

Implementation Of SaaS Cloud Computing Services On E-Learning Applications (Case Study: PGRI Foundation School)

by Diana Laily Fithri, Andy Prasetyo Utomo, Fajar Nugraha

Submission date: 31-Mar-2020 11:53AM (UTC+0700)

Submission ID: 1320130913

File name: n_E-Learning_Applications_Case_Study_PGRI_Foundation_School.pdf (770.69K)

Word count: 2728

Character count: 15406

PAPER • OPEN ACCESS

Implementation Of SaaS Cloud Computing Services On E-Learning Applications (Case Study: PGRI Foundation School)

To cite this article: Diana Laily Fithri *et al* 2020 *J. Phys.: Conf. Ser.* **1430** 012049

View the [article online](#) for updates and enhancements.



IOP | ebooks™

Bringing you innovative digital publishing with leading voices to create your essential collection of books in STEM research.

Start exploring the collection - download the first chapter of every title for free.

Implementation Of SaaS Cloud Computing Services On E-Learning Applications (Case Study: PGRI Foundation School)

Diana Laily Fithri¹, Andy Prasetyo Utomo², Fajar Nugraha³

^{1,2,3}Program Studi Sistem Informasi, Fakultas Teknik, Universitas Muria Kudus Gondangmanis,
PO Box 53, Bae, Kudus 59352 Indonesia

¹diana.laily@umk.ac.id, ²andy.prasetyo@umk.ac.id, ³fajar.nugraha@umk.ac.id

Abstract. Learning activities in PGRI Foundation schools, especially in SMA PGRI Kudus still use the conventional model that is directly face to face, so it is necessary to develop online learning media or what is now often referred to as e-learning to help teachers and students take material and do assignments by online. With online learning, teachers are expected to be able to update learning material and students can access it without constraints on place and time, besides assignments to students can be well controlled. In general, all PGRI Foundation schools in Kudus district have the same business process as well as the information system and technology requirements. But in reality, each school develops its architecture and information system separately. On the other hand, the majority of schools do not have enough budget to procure infrastructure to support the information systems needed specifically for learning activities such as e-learning. Cloud computing is often referred to as a new paradigm in the world of information technology related to resource efficiency. Cloud Computing has a service layer known as Software as a Service (SaaS). SaaS has several advantages and conveniences offered, including those related to resource efficiency and speed in developing an application. With SaaS, an application can be used at the same time by many tenants, with each tenant still being protected, so that application development costs can be further reduced. This research uses object-oriented system development methods with UML tools. This research aims to help schools in the Kudus Regency PGRI foundation improve the quality of learning by utilizing e-learning media without the need to think about the process of procurement, installation and configuration of hardware or software.

1. Introduction

Technology and information systems are currently constantly evolving to provide convenience for its users. This development was followed by increasingly fierce competition between organizations, including in the world of education. In the world of education today, the need for information systems is mandatory to be fulfilled. Information systems help process data better which can later be used for more accurate and faster decision making.

The world of education has received a positive impact from the rapid development of technology and science. Learning media that were originally in the form of tape recorders, modules or television are now developing by utilizing internet media and smart devices such as computers, laptops or smartphones, which are now often referred to as e-learning. Basically e-learning is changing the form



Content from this work may be used under the terms of the [Creative Commons Attribution 3.0 licence](https://creativecommons.org/licenses/by/3.0/). Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.

Published under licence by IOP Publishing Ltd

to digital format from conventional learning by utilizing internet technology and smart devices so that it can be used anywhere without limited space and time.

The PGRI Foundation has an important role in educating the nation's life, through improving facilities or learning media. At present the PGRI education foundation in Kudus Regency houses several schools, both junior high schools, senior high schools and vocational schools.

Learning activities at PGRI Foundation schools, one of which at SMA PGRI Kudus still uses conventional models, namely by directly face to face, so it is necessary, the development of online learning media or what is now often referred to as e-learning to help teachers and students in accessing material and assignments online. With online learning, teachers are expected to be able to update learning material and students can access it without constraints on place and time, besides assignments to students can be well controlled.

With the e-learning media in the schools of the Kudus Regency PGRI foundation, especially in the SMA PGRI Kudus, it will facilitate students in accessing or taking learning material so that it can improve the process of implementing education. With the availability of e-learning, it will make it easier for teachers to deliver material and conduct assessments or evaluations of learning.

In general, all PGRI foundation schools in Kudus district have the same business process as well as the information system and technology requirements. But in reality, each school develops its architecture and information system separately. On the other hand, the majority of schools do not have enough budget to procure infrastructure to support the information systems needed, especially for learning activities such as e-learning. Based on these problems schools at the Kudus Regency PGRI foundation need an information system that can help the implementation of the teaching and learning process.

Cloud computing is often referred to as a new paradigm in the world of information technology related to resource efficiency. Cloud computing has a service layer known as Software as a Service (SaaS). Software as a Service has several advantages and conveniences offered, including those related to resource efficiency and speed in developing an application. With SaaS, an application can be used at the same time by many tenants, with each tenant still maintaining privacy, so that application development costs become more efficient.

The development of e-learning applications that apply the SaaS cloud computing concept can be utilized by the PGRI foundation in Kudus district to overcome existing problems. The e-learning application developed will have more advantages compared to conventional e-learning applications, one of which is an e-learning application that can be used by all schools in the PGRI Kudus foundation while still maintaining data privacy in each school.

2. Methodology

System design for cloud computing-based e-learning applications, using the OOD (Object Oriented Design) method, with Unified Modeling Language (UML) as the standard notation. OOD is a method that brings us to object-oriented decomposition. By implementing an object-oriented design.

Software can be made more resilient by minimizing the writing of expressions while reducing the inherent risk in developing complex software systems [1]. UML is a family of graphical notations, supported by a single Meta-model, which helps in describing and designing software systems, especially software systems that are built using object-oriented (OO) styles [2]. Design diagram models included in UML are usecase diagrams, class diagrams, sequence diagrams, activity diagrams, state diagrams and collaboration diagrams.

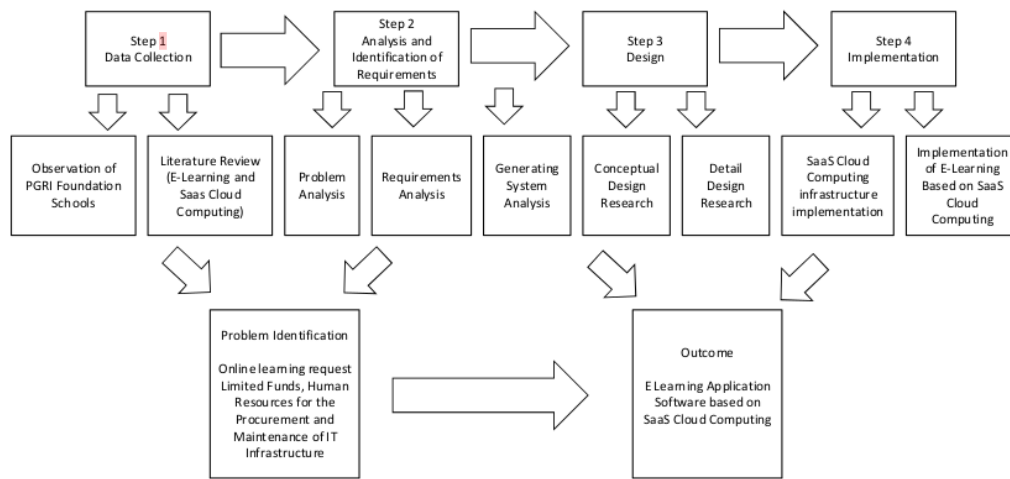


Figure 1. Stages of the implementation of activities.

Figure 1 shows the stages of the activities carried out. In the first step, the required data is collected. The activities carried out in the first stage are observation and study of literature. These observations were made of PGRI foundation schools in Kudus Regency. Observations were made, accompanied by interviews with principals and teachers of the PGRI Kudus foundation school which were sampled, namely the SMA PGRI Kudus district. The study was conducted by finding sources of literature and journals relating to the use of e-learning applications and the concept of SaaS in cloud computing. In the second stage, based on data previously obtained in the first stage, an analysis and identification of needs is carried out. The activities carried out in the second stage consisted of the analysis of needs and problems. From the results of observations and interviews, summarized the problems that existed at the PGRI Kudus foundation school. Once the main problem is found, then identify what is needed in order to find a solution or solution to the problem. Based on the solutions that have been produced in the second stage, in the third stage, the solution is implemented in the system design. The activities carried out in the third stage consist of analyzing system requirements, then pouring the results of the analysis into UML notation. The final activity of the third stage is applying the results of system design to the software. The implementation of the system that had been produced in the third stage was done in the fourth stage. The activities carried out in the fourth stage have begun by implementing cloud computing infrastructure at the Kudus Regency PGRI foundation which acts as a provider of cloud computing services. Then apply the resulting software to service providers in this case the PGRI Kudus foundation and service users in this case the PGRI foundation schools in Kudus district.

3. Methodology

SaaS cloud computing technology will be implemented in e-learning applications. In the application of this technology, the Kudus Regency PGRI foundation invites service providers (service providers) who are responsible for managing services, managing and maintaining cloud servers, and software applications that will be delivered to the PGRI foundation in Kudus district. PGRI foundation schools in Kudus regency can directly utilize e-learning application software services without the need to install and manage these applications. Every e-learning application software is used simultaneously by all schools of the Kudus Regency PGRI foundation, the data privacy of each school can still be comfortable. Figure 2 shows the distribution of cloud computing technology services.



Figure 2. Distribution of cloud computing services.

This is due to the use of multi-tenant architecture in SaaS cloud computing. Multi-tenant architecture provides applications on the infrastructure provided by the provider, and some tenants are then allowed to use the same application with the agreement [3]. In a multi-tenant architecture, an application will be accessed by many tenants or application users, but each tenant will automatically have a different database with other tenants. Multi-tenants meet with many companies to share applications where each tenant can only provide his own data [4]. Figure 3 discusses multi-tenant architecture. Each school in the PGRI foundation in Kudus district is a tenant. Each tenant can run e-learning applications exclusively. Every PGRI Kudus district school can apply e-learning applications freely, starting from determining the e-learning application in their respective schools, respectively, clicking on the application and managing others.

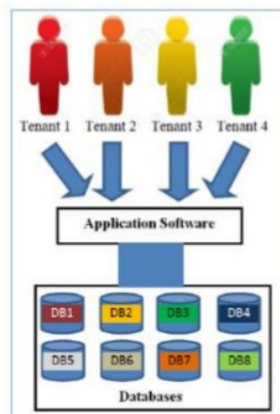
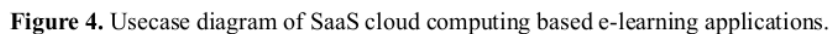


Figure 3. Multi-tenant architecture [5].

1 The e-learning application based on SaaS cloud computing that was developed consists of four actors, namely Admin cloud (Cloud Provider in this case is the PGRI Kudus foundation), Admin e-smart, teachers and students. Cloud Admin is an IT staff in the Kudus Regency PGRI foundation appointed as

1 detailed explanation of who acts as the user of the system and what will be done is explained by the usecase diagram. Usecase is a specification of a series of actions carried out by the system [6]. Figure 4 shows the usecase diagram for an e-learning application based on SaaS.



5

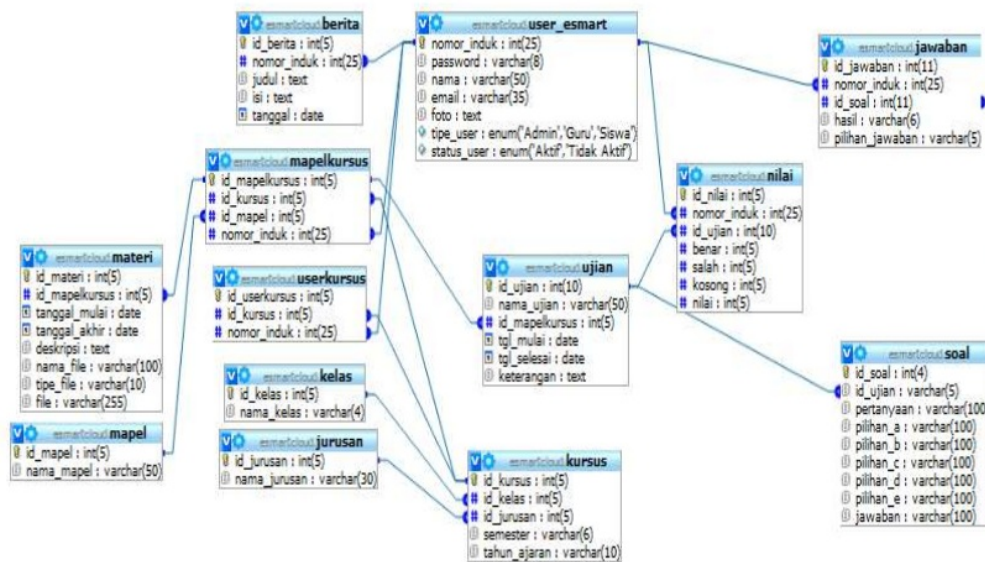


Figure 5. Tables in the tenant database.

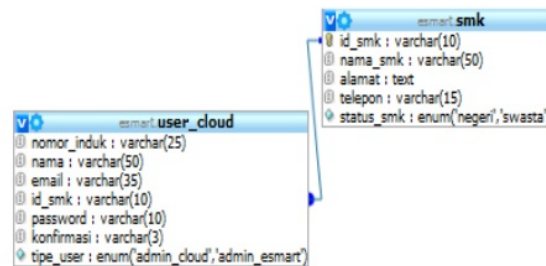


Figure 6. Tables in the cloud database.

SaaS e-learning application software has been developed. Some examples of display screens from the prototype of the SaaS e-learning application are shown in Figure 7 which shows the initial appearance or the homepage of the application. In figure 8 shows the homepage display of the admin-esmart page (e-learning manager in each school). Whereas in Figure 9 shows the homepage display e-learning applications for students or students.



Figure 7. Initial view or homepage of the e-learning cloud application.

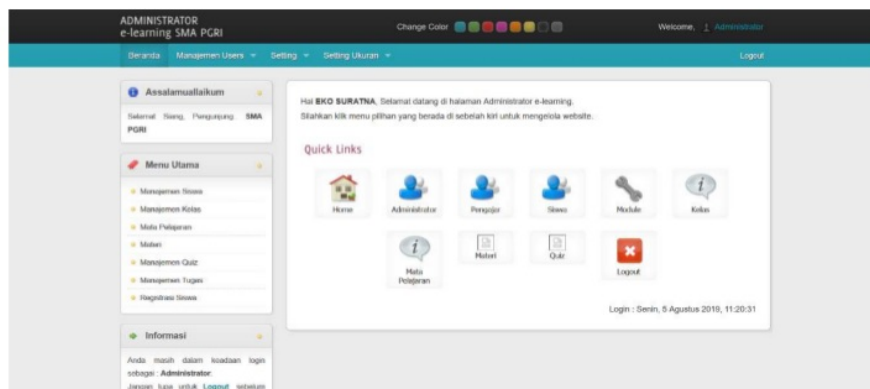


Figure 8. esmart administrator home page.

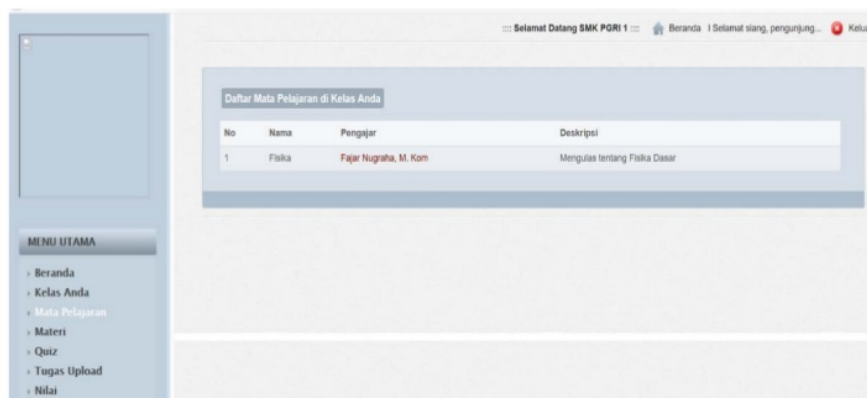


Figure 9. E-learning home page for students.

4. Conclusion

Information technology resource constraints faced by schools at the PGRI foundation in Kudus district can be overcome by using cloud computing services in the form of SaaS. This service can be accessed by schools at the PGRI foundation through the internet using various tools. By using cloud computing services in the form of e-learning application software, schools at the PGRI foundation can improve the quality of the learning process through the use of e-learning learning media without the need to think about the process of procurement, installation and configuration of hardware or software.

5. References

- [1] M. Fowler, "UML Distilled: A Brief Guide to the Standard Object Modeling Language," *Pearson Paravia Bruno Mondad*, p. 175, 2004.
- [2] G. Booch, R. A. Maksimchuk, M. W. Engle, B. J. Young, J. Connallen, and K. A. Houston, "Object-oriented analysis and design with applications," *ACM SIGSOFT Software Engineering Notes*, vol. 33, no. 5. Pearson Education, Inc, p. 29, 2007.
- [3] S. K. Khatri, H. Singhal, and K. Bahri, "Multi-Tenant Engineering Architecture in SaaS," 2013.
- [4] Y. Zhu, "A platform for changing legacy application to multi-tenant model," *Int. J. Multimed. Ubiquitous Eng.*, vol. 9, no. 8, pp. 401–418, 2014.
- [5] Supriyono and A. Prasetyo Utomo, "Utilization Of Saas (Software As A Service) Cloud Computing On Financial Management Applications Smes In Kudus District," *J. Educ. Soc. Sci.*, vol. 4, pp. 319–323, 2016.
- [6] N. Ibrahim, R. Ibrahim, M. Z. Saringat, D. Mansor, and T. Herawan, "Consistency rules between UML use case and activity diagrams using logical approach," *Int. J. Softw. Eng. its Appl.*, vol. 5, no. 3, pp. 119–134, 2011.

Acknowledgments

Thank you to the Directorate General of Higher Education, Ministry of Research, Technology and Higher Education of the Republic of Indonesia for funding this community service through a grant program under the Community Partnership Program scheme.

Implementation Of SaaS Cloud Computing Services On E-Learning Applications (Case Study: PGRI Foundation School)

ORIGINALITY REPORT

12%

SIMILARITY INDEX

10%

INTERNET SOURCES

6%

PUBLICATIONS

0%

STUDENT PAPERS

PRIMARY SOURCES

1

www.jesoc.com

Internet Source

10%

2

Daniel Chandran, Sunil Kempegowda. "Hybrid E-learning platform based on cloud architecture model: A proposal", 2010 International Conference on Signal and Image Processing, 2010

Publication

3%

Exclude quotes Off

Exclude bibliography Off

Exclude matches < 3%