# Data Dissemination via web Services for Distributed and Heterogeneous Data sources: An Enhancement of the Nigerian University Certificate Verification System

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***Abstract*— Harmonization of academic records between institutions will ease information sharing among institutions and reduce forgery of certifications and other academic qualifications. A solutions was proposed which collect relevant certificate information from Nigerian Universities' databases via web service and make it publically available across all platforms via web service as a means for verifying certificate authenticity. One of the limitations of the proposed system is the limitation imposed on the data that can be retrieved from institutions by the defines JSON template, more relevant data might be neglected, also it was assumed that all universities use relational database, with the current trend it is possible in the nearest future a good number of institutions might move to NoSQL platform. In this study we proposed an enhancement of the initially proposed system to accommodate diversity of data and databases provided by institutions by using NoSQL platform and allowing institutions modify the template for the web service they will share their data, this improves the parsing time as data will not need to be structured as relational database. Hence an enhancement of the Nigerian Universities' Certificate Verification was proposed.**

***Keywords*— Remote Database Access (RDA), Web Service, Certificate Verification, NoSQL, JavaScript Object Notation.***

## I. INTRODUCTION

As it was established in the previous study[1] privileges are given to individuals in for scholarships and employment opportunities base a qualification which is evident in form of certificate. This led to people forging certificates with a very good competitive edge over others, process of verifying a certificate to solve this problem was proposed to allow certificate data collection from universities processing it to a de-normalized format and archiving it in a data via web services and a search web service was implemented on that database for verification purpose.

Benefits of the approach compare to existing proposals prior to it are:

1. platform independency
2. improved data availability
3. real time verification.

At the end of the study it was recommended that a NoSQL platform should be used to accommodate diversity. In this study we identified that the template for data retrieval for uniformity is limiting how much data an institution can provide thus a modification was made to allow universities provide as much data as possible. Additional fields will be defining at configuration.

In the previous study [1] a service oriented approach is used in collecting certificate data from universities and archive in a database *central database* which is further consumed for verification purposes was proposed. The proposed technique has three main modules as listed below (Figure 1):

I. Data acquisition.
II. Data processing.
III. Data consumption.

**Data acquisition: -** This module entails Universities publishing their certificate data based on a *JavaScript Object Notation* (JSON) template defined for uniformity. Service URLs are stored in a table in the central database, URLs are queried and invoked sequentially to control concurrency in

[1] Web service based Nigerian university certificate verification system, published [1]

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writing to the database. For records that have already been archived fields will be updated.

**Data Processing: -** Data processing module involves sequential invocation of certificate data services, replicate by dumping the JSON object in a dedicated JSON file, then parsed, content is then archived in the database in a de-normalized manner.

**Data Consumption: -** Archived certificate data are consumed via the search service implemented at the processing phase.

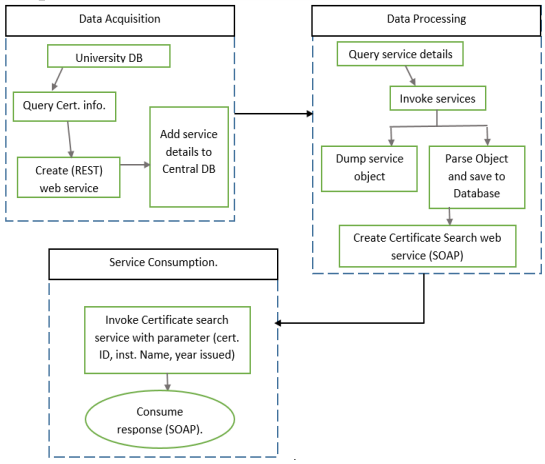


**Figure 1 System Model**

The rest of the paper is structures as follows: Section II discusses relevant literatures, Section III discusses the proposed optimization of the system, Section IV comparing the initial system and proposed optimization.

To establish the need for an effective and highly available system for certificate University verification system, some of the headlines of recent cases that were published in online dailies were recalled as follows:

On the 15th of February a news headline title "Alleged forged certificate: IGP orders investigation of Abia lawmaker". "PDP Rep-elect loses seat over certificate forgery", "800 Ogun teachers forged certificates, six thousand not qualified-education commissioner". Forgery cases are gaining more popularity in dailies.

Some effort has been put in place to check the problem of certificate forgery like orientation of student on forgery at ceremonies such as matriculation and convocations. Making a forgery a punishable offence by the constitution. Some computer based certificate were adopted by few Institutions like Lagos state University. Other commercial website like ETX-NG, Qualification Check, and certificate validate.

## II. LITERATURE REVIEW

Electronic certificate verification system is a data driven system as its efficiency and turnaround time depends on the CIA security of certificate data from institution. Database access standardization (ANSI/ISO/IEC 9579-1:1993) and (ANSI/ISO/IEC 9579-2:1993) define rules for database connection and access respectively. [1] Proposed a generic database service by replacing API's for accessing databases with web service reducing platform dependency in database access. The latter concept was used [2] to manage a database grid *Vince Service Grid* and improve on the query optimization and data type enforcement with XML Schema.

Cloud computing has become the biggest change in IT after the rise of World Wide Web [3]. [4] Proposed the use of scalable private key for centralized database on the cloud. As security remains a challenge in database access. [5] Establish that a security solution must meet three requirements: confidentiality, integrity and availability. [6] Reported that 5% of the $27 billion spent on security products directly addressed data security they proposed the use of multilayer security verification. [7] Proposed monitoring and analysis of data accessed by users to determine attack.

Validity of document has been threatening by forgery, [8] proposed encrypting and embedding information of device used it creating the document, on verification a decryption algorithm is used to verify the authenticity of the claimed document.

Electronic verification results are usually in human readable format such as PDF and HTML pages but not machine readable [9] Proposed a methodology for data dissemination between Education information management systems (EMIS) in both human and machine readable format pdf and html, and XML through a web service respectively.

University certificate verification systems commercial available are numerous such as the Nigerian based *EXT-NG* and *Degree Validate* and international: *Qualification Check*.

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## III. PROPOSED MODEL

The Nigerian Universities' Certificate Verification System was designed and implemented to retrieve data from individual university via a web service, universities are given template of the structure of the web service, in the proposed Optimization Universities are not limited to just the defined template, institutions can append other relevant fields accommodating the diversity of the institutions.

After consuming the web services for data retrieval from the Universities, the data is gotten in a JSON format, in the original design *figure 1* the system will have to process the data into a relational database system compatible format, duplicate it before being parsed, the proposed modification uses a NoSQL based database at the central DB side as shown in *figure 2*, hereby reducing the computation time for processing the data into relational databases compatible format for parsing into the database.

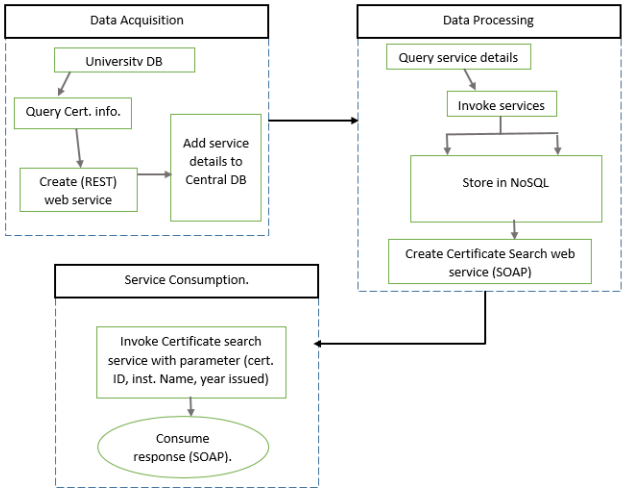


**Figure 2: modified System model**

## IV. Evaluation

Comparing the original proposed system and the proposed optimization based on the three important stage:

### *A. Data Acquisition:*

*1) Before:*

Rigid template limiting information that organization

*2) After:*

Flexible as it allows universities to append other data that are relevant to certificate verification process

### *B. Data Processing:*

*1) Before*

More processing is needed to parse JSON file to retrieve data before being parsed to the relational database.

*2) After*

As JSON files can be parsed in to NoSQL database, the processing require will be reduces.

### *C. Data Consumption:*

*1) Before:*

Limited by the limitation in *A*

*2) After*

Might have more data verifying a claimed certificate due to the flexibility in *A*

## V. Conclusion

Certificate verification process involves contacting the issuing institution or subscribing to a third party with reliable communication channel with institutions. In the previous study, the limitations of the aforementioned approaches were identified and a web service based approach was proposed to replace the verification process by retrieving certificate data from institutions and archiving them in a database from which verification can be made eliminating security threats and human error. In this research the previous research was studied further and some limitation was observed, the proposed optimization solves the problem and increase the efficiency of the earlier system

## VI. Recommendation and Future Research.

- Use of more realistic experiment environment: the performance of the system cannot be fully established if the size of data is large running on the internet.
- Use of parallel algorithm for data update to improve the throughput during data collection.

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