to easily settle payments with ELA coins in franchises. In payments made through ELA PAY, real-time pricing information and settlement automation systems are provided by the Exchange with a pricing information API. The information is then sent in real time to POS system and App of the merchant or online retailer. When a user purchases product, the payment information entered at POS is sent to the ELA PAY API. API then sends the payment information to the Payment Gateway (PG) and provides real-time pricing information to POS system. With POS system receiving the pricing information, the user pays ELA Coin and it is sent to the exchange and it gets exchanged for the purchase price. Exchanged payment of purchase and sale are transferred to a POS franchise through PG company and that's how the payment process is completed.

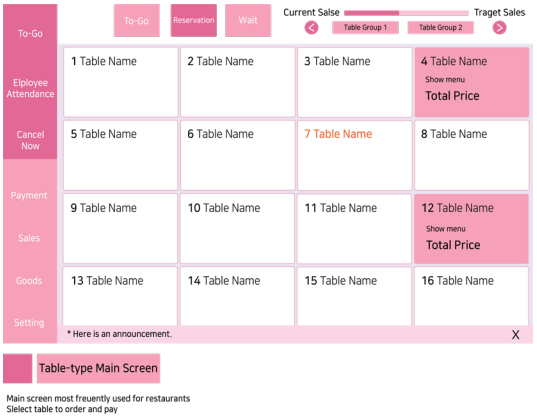


· POS Client Devices



All-in-one pos uses Android OS on 5.1-inch display and includes a camera and 2-inch printer for NFC, IC card, MSR and bar code reading. It supports 3G and 4G connected environments and can be used in shops or wherever POS is required in mobile environment.

Desktop-type POS is a POS developed and manufactured by Elamachain. The payment screen is connected to a tablet PC (selectable size) and Bluetooth. External communication is connected by LAN and has built-in camera and 2 inch printer for NFC, IC card, MSR, QR code reading. For more potential partnership with relevant companies, our plan is to add beacon functionality in the future to support hardware enhancements of POS.



· Table App

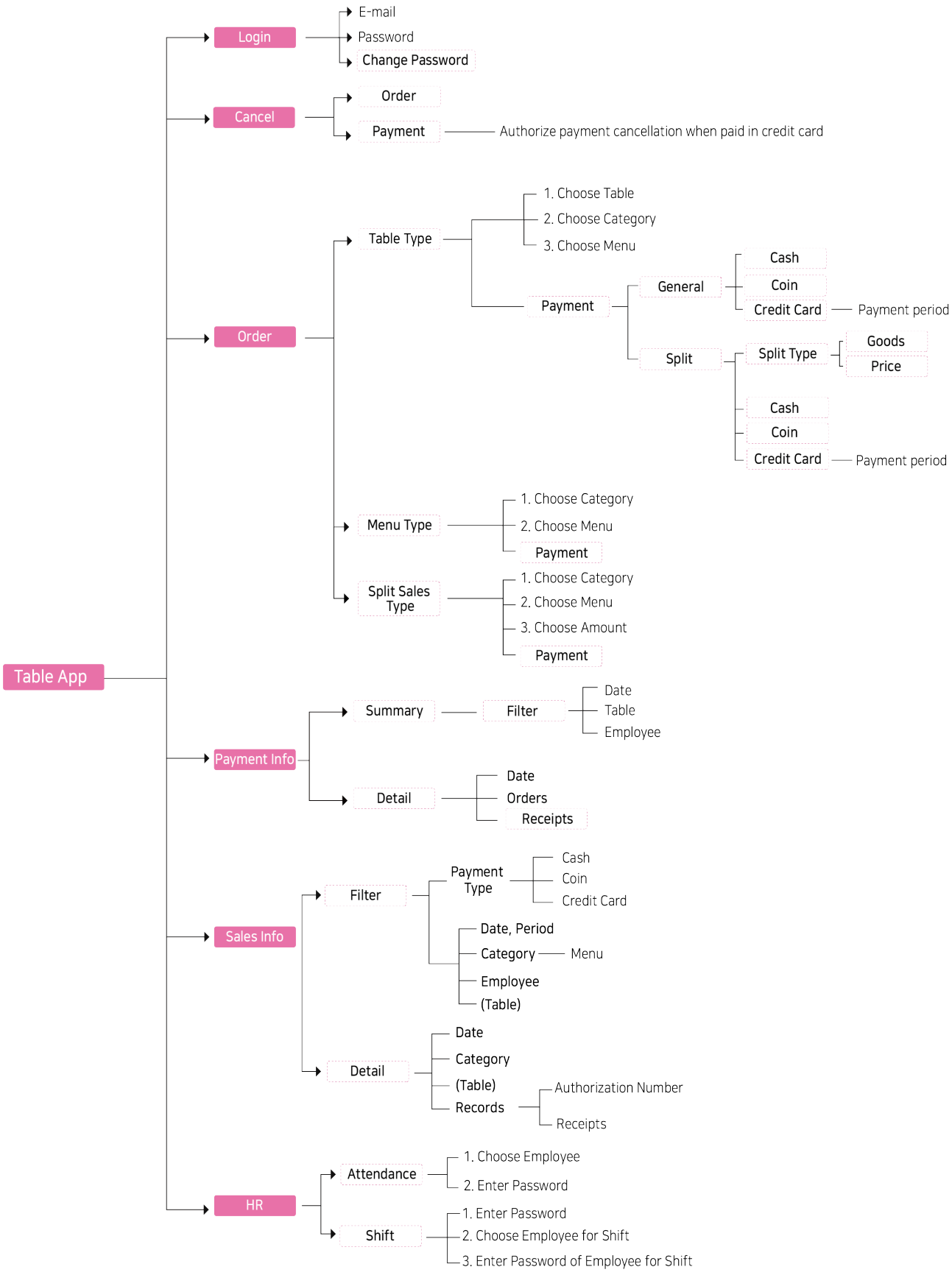
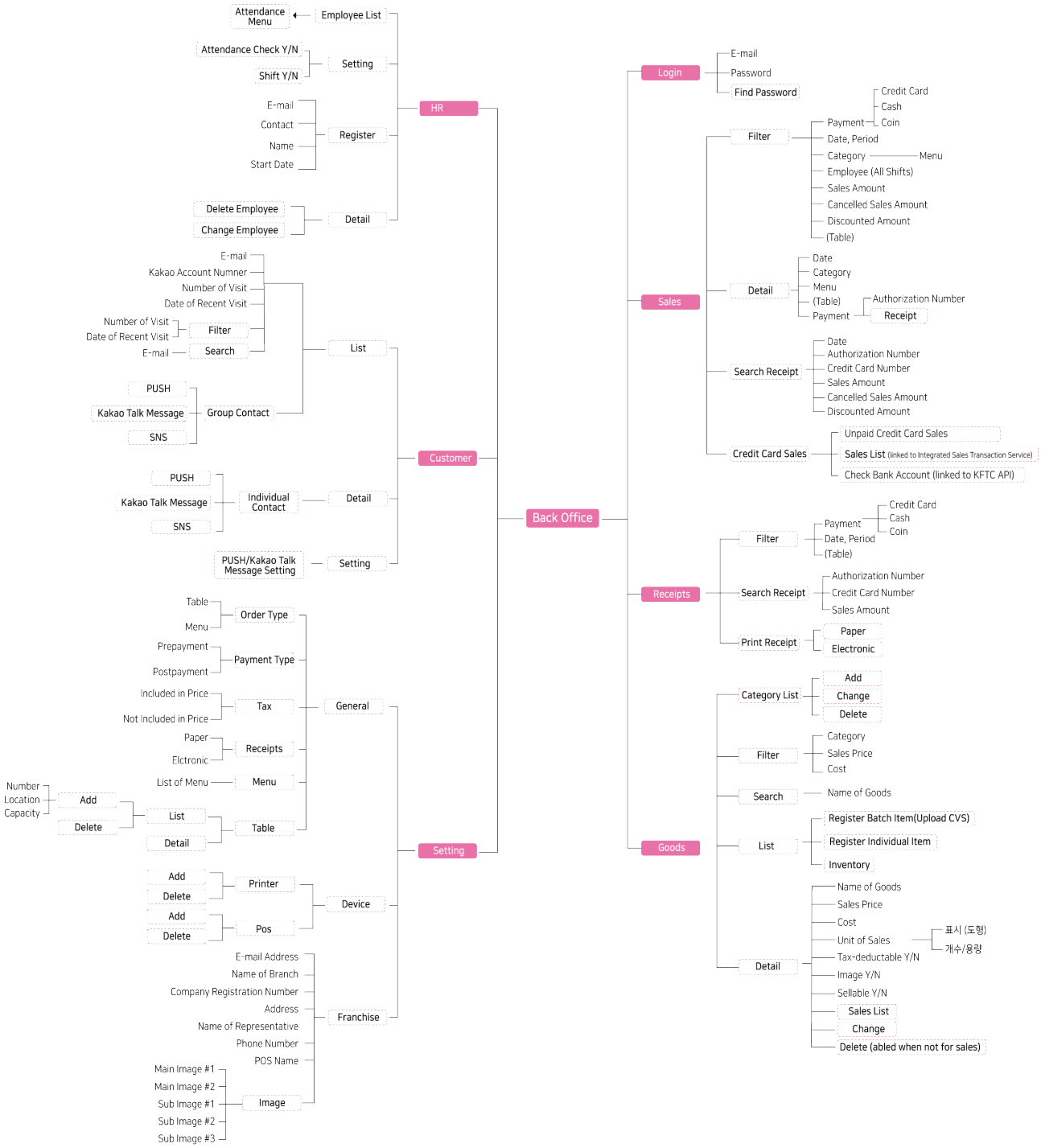


Table App
Login
E-mail
Password
Change Password
Cancel
Order
Payment
Authorize payment cancellation when paid in credit card
Order
Table Type
1. Choose Table
2. Choose Category
3. Choose Menu
Payment
General
Cash
Coin
Credit Card
Payment period
Split
Split Type
Goods
Price
Cash
Coin
Credit Card
Payment period
Menu Type
1. Choose Category
2. Choose Menu
Payment
Split Sales Type
1. Choose Category
2. Choose Menu
3. Choose Amount
Payment
Payment Info
Summary
Filter
Date
Table
Employee
Detail
Date
Orders
Receipts
Sales Info
Filter
Payment Type
Cash
Coin
Credit Card
Date, Period
Category
Menu
Employee
(Table)
Detail
Date
Category
(Table)
Records
Authorization Number
Receipts
HR
Attendance
1. Choose Employee
2. Enter Password
Shift
1. Enter Password
2. Choose Employee for Shift
3. Enter Password of Employee for Shift

· Back Office

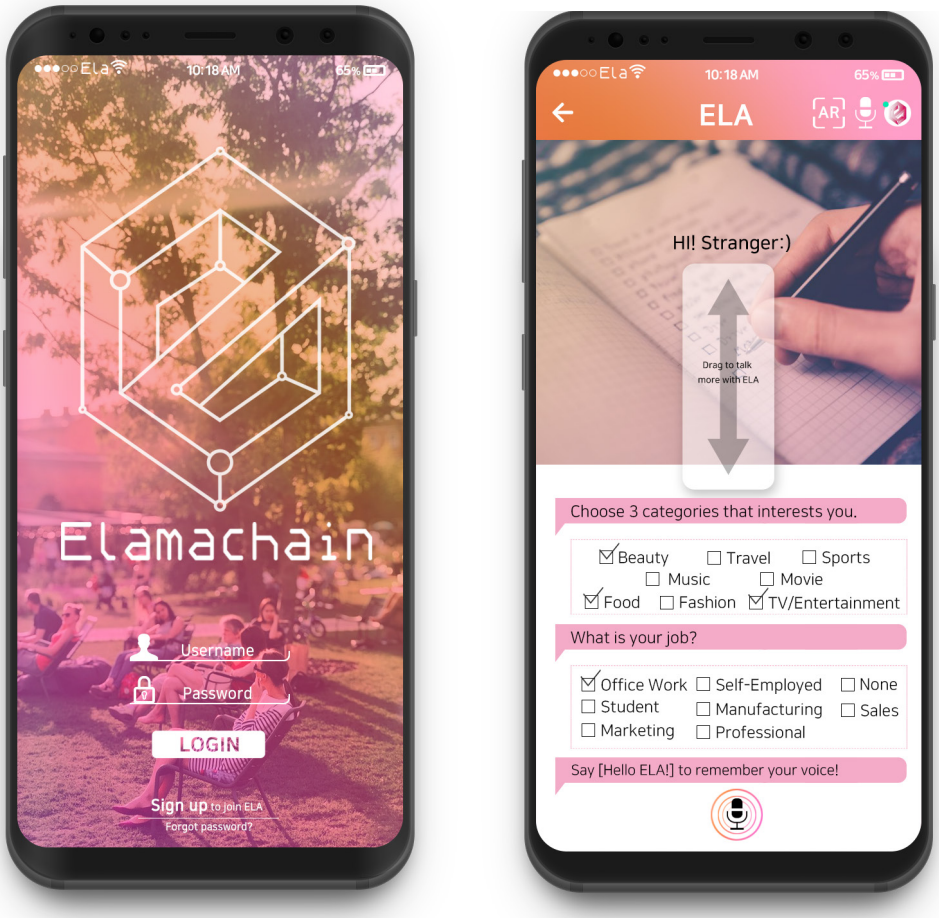


5.3 Scalable Consumption Pattern Analysis Dapp

AI engines of ELAMACHAIN can be applied in various AI services including chatbot, MR, IoT, etc. Use of AI enables providing personally customized differentiated services in business models of health care, travel, game, and more.

① Starting ELA

ELA, who wants to have the closest and personal relationship with you, wonders what you think now, how you feel, what you need, what you want to do, and so on. ELA always wants to know your thought and mind.



ELA can be your guardian, personal assistant, friend or more on your request. ELA is with you at home, work, or even your walk on your favorite park. ELA greets you in the following orders to get to know and understand you better.

Step 1	Step 2	Step 3	Step 4	Step 5
Sign-up	Tutorial	Select character and start conversation	ELA Mission	ELA as a daily life
Make basic information DB	DB process of user tendency	Learning and reasoning of user emotion	Implement learning & reasoning and devise results	Implementing learning & reasoning and providing results

Sign-up process build database with user's basic information. Users receive 1st ELAMA reward when they enter their national-ity, age, area of residence, occupation, and other basic information.

② Tutorial

In tutorial users answer set of questions designed to figure out baseline preference. ELA suggests users with words, images, etc., and ELA learns basic user interface and builds database. ELA, upon establishment of big data database on basic user preference, moves on to machine learning users preferred food, travel sites, music genre, etc.

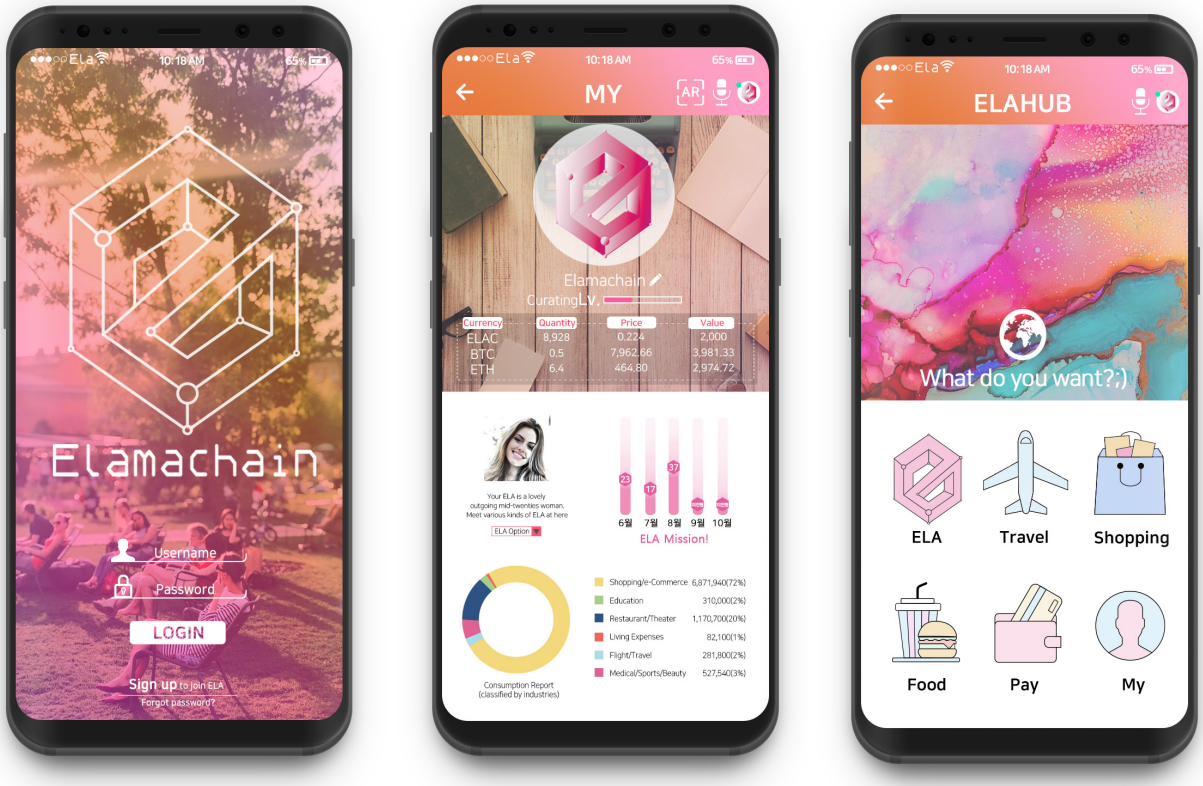
③ First meeting with ELA and conversation

Now, here is your fluttering first meeting with ELA. When a user selects the conversation character of the choice and starts the conversation with ELA, a surprising world will begin.

"ELA wants to know your every daily life. Nicely answer to ELA's questions. Ask what you want to know from ELA and ELA will answer. If you repeat such casual conversations with ELA, ELA's affinity level will go up!" Emotional conversation with ELA is conducted via user-selected characters. Custom characters differ in emotional settings, conversation tone, and visual avatar. Some of the characters and their likelihood are as below.

Character	Boyfriend / Girlfriend	Friend	Family
Emotion	Love	Friendship	Family love
Example of friendliness	Lv. 10	Lv. 10	Lv. 10
Example of conversation tone (AI)	Honey, dinner yet?	Buddy, got snack?	Sis, did you eat?

When you choose a character and meet your unique ELA, ELA's exclusive AI service will actively engage in emotional conversation with you. ELA will learn through text-based conversation of the big data for recognizing your spending patterns, spending process, and influence factors (recognition, emotion) throughout behavioral analysis. Then, via machine learning, it will study to recommend the optimized life choices that suits user's preference.

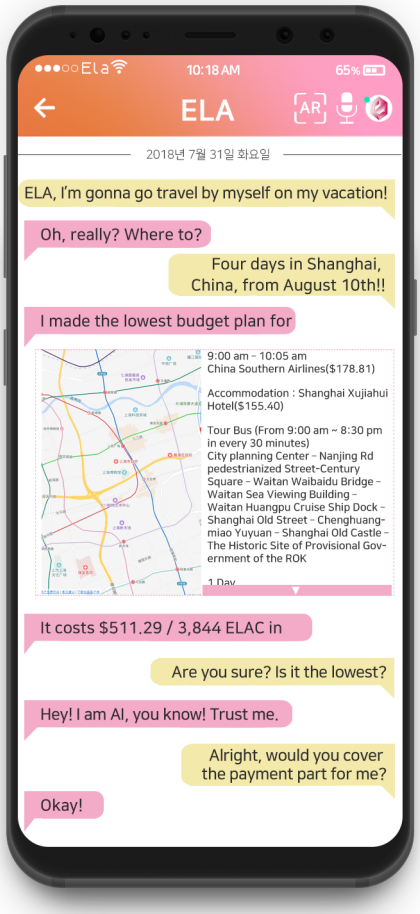


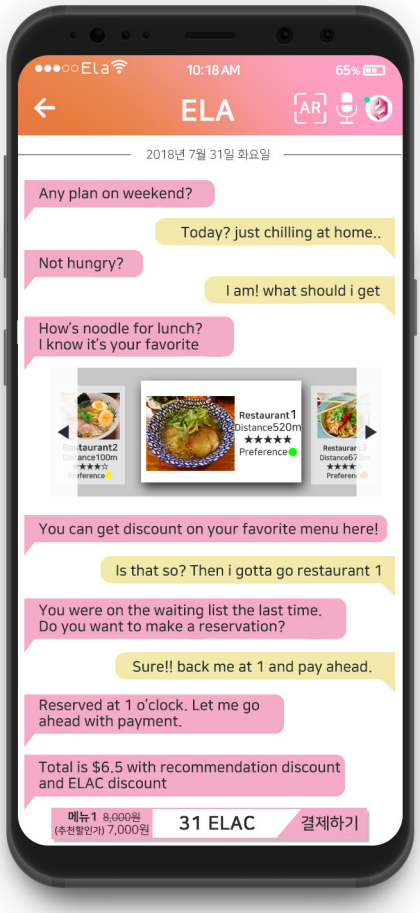
ELA collects the baseline information on user behavior talking with users as a friend or family. Processed and analyzed user information then are ELA devises this 6-staged consumption purchasing process

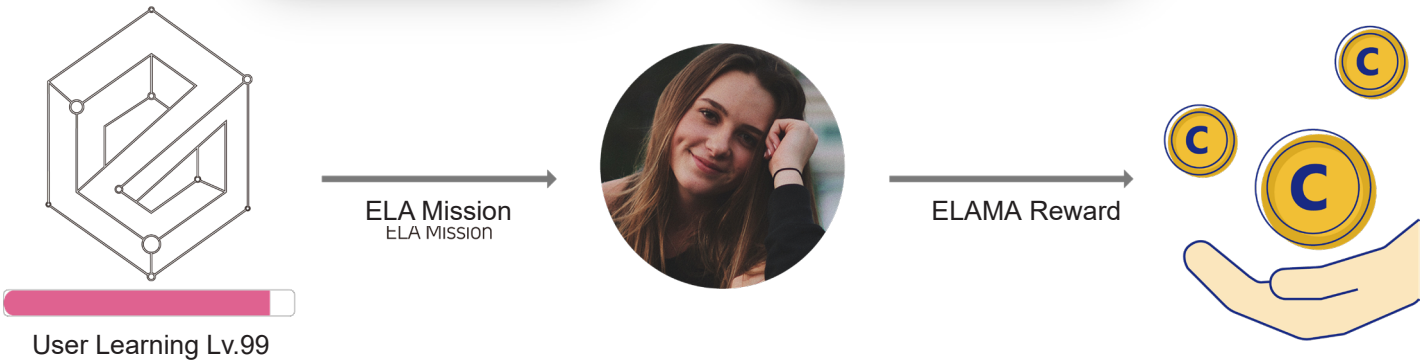
Stages of Unser Interaction Process					
Step 1	Step 2	Step 3	Step 4	Step 5	Step 6
Recognize needs	Search information	Evaluate choices	Purchase	Use&Experience	Post-purchase actions

④ ELA Mission

ELA will now ask you to complete 'ELA missions' to bring most optimized results in adherence to your own preference. ELA will suggest you with the customized missions, such as shopping or travelling, and ELAMA rewards are given as a compensation for completing the mission. This is the actual starting point of ELAMACHAIN Eco-system.





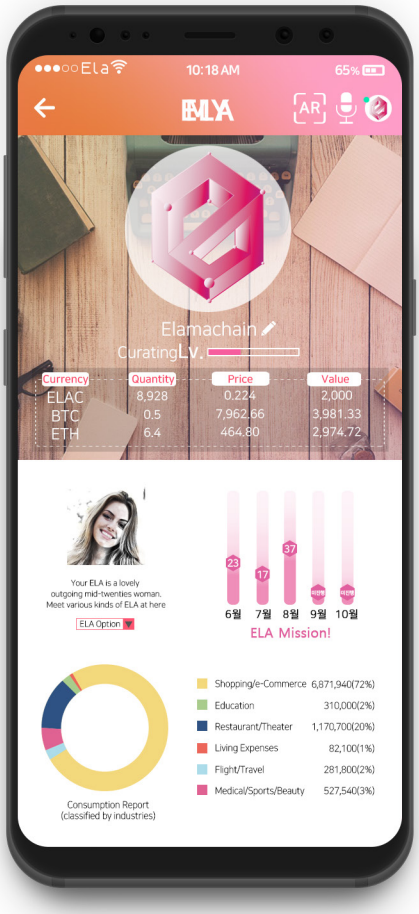


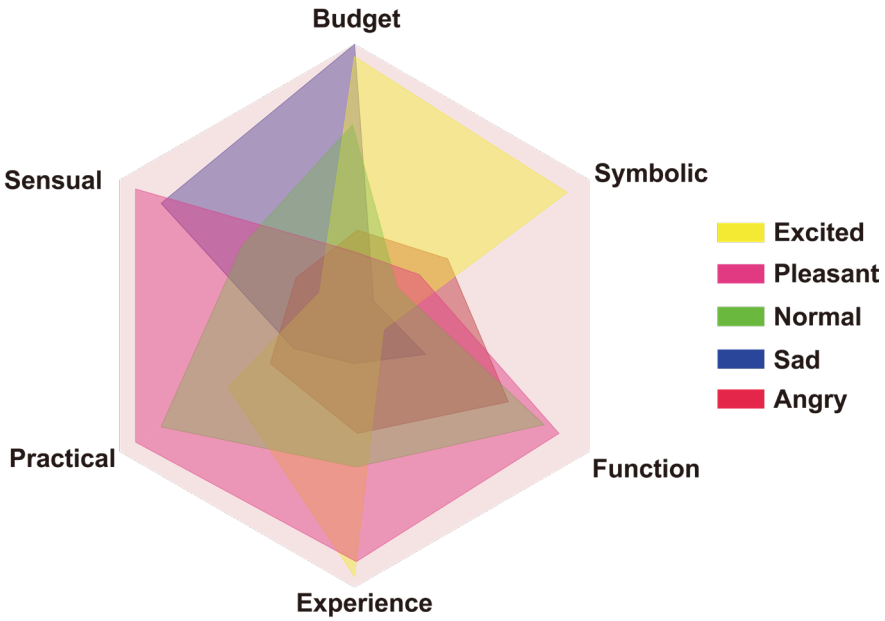
Experience	0	200~	500~	1000~	2500~	3500~	4500~	7500~	12500~	20000~
Level	Lv.1	Lv.2	Lv.3	Lv.4	Lv.5	Lv.6	Lv.7	Lv.8	Lv.9	Lv.10
Chat Reward (KRW)	100	200	300	400	500	600	700	800	900	1000
Mission cap per 24 hours	20	20	20	20	30	30	30	30	50	50

[Reward table by experience and level]

⑤ ELA as a daily life

ELA's emotional intelligence grows as learning processes repeat with continuously performed user missions. Smarter ELA from machine learning aids you to make the perfect choice.

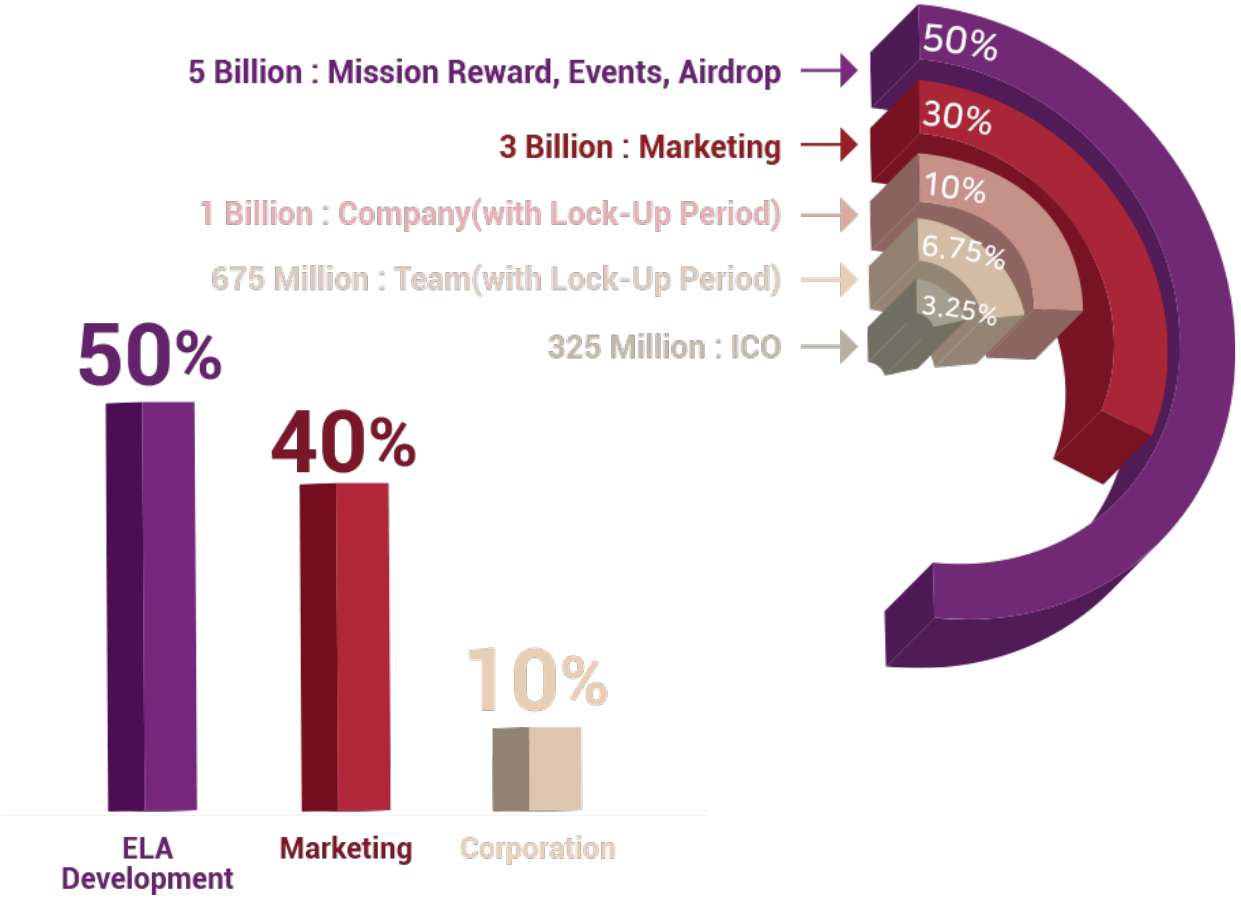




6. Distribution

- ELA Coin(ELAMA) Distribution

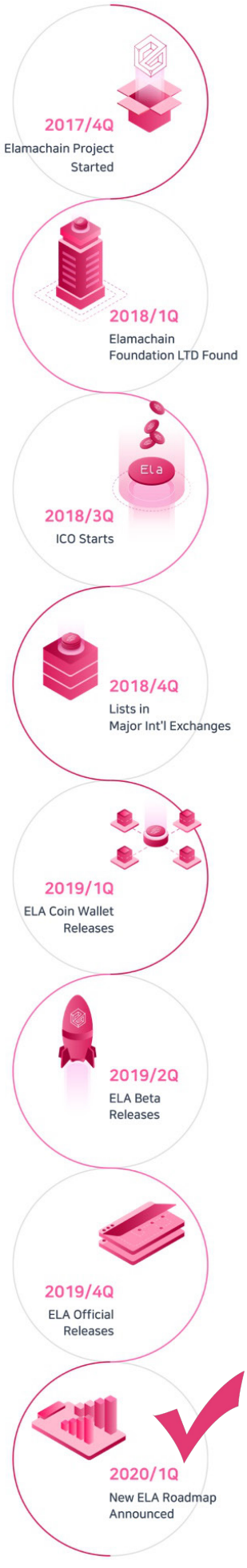
ELA Coin(ELAMA) is an ERC-20 based token. Total token amount to be issued is 10 billion ELAMA. ELAMACHAIN service users are rewarded a certain amount of ELAMA upon completing missions from ELA AI. 3.25% of total tokens are distributed at ICO. 6.75% goes to team. 10% of tokens are reserved for the foundation and 30% will be used for marketing purpose. Rest of the tokens, which is 50% of total tokens, will be reserved and used for mission rewards, airdrop, and other events.



- Distribution of ICO Fund

For funds from token sales, 50% will be used for development, 40% marketing, and 10% reserved for company. Resources for the development, which we allocated 50% of the fund, would work as a key factor to successfully develop and launch ELAMACHAIN Platform as well as to construct balanced and sustainable ELA Eco-system.

7. Roadmap


2017/4Q
Elamachain Project Started
2018/1Q
Elamachain Foundation LTD Found
Ela
2018/3Q
ICO Starts
2018/4Q
Lists in Major Int'l Exchanges
2019/1Q
ELA Coin Wallet Releases
2019/2Q
ELA Beta Releases
2019/4Q
ELA Official Releases
2020/1Q
New ELA Roadmap Announced

8. Partner

HYPERLEDGER
BLOCKCHAIN TECHNOLOGIES FOR BUSINESS

Linux

BIG DATA

CAMPG

TAEJIN INFOTECH

The Blockchainer®

BitForex

DigiFinex

Bitsdaq

CoinMarketCap

BITTREX GLOBAL

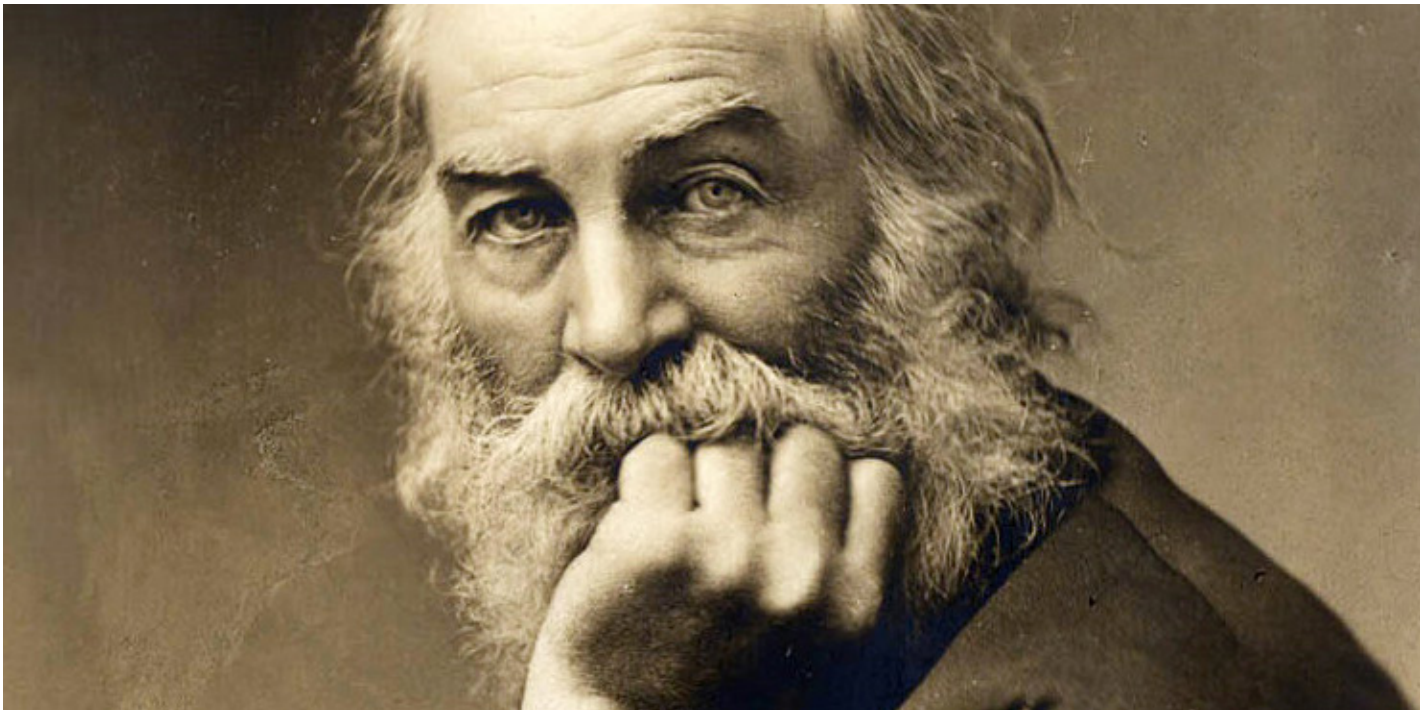
Unixbank

BITBERRY

ICO bench

MyToken

CoinGecko



Do anything, but let it produce joy!
Happiness, not in another place but this place,
not for another hour, but this hour!
- Walt Whitman -

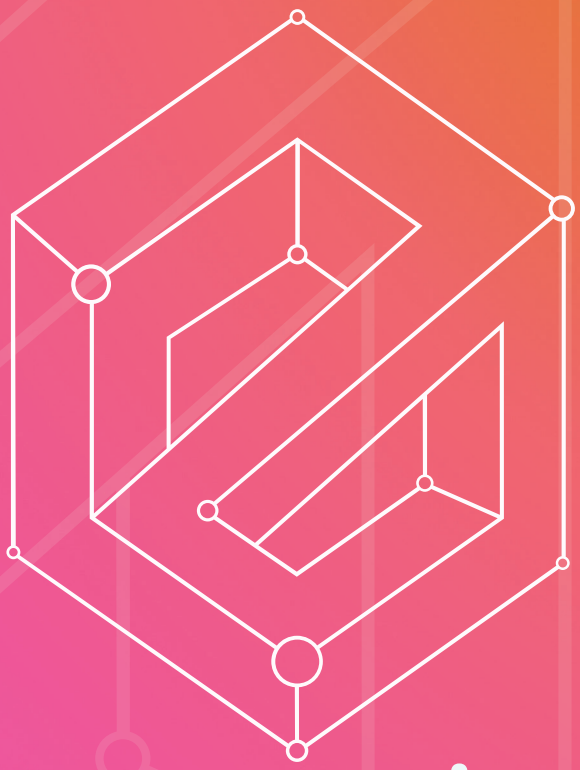
Great American poet Walt Whitman says in his poem “Leaves of Grass” as above.

We make so many choices in our lives. Not all of them, unfortunately, give us the satisfaction and happiness we intended. What if an opportunity is given to you, an opportunity of choices only made for you and by you? We believe you will get more satisfaction with such opportunities.

Emotional intelligence blockchain platform designed to help you to make the right decision based on your own emotional preference.

That is ELAMACHAIN.

And it starts here and now with you.



Elamachain

www.elamachain.io