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Cloud Computing Technology in Supporting the Implementation of One Data Indonesia

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Abstract – Cloud computing services provide resources in the form of infrastructure platforms, software, and other hosting to customers. Data provided by digital systems is carried out in a cloud computing model service, providing data access anywhere as long as it is connected to the internet. In today's digital era, cloud computing supports the implementation of One Data Indonesia (SDI) to obtain quality data that is well integrated between local governments and the central government. With One Data Indonesia, it is hoped that data will have consistency so that it can be relied on for analysis and has a good level of security. One Data Indonesia is an idea from the Indonesian government to combine and maximize the use of data generated by government agencies in Indonesia so that it is useful for decision-making, planning, and more optimal public services. In realizing SDI, cloud computing can be utilized for data storage, ease of access, and creating better cooperation between government agencies. Cloud computing can help the Indonesian government optimize public services safely, and reliably, and maximize data potential in various fields to gain competitive advantages in all sectors of government.

Keywords – Cloud Computing, One Data Indonesia, Internet, Digital Era, Data.

I. INTRODUCTION

At this time, the emergence of the use of internet networks that are easily accessible anywhere and anytime makes human activities in obtaining data and information easier. This causes humans to experience a flood of data, because of the availability of abundant data [1]. The term flood is used to describe the surge in information that continues to increase rapidly, where the information produced exceeds human capabilities in managing and using the information optimally. The internet network has made major changes to humans in various aspects of their lives such as the way they work, where working using the internet network allows humans to work remotely, do E-commerce, Email, video calls, social media and so on. The internet refers to the emergence of the digital era, where digital technology and information have influenced many aspects of people's lives in Indonesia. In the digital era, there has been a large data explosion and increasing data complexity, requiring the ability to manage the data surge professionally [2]. The growth in the volume of data and information among local and central governments has brought challenges for the Indonesian government to be able to manage data so that data can be used effectively in producing innovative ideas and can generate profits in facing problems. In addition, effective data processing will produce optimal and efficient results to overcome problems according to public needs [3]. The implementation of One Data Indonesia (SDI) is expected to be able to carry out integrated data management properly so that administrative activities and public services to the community can be carried out quickly and accurately, in order to support decision-making based on significant and up-to-date data [4].

Integrated data will enable the government to work well so that there is a smooth exchange of information between central and regional government agencies. With the smooth flow of information between government agencies, it will accelerate decision-making encourage development, and increase public trust in government performance [5]. Well-integrated data is a valuable asset for the development of new innovations, and public services and also as a driver of economic growth for the welfare of the wider community. To obtain well-integrated, updated, and valid data so that it can be used by the central and regional governments has been stated in Presidential Regulation Number 39 of 2019 concerning One Data Indonesia [6].

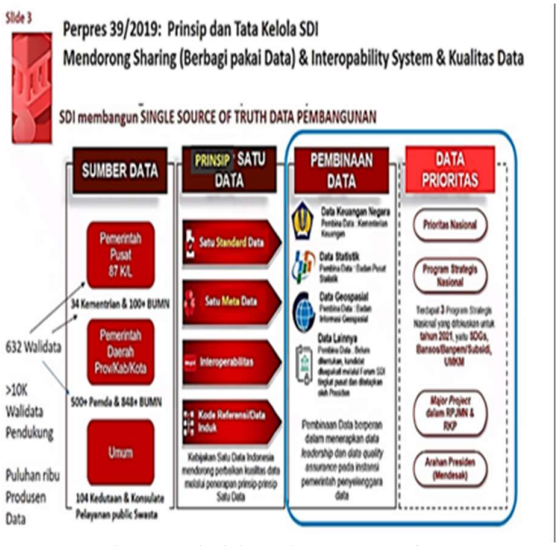

Figure 1. Principles and Governance of SDI
(Source ABDI.ID)

Where the implementation of One Data Indonesia has principles for managing data, namely data specifications, standard metadata, interactions between systems, and single identifiers.

The benefits obtained from One Data Indonesia are efficiency in the use of data sources to avoid data duplication, can be used as a basis for better decision-making, and improve public services [7]. With One Data Indonesia, it is possible to coordinate the sharing of

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information exchange, manage public data more openly, increase public trust in the government, for the development of new innovations and also provide E-Government services in Indonesia [8]. In addition to the benefits of implementing One Data Indonesia, there are also challenges in its implementation, namely [9]:

a. in the form of the need for systems, technology, and infrastructure that are not yet adequate to support One Data Indonesia
b. Data security from cyber threats.
c. data policies to facilitate data exchange, require adequate human resources, support from organizational structures is needed and good coordination between government agencies and public institutions is needed.

Cloud Computing is a computing model where by using internet facilities users can access data, store data, and use cloud services from different geographical areas. Cloud computing is data processing where resources such as software, databases, data storage media, server computers, and internet networks can be used together according to the needs of the user flexibly and payments are adjusted to what is used by the user. Cloud service providers will share the use of resources so that they can be used by many users simultaneously [10]. The basic principle of cloud computing is that users can easily access computing resources (On-Demand Access), such as hardware and software resources, flexibility in the use of computing resources, cheaper costs, and where users only pay according to what they use [11]. In addition, it also provides good data security services, such as data encryption, and users can access resources on cloud computing from different places worldwide. In providing its services, cloud computing has three main service models [12].

Figure 2 Cloud computing
(Source: Indonesian Cloud)

Each service model is needed to provide benefits for institutions or users. The three service models are IaaS (infrastructure as a service), namely virtual server services, virtual storage, and virtual computers, SaaS (software as a service), namely services in the form of sending simple to complex software via the internet network and PaaS (platform as a service), namely services that combine IaaS and SaaS into one package [13], [14].

The use of cloud computing for One Data Indonesia can provide benefits, namely being able to store data in the cloud where security is more guaranteed at an affordable cost, data on cloud computing can be used as integrated data, large-scale data analysis can be carried out, and cloud computing can facilitate easy collaboration between various government agencies.

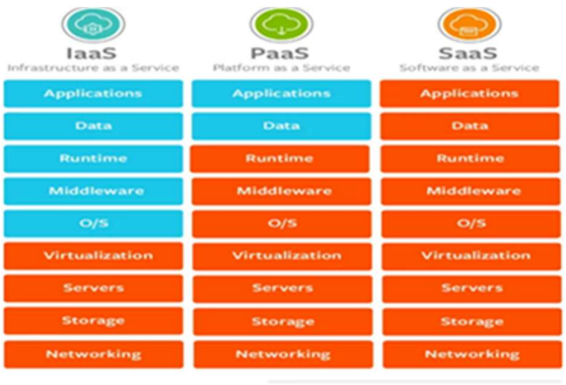

Figure 3 IaaS, PaaS and SaaS
(Source: exabyte)

For data management, cloud computing helps the Indonesian government optimize public services safely, reliably, and faster digital services to maximize the potential of data in various fields such as public services, transportation, administrative services to the public, education, health, and so on [15].

II. Research Methodology

A. Research Stages

The author conducted a study on the role of cloud computing in supporting the implementation of One Data Indonesia using the literature research method. This method is expected to provide clarity on how cloud computing technology can optimize and support efficient data management facilities in the implementation of One Data Indonesia. Figure 4 below shows the image of the research method.

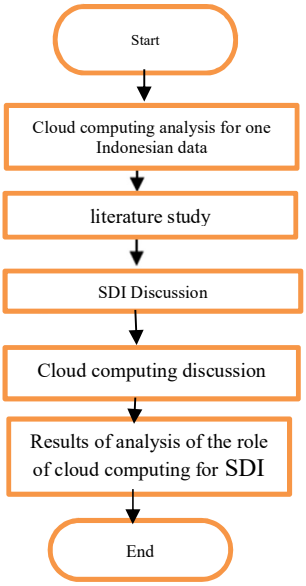

Figure 4. Research Methods

Figure 4 above analyzes the study of how cloud computing supports the success of the implementation of One Data Indonesia. In analyzing, a literature study is carried out, from the literature study it helps researchers to understand

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the theory, concept or all the latest things from the thing being studied. By conducting a research method, researchers can choose the most appropriate methodology for their research being carried out. A good literature study will greatly support the chosen research method. After that, a discussion of One Data Indonesia is carried out based on the literature study that has been carried out. The discussion of the cloud that has been carried out after that will obtain the results of the analysis, the analysis has a function so that existing data management can be obtained properly and accurately. The analysis also aims to be able to understand the research results so that from the raw data it can produce accurate information for the role of cloud computing for One Data Indonesia.

B. Cloud Computing Aspects Affect One Data Indonesia

There are several aspects of cloud computing that affect One Data Indonesia, namely:

a. In terms of data storage capacity, cloud computing can adjust the size of data storage media according to the needs of One Data Indonesia. This is because the data on One Data Indonesia is quite large.

b. Cloud computing allows people or groups of people who work in distant places or in different regions to work using the same data so that good performance effectiveness is created for One Data Indonesia.

c. In One Data Indonesia with cloud computing, data storage in the cloud is possible so that the level of security is high and data can be backed up faster if data is lost due to system failure. This needs to be considered because Indonesia has a geographical area of islands, mountains and oceans so that it is prone to natural disasters.

C. Cloud Computing Architecture Towards One Data Indonesia

In building the right cloud computing architecture, it is very dependent on the needs, size, and objectives of the project to be built against Satu Data Indonesia. In addition to depending on the needs, size and objectives of the project, the basis for choosing a cloud computing architecture is also the configuration depending on the cloud provider that suits the needs, choice of geographic area, cloud service class, security, cost management, scalability and data backup [16]. Satu Data Indonesia is very dependent on the needs, size, and objectives of the cloud computing project. This is expected to remain responsive in adjusting resources according to changes that will occur in the future. Changes that may occur are due to user needs or geographic changes so that there is no need to change the infrastructure as a whole and it is also important (significant) considering that Satu Data Indonesia is used to exchange data with a fairly wide geographic area.

D. Government Data Management and Cloud Computing

As a result of the development of digital transformation in large-scale data processing, the use of cloud computing services in Indonesia is increasingly widespread in various government sectors, where to reduce operational costs with the ability to repair disasters and data damage quickly [17]. Digital transformation itself is a process in which an organization can implement digital technology with new methods or approaches to modify the way it operates, interacts with users in order to achieve the goals of the business organization that have been previously set. Before cloud computing was used in the government sector, data management using data storage system infrastructure in physical locations by the government separately by the government could result in several problems including data redundancy, data isolation and inefficiency, varying data quality, data analysis becomes more difficult and data security problems. Data redundancy problems are situations where there are several copies of the same or very similar data on a computer system or in several data storage media. This can happen because different hardware and software are used to store the same data or because data is downloaded or copied manually (without the help of a computer). Data redundancy can cause inconsistent data, waste of data storage media and difficulty in data maintenance (data management) because data is spread across various storage media. Data isolation can occur when data is managed separately by the government because information needed at a certain level of government may not be available or cannot be accessed by other government entities that need it. This causes high costs, varying data quality, making it difficult to analyze data, maintain data security and hinder government efficiency in providing services to the public. Therefore, One Data Indonesia is an idea from the Indonesian government to unify and maximize the use of data produced by government agencies in Indonesia so that it is useful for decision making [18]. An example of the application of One Data Indonesia that has been implemented by the Indonesian government is the Population Identification Number and E-KTP [19].

III. RESULTS AND DISCUSSION

Data analysis and mapping will support efficient data management and appropriate policy making. One Data Indonesia is expected to produce quality data, so that it can support development and data uniformity between the central government and local governments. In digitalization services, the role of quality data is very important, therefore data analysis and evaluation are needed to follow technological development trends. Cloud computing provides services where data can be transferred from a cloud server to another cloud server. Transferring data from one server to another aims to increase the productivity of cloud technology for the implementation of One Data Indonesia. In addition, cloud computing technology can be a data storage medium with high capacity at affordable operational costs. One Data Indonesia can be more optimally organized with cloud computing technology where it gets benefits in data management as well as with a good level of data security. With One Data Indonesia supported by cloud computing technology, an effective, efficient and optimal configuration is created to integrate data from various applications, data sources, and platforms as well as possible

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for the government. This is the basis for a better decision-making process with a good planning cycle for One Data Indonesia and easier and more accurate access to data for the government to gain competitive advantages in all government sectors.

III.1 Data Analysis and Mapping

Analyzing and mapping data is an important step in understanding and illustrating information stored in a set of data. In Satu Data Indonesia, there are several steps to analyze and map data. These steps are:

a. Identifying related data sources from various entities, namely government institutions, non-government institutions, statistical agencies and so on.
b. Implementing an integrated data system for easy access and analysis.
c. Conducting a data filtering process so that data is free from inconsistencies, data redundancies and data gaps. In addition, data normalization is also needed.
d. Statistical analysis can be carried out to obtain useful information so that it can be used as a basis for decision making.
e. In data containing spatial elements, geographic mapping techniques need to be used to visualize information based on its geographical location.
f. Implementing information security, namely maintaining data security.
g. Documenting data.
h. Implementing metadata.
i. Maintaining data accuracy.
j. Data analysis and mapping are important steps that support Satu Data Indonesia's goal of developing a system that unifies and is effective in using data.

III.2 Data Architecture Plan on One Data Indonesia

What is meant by data architecture in Satu Data Indonesia is how to take an approach that can be done to organize data originating from various sources for management, uniting data into integrated data, storage and exchange in order to facilitate the need for integrated information for government institutions. In addition, the data architecture in Satu Data Indonesia includes criteria, guidelines and rules that must be obeyed so that data remains consistent, interoperable and creates security for information (information security). Table 1 below contains several factors that can be included in the data architecture plan for Satu Data Indonesia.

Table 1 Data Architecture Planning Factors

No	Arsitektur	Prinsip	Deskripsi
1	Data Grouping	Identifying data types	Demographic, Economic, Environmental, Geographic, Health, Social, Financial, Technology and Communication Data.
2	Business Objectives	Targets to be achieved	Analysis, Reporting and Decision Making
3	Data Quality	Accessibility of relevant, accurate and consistent data	Data Cleaning, Validation and Standardization
4	Security Information	Privacy regulations	Giving individuals control over personal information. Policies, laws
5	Technology Infrastructure	Development, use and functionality of technology.	Hardware and software, communication networks, data storage systems and servers, data centers and the internet
6	Data Integration	Combining data from different entities.	The creation of a structured, organized data environment supports business and analytical needs.
7	Continuous Maintenance and Development	Data maintenance, management and growth.	Quality control, Regular updates, Innovation and Expansion of data and model development.

III.3 Data Integration

To maintain data integration in One Data Indonesia, cloud computing offers a centralized platform that accommodates the collection, storage, and access to data from various sources. In the following table 2, the role of cloud computing in maintaining data integration:

Tabel 2 Cloud Computing Maintains Data Integration

No	Cloud Computing	Penjelasan
1	Integrated Data Center	Cloud computing enables a centralized data warehouse, so that data from multiple sources can be collected and stored in a standardized format
2	Application Programming Interfaces and Web-Based Services	Cloud computing provides API services so that data can be exchanged securely between dissimilar systems so that data is integrated in real-time
3	Data Centralization	With cloud computing, government agencies can implement consistent and centralized data management policies to maintain data integrity and quality
4	Cooperation / Collaboration	Facilitate resources that enable multiple stakeholders to collaborate on the same dataset.
5	Security and Privacy	Protecting data from unauthorized access to ensure that data management is carried out securely
6	Access Management	Access management where management of access to data determines the rights to data to only view, the right to change certain information to support data integrity

Data integrity reflects the quality of stored information including the truth of the stored information and its authenticity. With well-integrated data, competent information will be obtained throughout its stages, so that it can reduce data discrepancies when used to create reports. In One Data Indonesia, data integrity supports cooperation in exchanging information between several government institutions so that it is more efficient and runs smoothly in the decision-making process. Openness and

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accountability of well-integrated data will have a positive effect on One Data Indonesia in terms of governance, accuracy, and improving services in a number of public sectors to the wider community. It can be said that the role of cloud computing is very important in providing the necessary infrastructure to ensure efficient and effective data integration and is one of the pillars of One Data Indonesia.

III.4 Dashboard One-Stop Data

The one-stop data dashboard is an integrated access interface to various data and information so that users can easily access and analyze information, so that the data or information available is easy to understand even though it comes from various different places. At Satu Data Indonesia, the one-stop data dashboard aims to provide a platform that makes it easy to access various data needed by users from various fields so that they can make the right decisions based on the available data and information. Some preparations that can be made for the one-stop dashboard are understanding the purpose of creating the one-stop data dashboard, identifying data sources, both internal and external data sources, determining access rights to data for users who have the authority only, data and information in the dashboard is accurate data. In addition, preparations that can be made for the one-stop dashboard include ensuring that the data in the dashboard is well integrated, managing the dashboard, conducting training on the use of the dashboard and ensuring that data security is maintained. The One-Stop Data dashboard, in addition to facilitating data analysis, is also useful for data integration, data visualization, data updates in the form of the latest information on the basis of decision making, customization, flexibility, supporting teamwork, identifying trends and patterns in data and accurate accessibility. The One-Stop Data Dashboard for One Data Indonesia is useful in terms of increasing the efficiency and effectiveness of integrated data management and utilization for government institutions and their stakeholders.

III.5 Documentation

In the concept of One Data Indonesia, documentation is in the form of official records related to the collection, processing, storage, and distribution of data by government institutions. The purpose of documentation is to clarify the methodology, ensure data quality, and support cooperation between government institutions when data management occurs. Data documentation in Indonesia refers to the process or results of recording information related to existing data. Things included in documentation in One Data Indonesia are how to set rules related to instructions for accessing data, data guides to obtain information about the availability of what data and where the data comes from, implementing technical guidelines that provide instructions for data integration, data transfer and API (Application Programming Interface). In addition, data security and reports on existing data analysis are also included in the documentation in One Data Indonesia. With good documentation, users of the One Data Indonesia platform can maximize its use. The components of documentation for One Data Indonesia include:

1. Contextual Data in the form of information about the dataset, such as title, abstract, keywords, time and date of collection, data format, and collection methodology.
2. Standards of Documents that explain technical and procedural standards in the implementation of data collection, storage, processing, and distribution.
3. Government Regulations in the form of One Data Indonesia regulations for data management and distribution policies.
4. Procedure Manuals in the form of instructions for implementing the data processing process in accordance with One Data Indonesia.
5. Data security in the form of maintaining data security, data access, data transfer, and data deletion.

Documentation aims to maintain data integrity and quality, data transparency, minimize data duplication in order to obtain more accurate data as a basis for decision making for the government.

III.6 Cloud Computing And One Data Management Indonesia

The implementation of cloud computing in the management of One Data Indonesia can provide many benefits for the government, organizations and other fields. Where the management and storage of large data sets to be more effective, efficient and optimal. This is very beneficial for the government and organizations in Indonesia. Cloud computing provides scalability as well as various resources needed to handle One Data Indonesia better. Where cloud computing is able to facilitate collaboration from better data sharing among various stakeholders in the government in Indonesia. This is very important for the central government and local governments, which require cross-sector collaboration on sharing various data for various purposes such as improving services to the community as well as a basis for decision making. To be able to manage data and to be able to provide access services from various data sources on centralized data, cloud computing has a very important role. Cloud computing creates integrated data by providing services and basic facilities in the form of storing and controlling data from different sources. So that it can carry out data management, data retrieval and data analysis in one platform for One Data Indonesia. Cloud computing technology can provide the ability to handle increased data additions or performance by adding or reducing resources. Cloud computing technology for One Data Indonesia carries out several methods, namely by adjusting capacity by users, making payments based on scalable usage, automatic infrastructure management, carrying out parallel processing and fast services that can be accessed from different places[20]. Dengan layanan berbasis cloud, maka Satu Data Indonesia dapat melakukan penyimpanan, pemrosesan, juga menganalisis data dalam jumlah besar secara optimal tanpa harus memerlukan infrastruktur lokal komprehensif. Sehingga dapat dilakukan penghematan biaya namun tetap memberikan skalabilitas dan fleksibilitas untuk memenuhi tuntutan manajemen data yang progresif. Cloud computing memiliki peran besar dalam mendukung manajemen Satu Data Indonesia yaitu berupa memfasilitasi infrastruktur skalabel, efisien, dan fleksibel sehingga tercipta integrasi serta analisis data yang

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cukup luas dari berbagai sumber pemerintah dan lembaga-lembaganya. Berikut ini adalah peran cloud computing dalam manajemen Satu Data Indonesia sebagai pembagian sumber daya, scalability, keamanan data, menganalisis data besar, efisiensi anggaran, pemeliharaan dan pembaruan. Dalam Satu Data Indonesia dengan penerapan cloud computing memiliki beberapa tantangan berupa masalah keamanan data dimana data harus dapat dilindungi dari ancaman cyber serta kerusakan data serta ketergantngan terhadap provider yaitu pihak penyedia layanan cloud. Selain itu perlu adanya pelatihan terhadap sumber daya manusia bagi penggunaan teknologi cloud computing dalam implementasi Satu Data Indonesia.

IV. CONCLUSION

By implementing cloud computing in supporting One Data Indonesia, more effective data quality and more secure data will be created, where only those who are entitled to the data can access it. Cloud computing plays a role in well-integrated data management, so that the government can be more efficient in government administration in order to create transparency, accountability, collaboration facilities between government institutions in data processing and create development for innovation in many government sectors. The role of cloud computing to support the implementation of One Data Indonesia includes ease of accessibility, the creation of an integrated system, good data protection in the form of data security, more efficient large-scale data analysis, information management without direct infrastructure management and paying for services based on usage so that cost savings occur. One Data Indonesia is a solid foundation for creating a transparent government, a responsive system, can be well connected according to what the public expects so that more efficient services are created for the wider community and are right on target. With cloud computing, it is expected to smooth the country's information technology infrastructure to support and improve the quality of decision making. Cloud computing requires a stable internet network that is easy to access anywhere and anytime in order to run smoothly. The implementation of One Data Indonesia uses cloud computing for data storage, optimizing public services safely, reliably, and faster digital services. Thus maximizing the potential of data in various fields in order to create more optimal cooperation between fellow government agencies with data that has been well integrated in order to gain competitive advantages in all sectors of government.

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