Cloud Solution with Optimal Document Indexing For Program Evaluation System

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Abstract

Accreditation is something inevitable, particularly those firm who are after process or service improvement. Academic organizations is not an exemption to this activity; there are several accrediting agencies in the country that aids academic institution improve their operation. Development of a cloud-based system for program evaluation that facilitates document submission online can be used to facilitate online submission of documents for evaluation. CloudPES facilitates this kind of transaction aside from giving importance on the user hierarchy. It is suggested to get cloud service from a vendor available in the country to minimize expenses. Lucene search indexing can be used for document clustering which allowed documents to be segregated according to the category. CloudPES had undergone uploading stress test it shows that as the number of concurrent user increases, the system response during uploading activity also increases. It is suggested to look into the maximum number of users that will be using the system to manage the resources.

*Keyword:*cloud computing, file management system, document indexing, program evaluation, program accreditation

I. INTRODUCTION

"Accreditation is a process for assessing and upgrading the educational quality of higher education institutions and programs through self-evaluation and peer judgment. It is a system of evaluation based on the standards of an accrediting agency, and a means of assuring and improving the quality of education. The process leads to a grant of accredited status by an accrediting agency and provides public recognition and information on educational quality" (Accreditation Assessment and Evaluation Process, 2019). Protection of the interests of students, parents, academic institutions and potential employers through accreditation.Accreditation ensures that the programs offered by school attained or exceeded level of standards that were developed by experts in the field. Although having an accreditation does not ensure graduates to be successful professional. One benefit of accreditation is that it guarantees that the student has shown set of skills and abilities that can be found in the accreditation instrument. Accreditation is not a measure of professional success but it's a necessary condition for some programs (Benefits of Accreditation). Accreditation is voluntary and universities and institutions should be independent of these accreditation bodies because they might end up losing what they value. Even though the accreditation is not obligatory, there are

sanctions (Conchada & Tiongco, 2015). Accreditation files should be kept secured but accessible at the same time for reference purpose. Cloud Computing is the use of a network of remote servers hosted on the Internet to store, manage, and process data rather than a local server (Arun, 2018). There are many benefits to storing data in the cloud over local storage such as companies only pay for the storage they use; the data is quickly accessible and reliable, and better protection in case of a disaster (Obrutsky, 2016). Clouds offer IT capabilities "as a service" but implementation detail may differ. Common shared resources in the cloud are virtualization, pervasive automation, self-service interfaces, and self-service interfaces (Cloud Computing Infrastructure, 2019).

This study aims to design a system for program evaluation with document indexing using cloud technology that can improve segregation, search retrieval, and storage.

II. METHODOLOGY

This study employs the developmental research method, Richey and Klein (2005) describe the crux of developmental research as a systematic examination of products, tools, processes, and models in order to provide reliable, usable information to both practitioners and theorists.

III. RESULTS AND DISCUSSION

The system architecture shows that uploading of data will be done remotely using the system. The existing system requires school applicants to submit their hard copy documents and flash drive containing a soft copy of the documents submitted. Several devices could also be used to upload or update documents for user convenience. Unlike the existing process of manual hardcopy submission, CloudPES allows a user to submit documents remotely using a personal computer, tablet, laptop, or even mobile phones. CloudPES does not only offer convenience but more importantly is the promptness of document submission. File uploading,

document indexing, storage, user management, analytics, and report generation will all be accomplished through cloud. The cloud provider will support setting up the program application to keep it running in cloud.
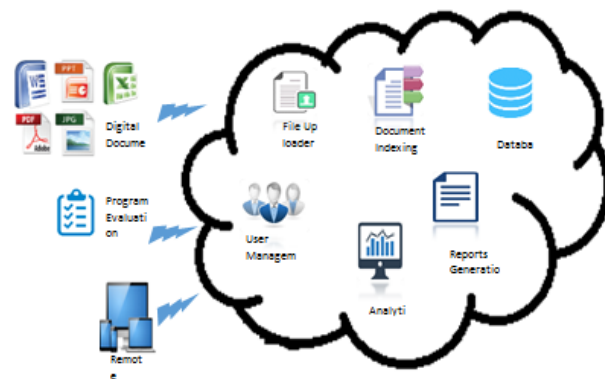

Figure 1.0 ClouPES System Architecture

Program Application and Web Environment – this part is concerned with the programs used to develop the system as well as the components for the web environment. PhP, MySQL and Operating System are the components for the programming development. PhP is the programming language and MySql is the database tool used to store data of the HEI and CHED. The operating system is the platform used to run a particular workstation or computer e.g. Windows 7, Fedora, Linux, etc. The displays the web applications.Example of browsers are Internet Explorer 8.0, Firefox 5.1, Google Chrome, etc.

Hardware and Network Infrastructure – this considers the hardware specification of the workstations or computers available for the user of the system. The system requires the following minimum specifications available in the market:

  a. Pentium IV processor

  b. 50GB Hard Drive

  c. Any preferred or available monitor

  d. 1GB Video Card
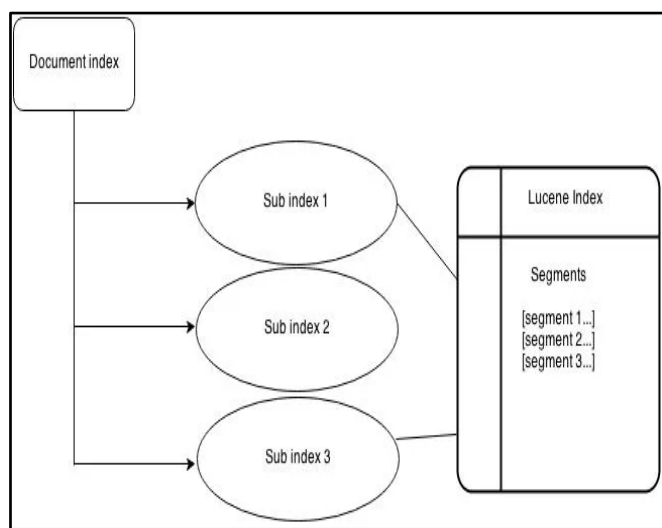
Figure 2.0 Lucene Search Indexing

(Source:
https://www.javacodegeeks.com/2015/09/building-a-search-index-with-lucene.html)

When Lucene indexes a document, it breaks it down into a number of terms. It then stores the terms in an index file where each term is associated with the documents that contain it. We could think of it a bit as a hashtable. Terms are generated using an analyzer which stems each word to its root form. When a query is issued, it is processed through the same analyzer that was used to build the index and then used to look up the matching term(s) in the index. That provides a list of documents that match the query.

Table 1.0 CloudPES Module Description

| Modules	Description
User Administration Module	This module allows administrator user to add system users like system administrator/s, program evaluators, and other system users.
Applications Monitoring Module	This module is in-charge of monitoring the approval workflow like approval of request from accreditation agency to school administrators. Remarks posting
(Application Approval Workflow)	from accreditation agency to school administrators. This module allows viewing of all applications, review of applicant's documents, and view ongoing applications.
Criteria Posting Management Module	This module allows criteria flexibility in case a new criteria will be set driven by accreditation agency or government agencies memorandum, revision of instruments, and other factors.
Reports Module	This module is responsible in providing portable document format for system reports to maintain output integrity.
Analytics	This module allows system users to view status of document submitted whether completed already as per criteria requirement
Document Uploader Module	This module allows documents to be uploaded in the system remotely

In designing access to a system like CloudPES, it is esssential to note the hierarchy of users that will utilize the system. User hierarchy can also determine system applications that need to be setup by the cloud provider. In the case of CloudPES, there are three user hierarchies, assuming that the highest level in the hierarchy is also the system owner. The accrediting agency provides access to the regional offices, where several evaluators are housed. These evaluators will also be given account for program evaluation purpose of the different schools in the region. The school administrators per HEI will also be given access, but schools should be given option whether they will give access to different academic program representatives that will be applying for accreditation. This will depend on the structure of the school in terms of accreditation application because some schools implement centralized accreditation application while some do it in a

programmatic approach, meaning program owners are in charge of their respective program accreditation.
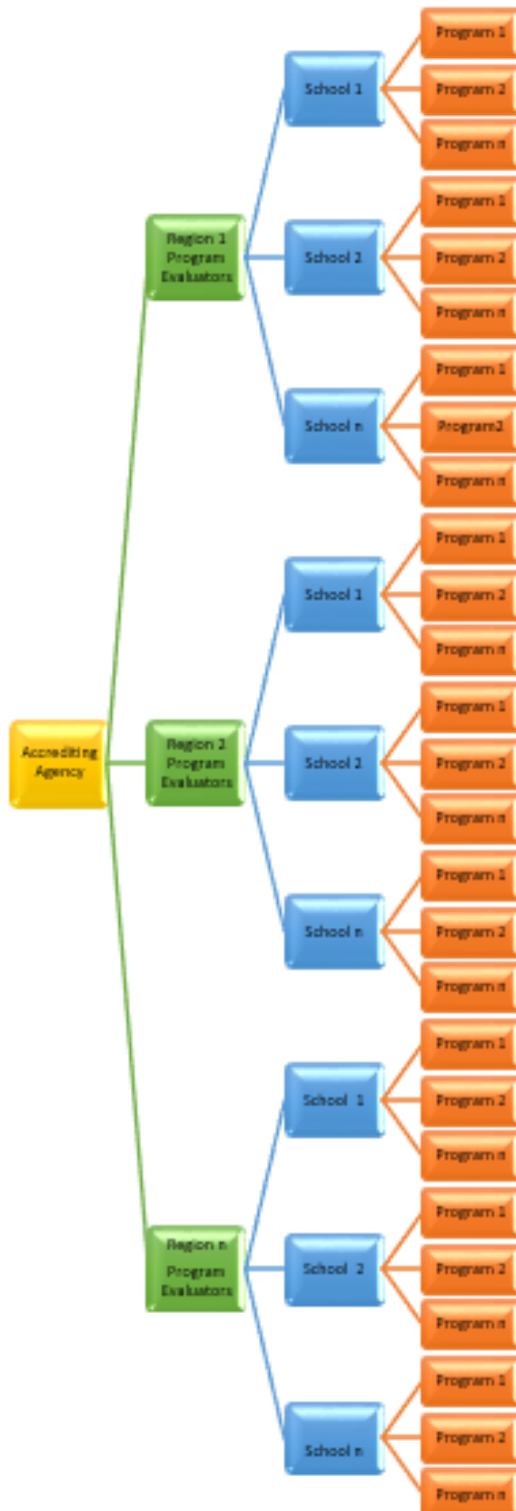
Figure 3.0 CloudPES System Hierarchy
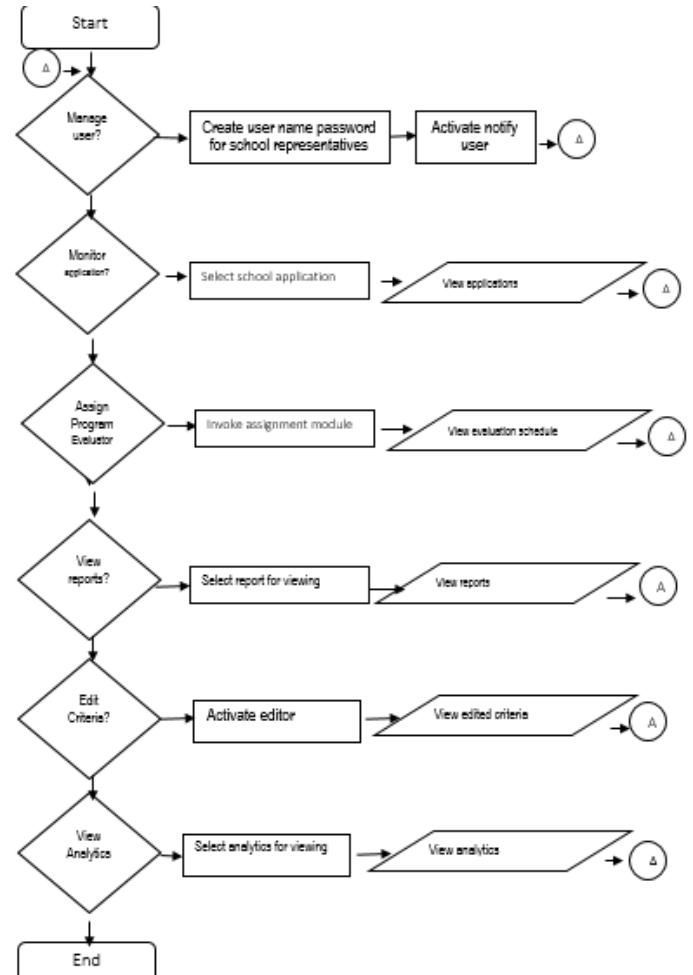
Figure 4.0 CloudPES System Flow Diagram for Accrediting Agency

The system flow diagram of CloudPES for accrediting agency allows the user to manage user, monitor application, view reports, edit criteria, and view analytics. Monitor application includes the monitoring whether the school applicant was able to complete the document attachment based on the specified criteria. This means that the accrediting agency, based on the documents uploaded, could determine if the school applicant will be forwarded for evaluation or not. The accrediting agency can also assign evaluator per region and program evaluation report can viewed in the system per region for the regional office but the central office of the accrediting agency can view all of the activities of the region.

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**Figure 5.0 Sample System Screenshot**

Figure 5.0 shows the sample system screenshot, which shows the progress of document submission. Lucene search indexing was used for document clustering which allowed documents to be segregated according to the category.

Table 2.0 CloudPES Browser Test

Browser	Compatibility Areas	1st Run	2nd Run	3rd Run
Mozilla Firefox	icons display	/	/	/
	hyperlink functionality	/	/	/
	image consistency	/	/	/
	font consistency	/	/	/
	table consistency	/	/	/
Google Chrome	icons display	X	X	/
	hyperlink functionality	/	/	/
	image consistency	X	X	/
	font	/	/	/

	consistency			
	table consistency	X	/	/
Internet Explorer	icons display	X	/	/
	hyperlink functionality	/	/	/
	image consistency	/	/	/
	font consistency	/	/	/
	table consistency	X	/	/

CloudPES has undergone browser compatibility test using the three predominant desktop browsers, Mozilla Firefox, Google Chrome, and Internet Explorer. CloudPES was improved based on the incompatibility issues that were seen during the system evaluation period. After several coding and formatting activities, CloudPES was able to run smoothly on the three platforms.

	1	2	3	4	5
Trial 1	20	25	60	157	350
Trial 2	20	32	15	201	258
Trial 3	30	23	12	238	302
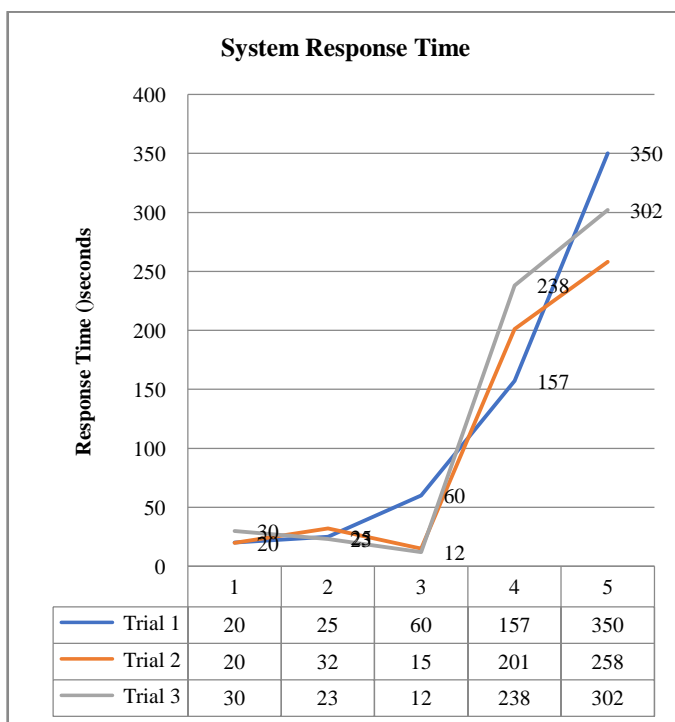
Figure 6.0 CloudPES System Response Time in seconds

CloudPES had undergone uploading stress test. The technical environment of CloudPES during the time of the testing is that it runs on a networked environment of a computer laboratory with 50 computer units. The network connectivity was running on a leased line of 50 Mbps. Figure 6.0 shows that as the number of concurrent user increases, the system response during uploading activity also increases. Concurrent number of users should be dealt with accordingly with the cloud provider to ensure 500 concurrent users uploading will not experience so much delay on the transaction with system CloudPES.

CloudPES has also undergone remote testing to determine system response time using smart phones File uploaded ranges from 10KB to 2,000KB. There were three areas selected where testing will be performed, and three network providers were also selected. The files used in the areas and trials were identical as well as the time of the day. The result shows that the time consumed during file upload on the three areas and with three different networks did not show big discrepancy on the time consumed per uploading activity. This also shows that document submission when performed outside the school premise can still done using mobile network as the need arise.

Table 3.0 CloudPES Remote Testing Response Time in Area A

Network Provider	System Response time in seconds		
	Trial 1	Trial 2	Trial 3
Provider A	2 sec	1.5 sec	2 sec
Provider B	2 sec	2 sec	1.8 sec
Provider C	1.6 sec	2 sec	2 sec

Table 4.0 CloudPES Remote Testing Response Time in Area B

Network Provider	System Response time in seconds		
	Trial 1	Trial 2	Trial 3
Provider A	1.6 sec	2 sec	1.8 sec
Provider B	2.1 sec	1.5 sec	2 sec
Provider C	2 sec	1.7 sec	2 sec

Table 5.0 CloudPES Remote Testing Response Time in Area C

Network Provider	System Response time in seconds		
	Trial 1	Trial 2	Trial 3
Provider A	1.8 sec	2 sec	2 sec
Provider B	2 sec	1.6 sec	1.8 sec
Provider C	2 sec	2 sec	1.6 sec

IV.   CONCLUSIONS

Development of a cloud-based system for program evaluation is a system that facilitates document submission online. User hierarchy should also be reviewed to determine resources that can be provided to each user. CloudPES used cloud to store data that can be accessed as the need arise. One proven advantage of a cloud-based system like CloudPES is the use of different platform like smartphone, laptop, and desktop. It is suggested to get cloud service from a vendor available in your country to minimize expenses. Lucene search indexing was used for document clustering which allowed documents to be segregated according to the category. CloudPES had undergone uploading stress test it shows that as the number of concurrent user increases, the system response during uploading activity also increases. It is suggested to look into the maximum number of users that will use the

system at the same time to manage resources efficiently.

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