

# The Architecture Design of Students' Career Information Management System using Block Chain Technology

Jin-ho Lim, Kwan-Sik Na, Yen-yoo You

**Abstract** In this paper, we propose a students' career information management system using block chain technology to provide trustworthy data and information for the secure authorized access to resources. Key to the success of this architecture design is a scalable and private architecture for trusted data sharing. With the advent of global competition, there have been many changes in the recruitment system of companies, which is a typical example of the universalization of the preference of professional workers who always employ the necessary manpower. In other words, in order to prefer the prepared personnel suitable for job performance, students should design their career in advance and accumulate their competencies in the major fields. Therefore, our proposed architecture design of blockchain based system in this paper would presents verifiable resources to store career management for students in university.

**Keywords:** Block Chain, Career Management, Student Career information management system, engineering certification, HR matching, recruitment, enterprise

## I. INTRODUCTION

A block chain is a kind of distributed record that records transaction information. Each node has its own book, and the contents of each book are equally stored by a consensus algorithm. Blockchain is attracting more and more attentions from many kinds of fields, such as finance, industry, and theory researchers.[1]The block chain technology attracts a great deal of attention from the World Economic Forum, as well as the application of technologies to finance, education, society and culture (annual growth of 83%). The UK, the US, and Japan are launching (or preparing) a platform for resume identification. Moreover, one entry recorded in a book can be represented as a transaction based on blockchain. When a user who wants to record in a book generates a transaction and transfers it to the P2P network, the block chain processing nodes collect the blocks and generate a block. Since the blocks are chained together, an ordered recording of transactions is possible. An instance of this linked chain represents one distributed book. The coherence or uniformity of the distributed books can be said to result from the identity

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of the block chain image that each node has. The identity of a block-chain image can be maintained naturally if one node in the center generates the block exclusively. Accordingly, we applied block chain technology our students' career information management system to verify data and information to pertain domestic universities in Korea

## II. RELATED WORK

There is increasing happening of falsification resume as common practice. When a business wants to work with a career, here is a huge risk that the job applicant's information provided is misleading, or even factually false. We understand that 53% of resumes and job applications contain falsification. 21% show fraudulent degrees. 29% show altered employment dates. 33% have inaccurate job description. 27% give falsified references. Given the cost of a bad hire, business are looking for a way to ensure the career they hire has the right skills.

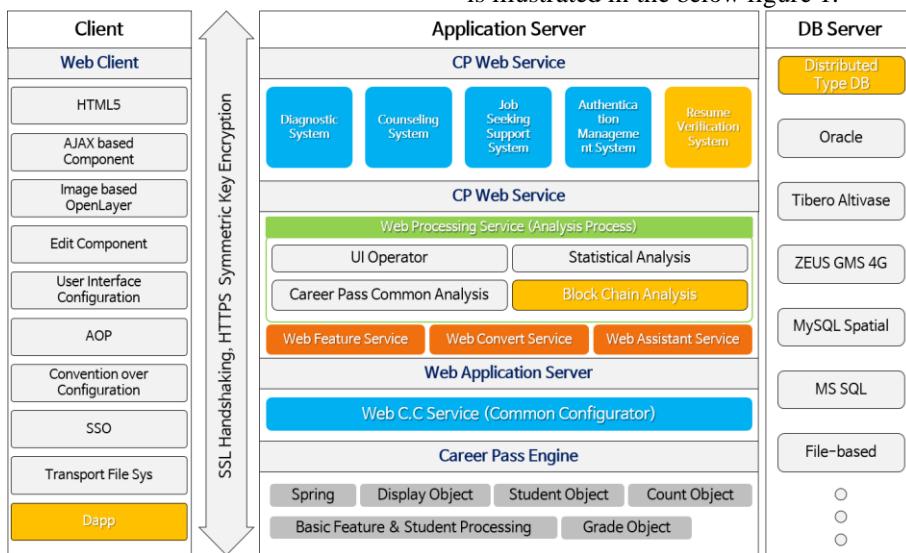
With our presented architecture design using blockchain technology, career can communicate to business the access to their stored data in the University students' career management system, enabling a more transparent and secure relationship. Employment Ministry of Labor and Employment Information Site Worknet, job Korea, people, career, etc., provide huge amounts of unilateral information, causing inconsistency between desired information and actual information. In addition, the failure of the youth employment policy (the unemployment rate of 17 years, 21.4%) causes serious social problems such as productivity deterioration, generational conflicts and loss of growth power (the social cost of the young Niet family: ₩23.8 trillion in 16 years). The block chain technology attracts a great deal of attention from the World Economic Forum, as well as the application and application of technologies to finance, education, society and culture (annual growth of 83%, 27% GDP of 10%). The UK, the US, and Japan are launching (or preparing) a platform for resume identification and recruitment based on block chaining. We applied block chain technology to Career PASS 2.0, our college career / history management solution approved by domestic universities (24 sites, 250,000 people), and using the resume verification technology that has secured credibility, and the time saved in the resume verification of HR personnel, as well as the agreement with the government's tailored job.



### III. METHODOLOGY

In this section present the architecture design of proposed approach, the detailed design of the career management system to overcome career information integrity.

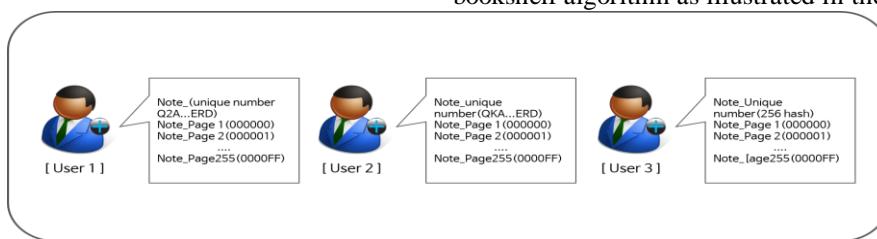
#### 3.1 Conceptual Solution



**Fig 1: Career Management System Architecture Design**

All the components are categorized above the system architecture design which is composed of an architecture that can be used in DApp form by registering the certified data such as student's qualifications, awards, and statistics in the block chain.

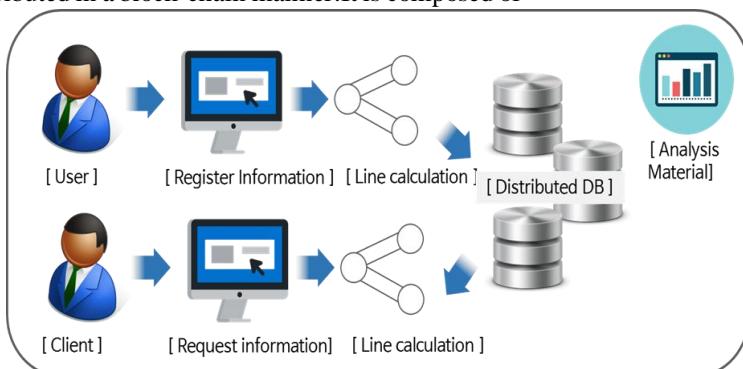
#### 3.2 Career Verification Scenarios



**Fig2. Structure of bookcase and structure of user notes**

This scenario could present some components with assimilation, in other words, bookcase regard as university, note as students, page as qualification and awards, line as career verification. Figure 2 shows how to organize user-specific notes in a bookcase and how each page's unique number is represented. A bookcase for each university and a note to the user who applied(256-digit hash code unique value-forgeryImpossible). The way of storing the provided notes is distributed in a block-chain manner. It is composed of

connected DB structure. To recognize a user's notes individually, use the unique number of the note. A page of notes and a pair of unique values for each line, with a 16-byte termination code as the Header. And, the one having the error detection code is configured as an individual note and a page in the below figure 3. In this scenario, fig3 presents to configure user data entry and verification of actual recruiting information

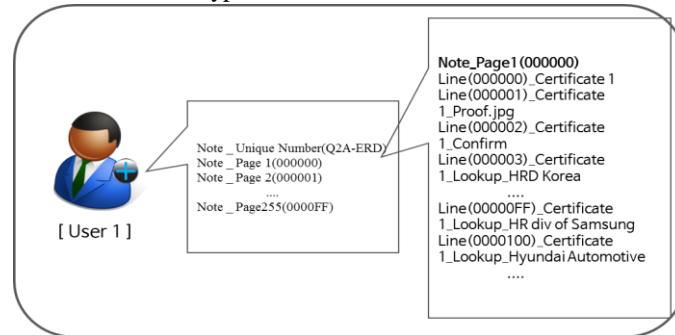


**Fig 3: Composition of pages and lines of each note**

### 3.2.2 Detailed lines of a page

In the user's page, the type of data is input in the first connection line, the data is stored as a connection type in the

proof, confirmation, inquiry contents of the input data, and the form of accumulating the history of inquiring data under each connected data.



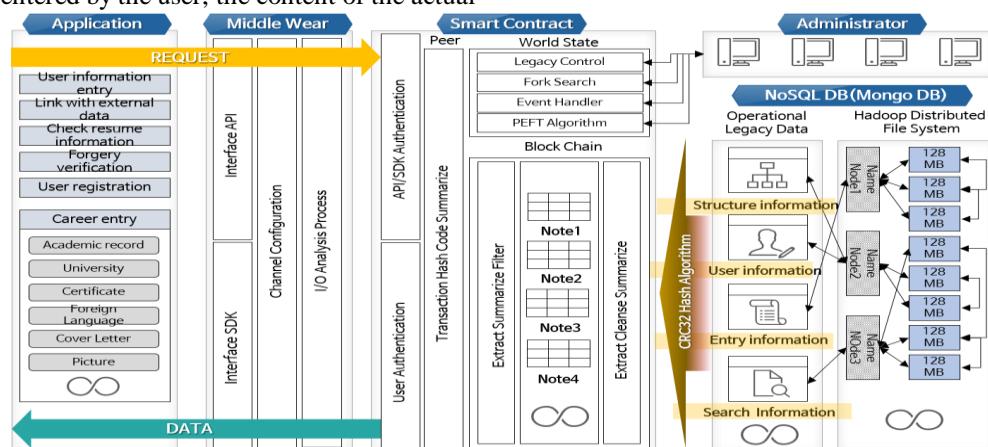
**Fig4: How to save detailed lines of a page and issue a unique number**

All information of the user is in the form of a chain. At each point in time, the point where the chain is recorded in the note is recorded in the note every 2 seconds, and the period of interworking between the distributed DBs is 15 minutes. The defects are recorded in a distributed DB which utilizes the block chain technique, recorded as a line, verifying the total Hash value of each note is compared. When the recruitment company requests information confirmation, it registers the line in the user's note and judges that there is an actual value when the registration is completed. Analyze the information entered by the user, the content of the actual

employment, and the information of the recruiting company in the form of big data and provide it to the users as analysis data in figure 4.

### 3.2.3 System Development Process

It will be designed for a service that deals with user's personal information. All data is stored in NoSQL DB using distributed storage technique. The administrator grasps the storage and events of all nodes, but the value is securely encrypted by hashing. This scenario is regarding data secure as illustrated in figure 5.



**Fig5: How to save user personal information with verification**

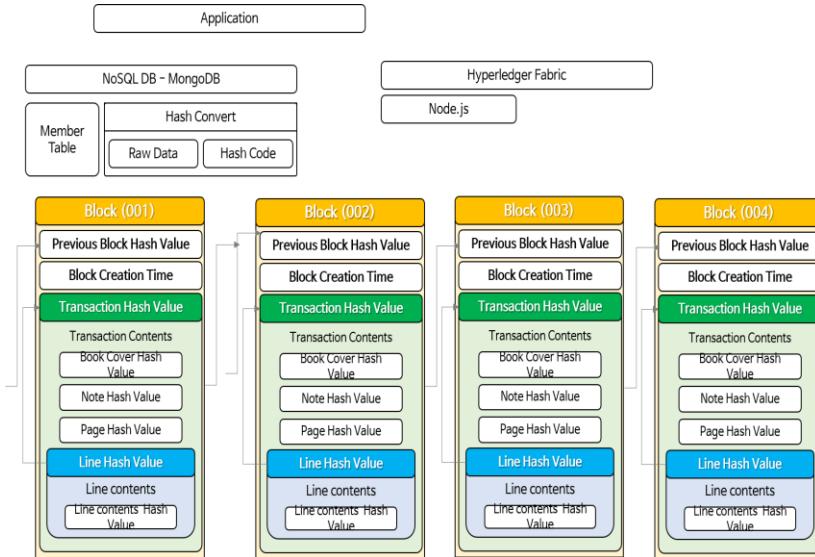
## 3.3 Blockchain Structure

### 3.3.1 Block Components

All of the components of a block are composed of a block of hash. To find the actual value, it is necessary to analyze the hash value and find out the actual value stored in the DB. It is impossible to deduce the existing value with only a part of the block by processing the contents of all blocks with a hash, and it is necessary to know and decode all the hashes to check the data. Hash formats all data using CRC32, a consensus algorithm to handle associations between all notes, and PBFT (Practical Byzantine Fault Tolerance[2]). A concept proposed

by Miguel Castro and Barbara Liskov in 1999, which is a concept that can counteract malicious attacks[3]. It is a typical consensus algorithm that verifies by communicating with all nodes.) Based on an extended consensus algorithm By using the two broadcast processes to the reliable confirm target, the Byzantine leader and the Byzantine validation node send a strange or arbitrary message for the network branch[4], all the nodes of the network can have the same message, Available. Since all members are already managed through Smart Contract, they decide to agree on only two broadcasts to the confirmed target[5]in figure 6.

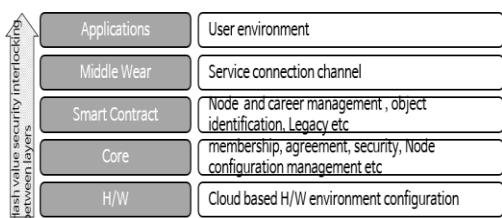




**Fig6: Blockchain structure**

### 3.3.2 System Implementation Scenario

The system structure to be implemented consists of Applications, Middle Wear, Smart Contract, Core, H / W. Application refers to the function that can be directly used by the user. It is divided into user information input and user information inquiry user registration. User information input is based on data input and manual input in figure 7.



**Fig7. Features by system tier**

### 3.3.3 User information registration

User information input is based on data input and manual input. Data interlocking: Data interlocking is automatically added to the history items in the college portal currently operated by affiliated universities and existing systems. Handwriting input: Ability to set up the items to be input by you and upload related contents and supporting documents. All items can be infinitely extended, and the evidence and history are stored at once in figure 8.

**Fig8. Applications**

User information inquiry is inquired by resume information inquiry, forgery, and discrimination.

Retrieval of resume information: It is a function that can retrieve the user's resume. It can inquire information based on the key of the note issued to each user. It also provides a snapshot (DB-provided read-only static view And the

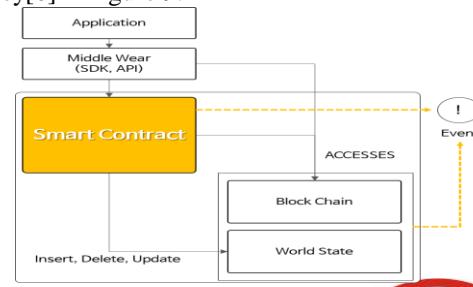
instance of the database is synchronized with the database at the time of creation), so that the information of the current point can be retrieved in the form of a fixed key. Forgery and tampering: The user's resume and all items entered are uniquely named in the form of a unique hash value, and it is possible to verify whether the information entered is forged or not by just verifying the relevant key.

### 3.3.4 Middle wear / DApp (Decentralized Application)

Middle Wear is a third party that uses block chains in the form of decapsulated applications (abbreviated as Decentralized Application), meaning functionality other than those manufactured by the manufacturer (external development extensibility). Supports interaction between DApp and Smart Contract is supported through API and SDK. Representational state transfer (REST) architecture-style API is designed and implemented through HTTP-based JSON type unsaved request modeling. Asymmetric key encryption framework using PKI (Public Key) supporting standardized and stable system operation and interworking using access authorization using FIDO 2.0 (Fast IDentity Online).

### 3.3.5 Threat reduction and user authentication through Smart Contract

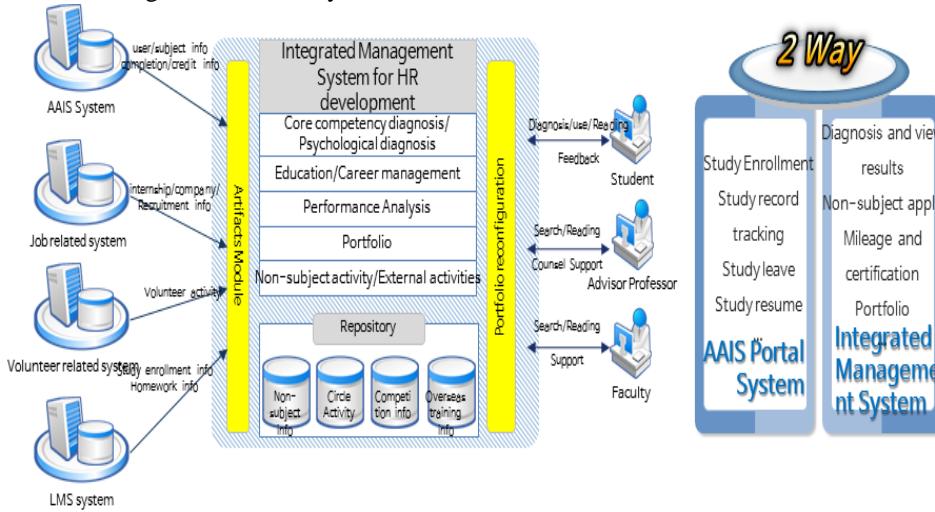
Authentication: Authenticated user through a combination of public key and private key issued to FIDO 2.0-based client, and implemented as a dual authorized system that inquires actual usage rights through issued API key[6] in figure 9.



**Fig9. Smart Contract, Peer**

#### IV. RESULTS AND DISCUSSION

Firstly, currently running architecture designed and developed to take into account the organic linkage with the existing campus system including the BS Portal system, and



**Fig10. Current operation system architecture**

Secondly, Problems with client-server centralized systems. The additional costs or shortcomings of the nodes, participants mention issues about load of computational resources on nodes. Concerns about system load, memory load, usage capacity increase, concern about system performance degradation, cost incentive, motivation method for inducing users to use, It is also advisable to suggest a linkage between the verification body and the verification body.

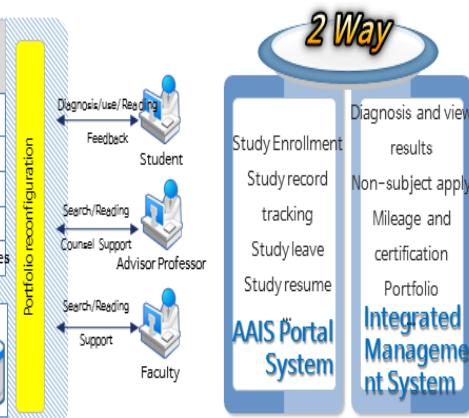
Thirdly, Problems of current career management system, Which has problem of easy to modulate, verification and security issues.

Finally, Expected Effect of Block Chain Based History Management System. At the heart of the block chain technology is the establishment of a P2P trust network without a trust mechanism[7]. Because the information is distributed in the block chain structure, it is possible to maintain a relatively high security level than to store everything in the central server[8]. Also, because all participants share information, basically all transaction records are open and transparent. The absence of a third party's notarization eliminates unnecessary fees, reduces the complexity of process and infrastructure costs associated with system integration, and assures timeliness as the transaction record is automatically executed by multiple participants[9]. The technical characteristics of the above-mentioned block chain are expected to solve the problems of the existing system

#### V. CONCLUSION

In this paper, we present the architecture design of students' career management system for on-line based degree verification, with preserved trustworthy job matching and increased availability[10]. Using blockchain technology we make the personalized career management platform that certifies all credentials, education, or other issues.

to ensure the convenience and accessibility through the standardized UI configuration, so that the business efficiency in the use of the system of major stakeholders is designed to be sufficient in figure 10.



Especially, job seekers can track their career history, credentials, and awards through a 'user certification day' with the same level of credibility as electronic certification[11]. We expect that we will be able to search for optimized jobs through 'Big Career Service' which is provided and verified and personalized information providing service. There are two ways in which the applicant registers his / her own career history and proof of the applicant himself / herself, and a method of applying to the company after the applicant registers the related matters in the job portal. Especially, this system can save time and money by allowing companies to filter out false resumes and fake diplomas by their applicants. It is unnecessary to go through the headhunters and it can save unnecessary cost. We are able to expect to introduce a reliable, transparent and fair verification system. In other words, the student can utilize the cumulative managed portfolio automatically for the career history of the learning activity, and there is no need to separately document each history. Companies can identify all of the job applicants' experiences without spending a lot of time and money, and find the best capability they want. In the case of universities, there is no need to input unnecessary time and manpower to check graduation path and degree, and in the case of corporate HR managers, it is possible to establish a capacity-based HR recruitment system, provide fair opportunities for applicants, experience, and ability to accurately assess talent. For future work, we will implement the validation on top of an open source architecture that will not only improve overall performance but also availability and scalability. We will use the extended students' data to check for career falsification which will in return provide better integrity for the career management system.

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