Open Peer Review on Qeios

Building Foods Data Automation Platform Using Cloud Computing Type PaaS

Anita Sindar Sinaga[1]

1 STMIK Pelita Nusantara

Funding: Thank you for the Ministry of Education and Culture, Higher Education Student Affairs, Ditbelmawa Dikti, Directorate General of Higher Education, and Ministry of Education and Culture for funding the 2023 PKM RE and the opportunity to conduct research

Potential competing interests: No potential competing interests to declare.

Abstract

Sources of information on the availability and prices of basic foods are spread on URLs, HTTP(s) on various websites in the Medan City government. Data synchronization and data integration between websites can produce quality information sourced from various public IP Address protocols. In a cloud-based Data Center, the Front End and Back End computer network devices are interconnected via the Internet. Data is stored as JSON and synced in realtime to every connected client. Platform metrics and Activity logs are collected automatically, routed to other locations using diagnostic settings. Cloud service solutions include IaaS (Infrastructure as a Service), SaaS (Software as a Service), and PaaS (Platform as a Service). PaaS integrates various operating systems and user applications. Secondary data collection takes public data that can be accessed using Web Crawling and Web Scraping techniques. Web API software components automatically update data between the client and server. Firebase Realtime Database can store and synchronize data in real time. The configuration of data requests that can be served by the food data cloud platform is 85% with a configuration runtime of 80%-95%.

Feby Normasatria Ginting[1], **Krisnanda Pratama**[1], **Juanda Tampubolon**[2], **Anita Sindar**[2,*]

[1] *Informatics Engineering, STMIK Pelita Nusantara, Indonesia*

[2] *Information Technology, STMIK Pelita Nusantara, Indonesia*

*Corresponding Author:

Anita Sindar,

Information Technology,

Jl. Iskandar Muda 1 Medan, Indonesia.

Email: haito_ita@yahoo.com

Keywords: Foods Data; Cloud Computing; Data Center; Platform; PaaS.

1. Introduction

Through digitalization strategies and food production innovation, stability and resilience of the country can be achieved. SIMPANG (Food Information and Management System) developed by the Medan town food security service with the vision of creating integration and harmony in the development of supplies of staple food sources for nine food groups [1]. Through digitalization strategies and food production innovation, stability and resilience of the country can be achieved. Cloud-based data centers implement an infrastructure design consisting of computing, storage and networking with virtual computers, website servers, or cloud-hosted database engines supported by interconnected networks. Third parties take on the role of managing and maintaining data centers, offering the infrastructure as a service to other organizations.

Amazon Web Services (AWS) creating innovative cloud data centers as a cloud vendor. On the product website feature from Microsoft, there is a virtual computer device that can deploy and install applications on a computer. If the data center is not able to accommodate data from areas only located in the center, several risks will arise that will be faced by central managers, such as the operation of human resources, hacker attacks, downtime and hardware damage [2]. Cloud computing utilizes three important components including servers, operating systems and software through the support of interconnected network connections. Components for building cloud infrastructure, computer hardware, virtualization tools for building cloud infrastructure, storage for cloud infrastructure, networks, cloud hosting service provider vendors [3].

Model PaaS merupakan layanan cloud hemat biaya dan waktu memungkinkan developer fokus pada sisi kreatif penciptaan aplikasi. Platform as a Service (PaaS) designed to support the web application lifecycle by building, testing, deploying, managing, and updating [4]. The client server application is developed from the website address and IP address of the server. The client works waiting for information to be sent to the server. The stages of communication development point in two directions, if the client needs information then the next stage goes to the server [5]. The cloud environment consists of physical hardware that can be placed in data centers in various regions. Cloud storage like Azure offers a variety of services for storing blocks, destinations, and files that enable performance to scale easily [6]. In the context of

cloud infrastructure, networking enables users to connect and deliver hybrid and cloud native applications with low latency [7]. Cloud infrastructure can include a variety of security measures such as encryption, authentication, access control, and monitoring designed to protect data by quickly identifying threats. Cloud infrastructure management is managed through a web-based interface for users to monitor, configure, and scale as needed [8].

Utilization API (Application Programming Interface) web allows applications to share data and services, combine components and interact with each other [9]. The API connects between websites in an encrypted manner, so it does not pose a security risk and protects sensitive data from suspicious access. PaaS is designed to support the web application design cycle of building, testing, deploying, managing and updating [10]. Infrastructure functions as a service, PaaS provides the benefits of building time efficiency, adding design capabilities without adding staff, developing multiple platforms more easily, supporting geographically dispersed design teams, and managing applications efficiently. In the context of a database, the client forms the interface of the website through the design of a software application system or hardware device by showing an attractive website interface as a user page [11].

Platforms are formed from programming languages that are used for the same device but are not used for other types of devices. A platform demonstrates reliability, security, cost optimization, operational excellence, and performance efficiency. At the PaaS cloud layer, cloud-based services cost the hardware, operating system, storage space and network capacity [12]. Developers access PaaS via a web browser connecting website components with the database. Web services have the ability to help programmers or developers in creating a web-based application that has additional functionality on top of the web platform itself, web functions by connecting to the platform unite components during operation in a virtual machine, unite web components and object-oriented middle tools, serve the flow work and unify the functional components of WSFL (Web Services Flow Language).

2. Methods

In this research, the research methodology used is quantitative research by collecting basic instruments to produce data that is real, complete and appropriate to the research topic. Secondary data collection techniques utilize data from several websites accessed via interconnected networks. After conducting a research study, the next stage is identifying the problem and conducting a literature study related to the scope of the research [13].

2.1. Network Topology

A central server manages the running of the system, such as monitoring traffic and client requests to ensure everything is running well. Cloud computing provides software as a backup service for the end user, but the underlying infrastructure must be scalable and strong enough. And must focus on the system. Network topology describes the geometry created by combining computer terminal devices, repeaters, bridges with other computer network devices, namely the Front End. and Back End. FE and BE are connected to each other through an interconnected network. FE comes from the user or client, part of the interconnected network diagram which is mostly illustrated as a cloud. FE includes the computer network and

applications needed to access the cloud platform. Cloud computing connects computer users or clients at the front end with various computers, process servers, systems and storage which ultimately create cloud computing functions at the back end [14]. Using migration techniques to move virtual machines from one host data location to another host data storage location.

2.2. Cloud Computing

Cloud Computing or cloud computing is a computing data processing system using an internet network with the support of data storage resources, servers, databases, networks and software. Cloud Computing is a model that allows networks to be accessed easily according to needs in various locations. Makes it possible to collect computing resources such as network, servers, storage, applications and services in one container. Cloud Computing as a support for a company in managing the information systems in the company with the intent and purpose of maintaining the business continuity of the company, because Cloud Computing provides solutions for companies to ease the company's operations in terms of data processing. One virtual Data Center from Cloud Computing services can be divided into several virtual machines [15].

2.3. Platform as a Service (PaaS)

Types of cloud computing services include Infrastructure as a service (IaaS), Platform as a service (PaaS), Software as a service (SaaS), Data-Storage as a Service (DaaS). Data Center supports applications on PaaS with interconnected networks, built and operated by service providers or companies that have a business model based on interconnected network commerce. Aspects of implementing PaaS include data center location selection criteria, data center space quantification, data center space layout and installation, required electrical systems, scalable network infrastructure settings, cooling and fire suppression system settings. The PaaS building blocks of managed infrastructure, design tools, testing, and an integrated design environment bring together the tools necessary to build software, including source code editors, compilers, and debuggers. The middleware of PaaS includes the tools necessary to unify the components of multiple operating systems and user applications. Operating systems and databases PaaS provides an operating system for running applications, as well as a variety of managed database options. IP infrastructure is the main service in the data center. This service is provided at layer two and layer three.

3. Result and Discussion

In the era of working based on data, the construction of data centers can meet diverse data requests so that each agency can serve every need, simpler in use, cost and time. Collecting the latest food data through North Sumatra food data sources spread across the official websites of the Medan City government. In this research, the problem that arises is how to build access to a complete food data collection quickly, easily and accurately, assisted by various useful features to obtain data quickly, always updated with accurate information sources. Quantitative research by collecting basic instruments to produce objective and accurate data. Primary data collection techniques through interviews, observation and literature study.

3.1. Data Sources

Food availability and retail prices of staple foods include strategic food commodities such as rice, purebred chicken eggs, purebred chicken meat, beef, red chilies, cayenne peppers, shallots, garlic, cooking oil and granulated sugar until June 2023. Data was taken through browsing the official websites of agencies providing information on prices and availability of staple foods:

1. https://simpang.pemko.go.id
2. http://edkpp.dishanpangternak.sumutprov.go.id/data-pangan/harga-komoditi
   https://panelharga.badanpangan.go.id/harga-eceran
3. http://disppesdm.sumutprov.go.id/

Table 1. Target Data

Data Sources	Device	Goal
Web API	Client Server	Client: The application sends the request. Server: sends response
IP Address	Properti IP address Router Server API Management	Resources Resources and allocation methods Traffic data

3.2. Migration Data

Data retrieval is processed in JSON format and synchronized in real time with each connected client. Automation of data processing computing service activities on one cloud website server to provide updated information on food prices based on pulling data from various Medan City food data websites. Storing online data in a Cloud Data Center by implementing a cloud infrastructure design consisting of computing, storage and networking with virtual computers, web servers hosted by the vendor.

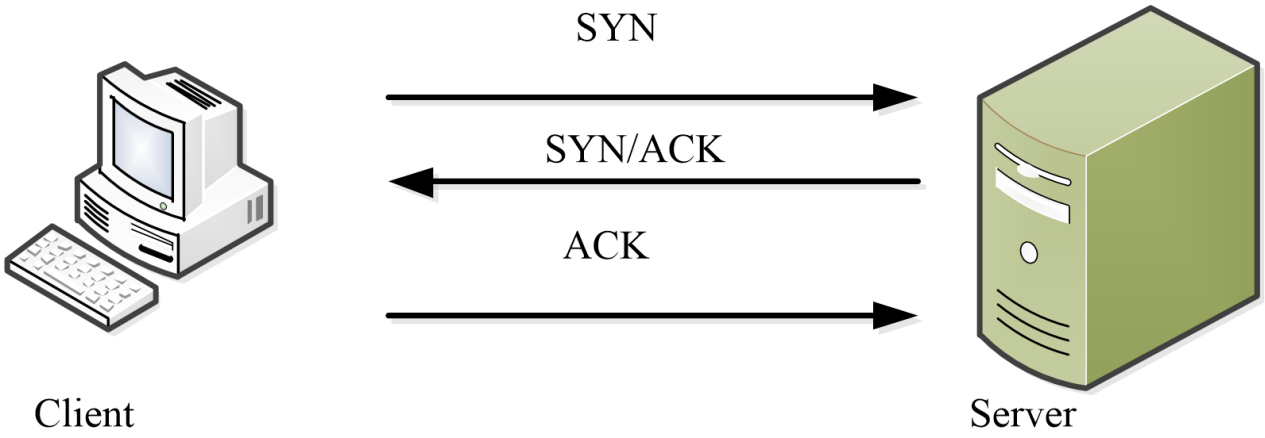

Figure 1. TCP Configuration

The cloud platform design for integrating staple food data is supported by a physical server, using virtualization techniques with a template in which the environment will be installed and configured, there is a client requesting services and a virtualization node for developing applications. Cloud architecture refers to the use of distributed computing resources to run web applications on a large scale, Figure 2.

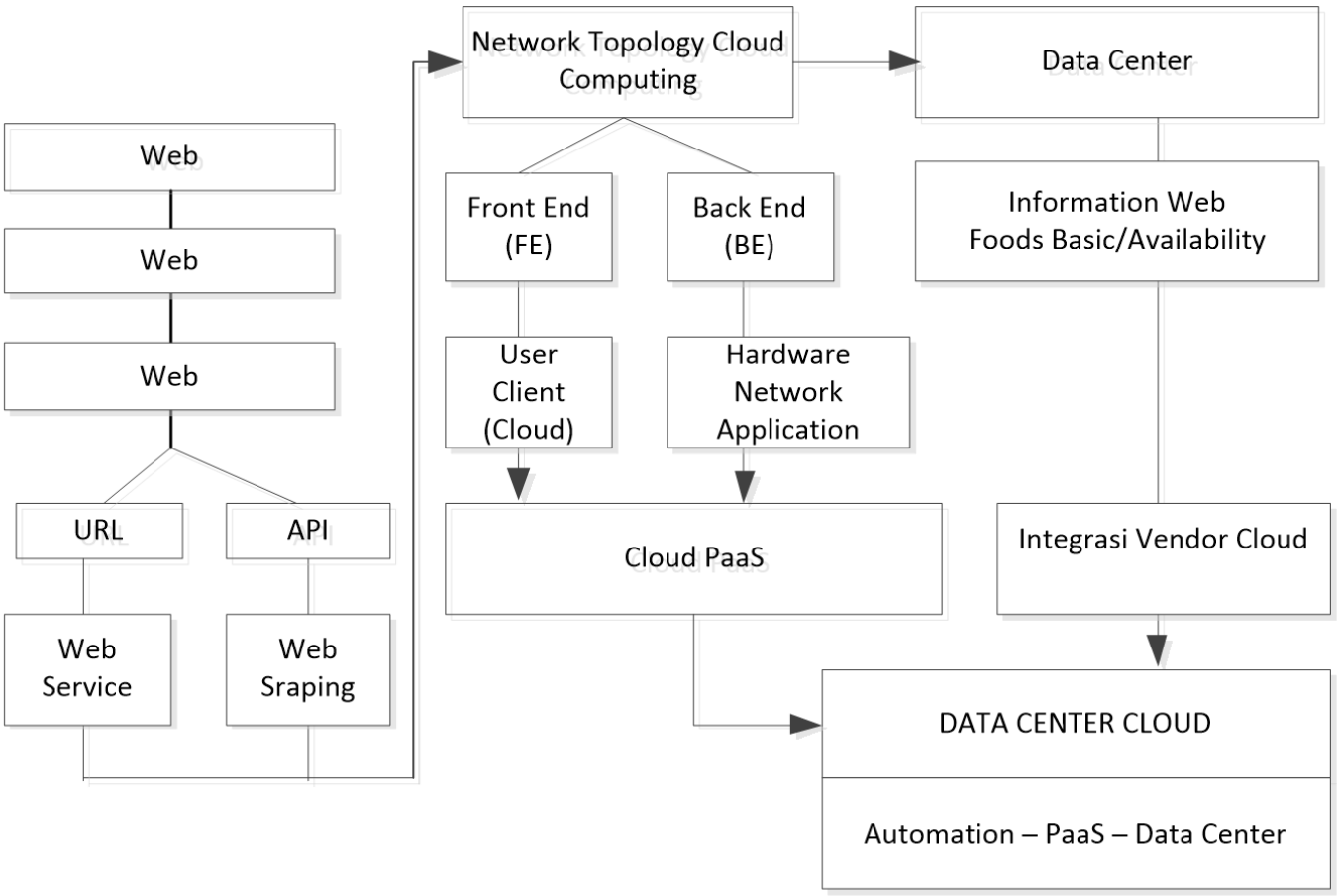

Figure 2. Cloud Architecture Platform

Realtime Database directly monitors activities that are occurring on each website. Firebase Builds cross-platform applications using the same Realtime Database instance and automatically receives the latest data changes. The cloud database model shows the logical structure of the database, the relationships and rules determining which data can be stored, organized, and manipulated. Firebase realtime database data is stored in JSON format. Firebase data by adding an asynchronous processor to firebase.database.Reference. Web API key AIzaSyDbC6Q-jazrnIVupq-35Aulvn0hkoNNB7A.

1. API Modular web

   import {getDatabase} from "firebase/database";

   const database = getDatabase();
2. API dengan namespace

   const database = getDatabase();

   var starCountRef = firebase.database().ref('posts/' + postId + '/starCount');

   starCountRef.on('value', (snapshot) => {

   const data = snapshot.val();

   updateStarCount(postElement, data);

   });

The web server platform integration model and the implementation of data exchange methods using scalable web service technology require a systematic study. Real time synchronization makes it easy for users to access data from any device. Integrate APIs and third-party services by calling and displaying web APIs using the Google Cloud Vision API, sending requests to webhooks in realtime database authors and enabling full-text searches on realtime database elements. File servers provide file management functions.

The deployment component configures the web server:

1. The server is supported by a processor and memory storage.
2. The network connects various data stores, applications, microservices, and other workloads in various servers and data centers.
3. Storage. Hosted persistent data space on a physical architecture to store cloud workloads.
4. Software. Platform as a service. uses virtual machines, analytics, data management tools, and more to simplify cloud deployment. PaaS provides developers with the resources to build, test, and deploy applications.

Table 2. Cloud Data Center Concept

Resources	Solusi
Server Storage	An on-premise approach to the solution center includes compute, network, server, storage, or virtualization on prebuilt workload appliances.
Network	Next-generation cloud and on-premise software for deployment and monitoring.
Mobility	Increase productivity and help Deployment mobile devices stay connected.
IT	Software helps businesses interact, serve and engage customers across all communication channels with one solution.
Security	Prevents all eventualities such as application downtime, theft of sensitive data, damage to company reputation, fines for non-compliance, and other unpredictable incidents.
Cloud	Cloud software providers provide flexibility for companies to obtain cost-effective IT resources without large initial investments, as well as time-consuming installation and maintenance processes.

3.3. Platform Cloud DataMaPo

The tools used to build cloud infrastructure include computer hardware, virtualization tools that build cloud infrastructure, storage from cloud infrastructure, networks and vendors. Cloud computing services centralize all data into a cloud data center to help digital transformation build a real-time database called Cloud dataMaPo. By activating Realtime Database, the management API will be active. The cloud-hosted database is stored as JSON and synchronized in real time with every connected client. The hardware and software requirements used to build Platform as a Service services are computer hardware, virtualization tools that build cloud infrastructure, storage from cloud infrastructure, networks, and companies. Configure the firewall to allow incoming connections on port 8172 with the.NET Framework 4.0 installation. and ASP.NET MVC 3.

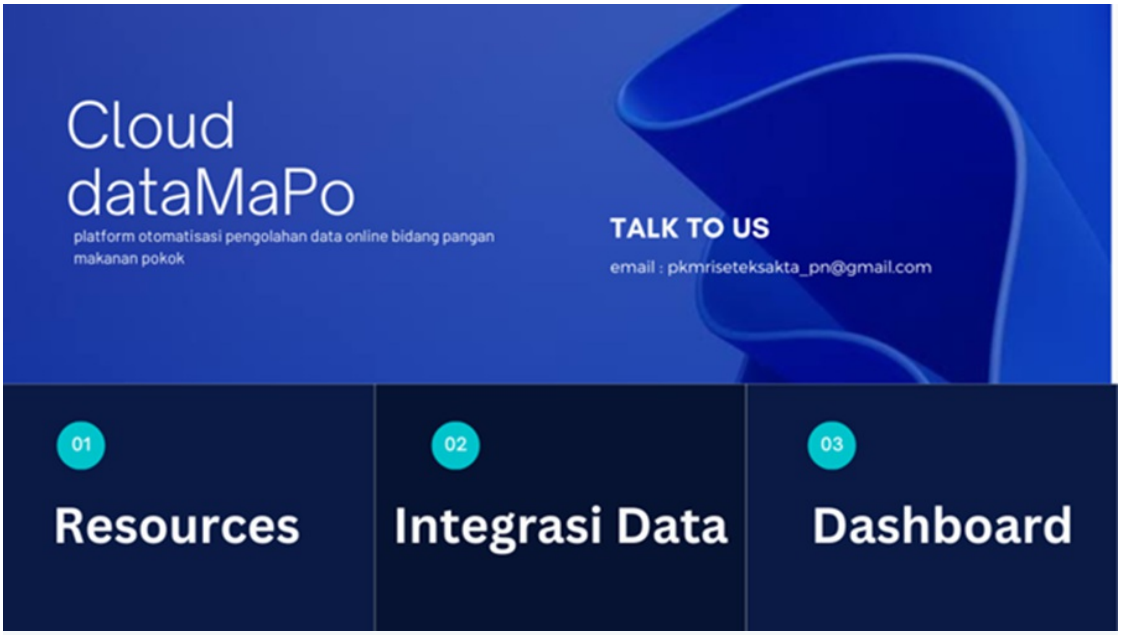

Figure 3. Cloud dataMaPo Platform

DataMaPo Cloud Platform service view:

1. Resources functions to retrieve data from the web.

2. Cloud Client Server
3. Server resources are collected and integrated to create a platform ready to host virtual services. Resource settings are flexible, so users can access more services and storage space when needed.
4. Data Integration functions for data collection on a cloud platform.
5. Food data center automation.
6. The application processing interface between servers automatically updates data between the client and server.
7. The dashboard functions to inform food data directly from web sources.

Adding a port to the list by specifying the protocol and port number can only specify TCP and UDP ports. When adding a port to the rule list, the port is open (not blocked) with advanced security running and whether there is any program or service incoming traffic on the port or not. Web management service configuration:

1. Enable basic authentication at the server level.
2. Configure the web management service to accept remote connections.
3. Start the web management service.

Table 3. Configuration Integration Data

Data	Link Resources	Itegration Data	Computational	Integration Runtime
average price of commodities	Kata Data	85%-90%	85%-90%	95%
basic food ingredients	Pemko Medan	85%-90%	75%-80%	90%
prices of basic commodities	Pilar Pertanian	75%-80%	75%-80%	85%
retail prices of basic foods	BPS	70%-80%	75%-80%	80%
food price	SiHarapanKu	70%-80%	75%-80%	80%
availability of basic food ingredients	Bisnis.com	70%-80%	75%-80%	80%

Runtime configuration defines interface messages. In a client/server architecture logs on to the server, authenticating the identification against credentials stored on the server. The analytics feature in Firebase is used to collect data and report which is displayed on the dashboard.

4. Conclusions

The research conclusion is development of PaaS type cloud computing based web applications built by migrating data between webs via web services and web servers. Automated data analytics with the use of computer systems to carry out analytical tasks The application of PaaS type cloud computing on government websites can be integrated on one platform with the support of quality data and monitored data security. Quality data is produced from valid data sources using real-time database data processing.Runtime for data request configuration integration on the cloud platform is around 80%-

95%.

Acknowledgements

Thank you for the Ministry of Education and Culture, Higher Education Student Affairs, Ditbelmawa Dikti, Directorate General of Higher Education, and Ministry of Education and Culture for funding the 2023 PKM RE and the opportunity to conduct research.

References

1. ^*J. Hassan et al., "The Rise of Cloud Computing: Data Protection, Privacy, and Open Research Challenges - A Systematic Literature Review (SLR)," Comput. Intell. Neurosci., vol. 2022, no. 5, 2022, doi: 10.1155/2022/8303504.*
2. ^*K. Phasinam et al., "Application of IoT and Cloud Computing in Automation of Agriculture Irrigation," J. Food Qual., vol. 2022, 2022, doi: 10.1155/2022/8285969.*
3. ^*M. F. S. Lazuardy and D. Anggraini, "Modern front end web architectures with React.Js and Next.Js," Int. Res. J. Adv. Eng. Sci., vol. 7, no. 1, pp. 132–141, 2022.*
4. ^*M. Engineering, "Transformation of Kebun Kelapa Village Administration with Platform as a Service (PaaS) Cloud Computing," vol. 1, no. 1, 2023.*
5. ^*R. Islam et al., "The Future of Cloud Computing: Benefits and Challenges," Int. J. Commun. Netw. Syst. Sci., vol. 16, no. 04, pp. 53–65, 2023, doi: 10.4236/ijcns.2023.164004.*
6. ^*D. S. Lamba, S. Mishra, and S. Rastogi, "A Review Paper on Cloud Computing," Int. J. Res. Publ. Rev., vol. 8, no. 7, pp. 1893–1895, 2022, doi: 10.55248/gengpi.2022.3.3.7.*
7. ^*O. O. Efuntade and A. O. Efuntade, "Application Programming Interface (API) And Management of Web-Based Accounting Information System (AIS): Security of Transaction Processing System, General Ledger and Financial Reporting System," J. Account. Financ. Manag., vol. 9, no. 6, pp. 1–18, 2023, doi: 10.56201/jafm.v9.no6.2023.pg1.18.*
8. ^*M. Boyd, L. Vaccari, M. Posada, and..., An Application Programming Interface (API) framework for digital government. 2020. doi: 10.2760/772503.*
9. ^*V. K. Demidov, O. I. Pyvovar, and Y. G. Kravchenko, "Modern development methodologies for GIS oriented web application," 17th Int. Conf. Geoinformatics - Theor. Appl. Asp., vol. 6, no. 1, 2018, doi: 10.3997/2214-4609.201801770.*
10. ^*O. E. S. Liando, M. R. Kapahang, and J. R. Batmetan, "Cloud Security Adoption Factors in Educational Institutions," Int. J. …, vol. 1, no. 3, pp. 117–123, 2022, [Online]. Available: https://www.ijite.jredu.id/index.php/ijite/article/view/67%0A https://www.ijite.jredu.id/index.php/ijite/article/download/67/45*
11. ^*A. Dima, A. M. Bugheanu, R. Boghian, and D. Ø. Madsen, "Mapping Knowledge Area Analysis in E-Learning Systems Based on Cloud Computing," Electron., vol. 12, no. 1, 2023, doi: 10.3390/electronics12010062.*
12. ^*T. N. Fajarotun and R. Z. A. Aziz, "Analysis and Development of Software As a Service-Based Private Cloud*

Computing System for At State Senior High School 1 …," … Int. Conf. …, no. December, pp. 128–138, 2020, [Online]. Available: https://jurnal.darmajaya.ac.id/index.php/icitb/article/view/2520%0A https://jurnal.darmajaya.ac.id/index.php/icitb/article/download/2520/1296

13. ^*A. Wu et al., "Enhanced Reader," Nature, vol. 388. pp. 1–14, 2020.*
14. ^*A. U. Mentsiev, Y. A. Kulpeiis, and K. K. Smagulova, "Cloud computing in industrial automation systems," IOP Conf. Ser. Mater. Sci. Eng., vol. 1155, no. 1, p. 012063, 2021, doi: 10.1088/1757-899x/1155/1/012063.*
15. ^*C. Mustafa Mohammed and S. R. M Zeebaree, "Sufficient Comparison Among Cloud Computing Services: IaaS, PaaS, and SaaS: A Review," Int. J. Sci. Bus., vol. 5, no. 2, pp. 17–30, 2021, doi: 10.5281/zenodo.4481415.*