GOVERNMENT CLOUD FIRST POLICY ADOPTION STRATEGY IN INDONESIA: ANALYSIS AND RECOMMENDATIONS

Farisya Setiadi[1], Gede Rizky Gustisa Wisnu[2]

[1] School of Computing, Telkom University
[2]Faculty of Computer Science, University of Indonesia
[1]farisyasetiadi@telkomuniversity.ac.id, [2]rizky@ui.ac.id

Diterima pada 26 Juli 2024; disetujui pada 27 September 2024; dan diterbitkan pada 13 Mei 2025

Abstrak

Penelitian ini membahas pentingnya adopsi komputasi awan (cloud computing) di sektor pemerintahan Indonesia dan menyusun strategi untuk mendukung penerapan Government Cloud First Policy. Komputasi awan memungkinkan organisasi untuk menyediakan layanan TI seperti daya komputasi dan penyimpanan data berdasarkan permintaan, menawarkan manfaat seperti penghematan biaya, skalabilitas, dan ketersediaan tinggi. Penelitian ini menggunakan pendekatan kualitatif dengan metode studi literatur mengumpulkan data dari berbagai dokumen regulasi, whitepaper, dan jurnal terkait kebijakan Cloud First dari berbagai negara serta focus group discussion (FGD) yang melibatkan para pemangku kepentingan dari bidang akademis, bisnis, pemerintah, dan komunitas. Penelitian ini menghasilkan daftar regulasi terkait cloud computing di Indonesia, analisis tantangan dan permasalahan adopsi adopsi Government Cloud First Policy di Indonesia, serta rekomendasi penerapan government Cloud First Policy di Indonesia.

Kata Kunci: komputasi awan, Government Cloud First Policy, Indonesia, transformasi digital, sektor publik, SPBE, benchmarking, analisis regulasi.

Abstract

This research discusses the importance of adopting cloud computing in the Indonesian government sector and develops strategies to support the implementation of the Government Cloud First Policy. Cloud computing allows organizations to provide IT services such as computing power and data storage on demand, offering benefits such as cost savings, scalability and high availability. This research uses a qualitative approach with a literature study method collecting data from various regulatory documents, white papers and journals related to Cloud First policies from various countries as well as focus group discussions (FGD) involving stakeholders from the academic, business, government and community fields. This research produces a list of regulations related to cloud computing in Indonesia, an analysis of the challenges and problems of adopting the Government Cloud First Policy in Indonesia, as well as recommendations for implementing the government Cloud First Policy in Indonesia.

Key Words*: *cloud computing, Government Cloud First Policy, Indonesia, digital transformation, public sector, SPBE, benchmarking, regulatory analysis.

1. Introduction

1.1 Background

Cloud Computing or cloud computing allows companies to provide IT services such as computing power and data storage on demand. Organizations are only charged for the resources they have used from the cloud service provider, known aspay on your demand [1]. Utilizing cloud computing offers various advantages, including cost savings, scalability and high availability, making it an attractive option for various sectors. Specifically, in the public sector, research by Khan et al. [1] shows that by utilizing cloud computing, the government can focus more on its main task, namely serving the public, rather than managing IT resources and maintenance tasks. Providing services efficiently and saving costs are two key factors driving cloud adoption in the government sector. Gartner predicts an increase in government use of public cloud services, with spending projected to grow an average of 17.1% per year through 2021 [2]. Global end-user spending on public cloud services is expected to increase by 20.4% in 2022, reaching a total of $494.7 billion, compared with $410.9 billion in 2021, according to the latest estimates from Gartner. By 2023, end-user spending is expected to approach $600 billion [3].

Current use of the cloud by government agencies varies greatly, depending on operations at the national, state or provincial, and local levels. In general, in some countries, local governments allocate 20.6% of their IT budgets to the cloud, while national governments allocate 22% [2]. Some IT categories that can transition to cloud use include application software, business process services, infrastructure software, and infrastructure systems. According to Gartner research [4], by 2025, 51% of IT spending in these four categories is expected to shift from traditional solutions to the public cloud, compared to 41% in 2022. The Covid-19 pandemic has underscored the importance of digitalization in government, state services -countries that have invested in these technologies are able to adapt better during crises and demonstrate greater resilience compared to countries that have been slow to adopt the technology. In the post-pandemic context, the ability of the civil service to shift to remote work, provide services online, use data to manage targeted work, and maintain sustainable operations has become increasingly important. The virtualization of these processes, facilitated by cloud computing technologies and services, marks a crucial step in the digital development path for governments [5].

In the future, the need for cloud computing technology will increase along with the exponential growth in the volume of data processed and the expansion of digital services. This makes the government need a cloud computing infrastructure that can be expanded and escalated quickly and flexibly [6]. The adoption of cloud computing in the government sector in Indonesia cannot be separated from its connection to the National Data Center (PDN). PDN as one of the Electronic Based Government System (SPBE) infrastructure based on Presidential Decree no. 95 of 2018 concerning SPBE. Then, based on the report prepared by Wantiknas (2020), there is the construction of 4 (four) integrated National Data Centers which are also in line with the President's direction regarding 5 (five) steps to accelerate digital transformation. This PDN was built in the Jabodetabek area, Batam, the capital city of the archipelago (IKN), and Labuan Bajo [7]. The challenge for the future is how the use of cloud computing in the government sector in Indonesia can be integrated with the PDN ecosystem that has been built. The adoption of a policy related to the use of cloud computing is required by the Indonesian Government. Therefore, it is necessary to formulate a Government Cloud First Policy as a legal basis for the use of cloud computing technology in government agencies in Indonesia. Several countries that already have cloud policies or strategies include the United States [8], United Kingdom [9], Australia [10], Saudi Arabia [11], and the Philippines [12]. This policy is to ensure there are appropriate legal provisions for cloud procurement as part of state procurement requirements. On the other hand, this policy will certainly lead to a reduction in capital costs for IT infrastructure services, increased responsiveness of digital services to societal needs, increased transparency, and improved public delivery [13].

1.2 Formulation of the problem

Based on the background that has been explained, there are several key questions that need to be answered to understand and overcome issues related to cloud computing adoption in the Indonesian government sector. The following is the problem formulation that will be the focus of this research:

1. What are the regulations related to cloud computing in Indonesia?
2. What are the challenges faced by central government agencies in preparing the Government Cloud First Policy in Indonesia?
3. What is the state-of-the-art view of Cloud First Policy in other countries?
4. What are the recommendations for implementing the Government Cloud First Policy for the Indonesian Government?

1.3 Objective

This research has several main objectives designed to support digital transformation in the Indonesian government sector through the adoption of cloud computing. These objectives are expected to provide in-depth insight and practical guidance for central government agencies in developing and implementing Government Cloud First policies. The following are the objectives of this research:

1. Identify regulations related to cloud computing in Indonesia
2. Providing analysis of challenges and problems as a reference for Central Government Agencies regarding the preparation of the Government Cloud First Policy in the Indonesian Government;
3. Provides a state-of-the-art Cloud First Policy overview based on developments and experiences in other countries.
4. Provide recommendations for implementing the Government Cloud First Policy as a reference in compiling the Cloud First Policy in the Indonesian Government.

2. Literature Review

2.1 Cloud Computing Service Model

Cloud computing provides three primary service models: Software as a Service (SaaS), Infrastructure as a Service (IaaS), and Platform as a Service (PaaS). Each model offers a different level of IT support required for

deploying IT solutions, tailored to the specific needs of organizations. Here's a breakdown of each service model:

- Software as a Service (SaaS)
  This model delivers applications over the cloud, allowing users to access software via a web browser without the need to install, update, or maintain it locally. SaaS eliminates the need for users to handle software management, providing access to applications such as word processors, spreadsheets, accounting systems, and Customer Relationship Management (CRM) systems directly from the cloud.
- Platform as a Service (PaaS):
  PaaS offers a comprehensive environment for developing, deploying, and managing digital applications. It includes the necessary programming languages, libraries, and tools provided by the service provider. PaaS supports the entire application lifecycle, from development to testing, by providing a ready-to-use platform.
- Infrastructure as a Service (IaaS):
  This model provides essential computing resources, including storage, networking, and fundamental data processing capabilities, which organizations would otherwise need to maintain in their own data centers. While SaaS and PaaS adoption is growing, IaaS remains a common choice for organizations seeking scalable and flexible infrastructure solutions.

2.2 Cloud Computing Deployment Model

NIST classifies cloud computing deployment models into several main types, each with its own features and applications. Here's an overview of these deployment models according to NIST [13]:

- Private Cloud:
  This type of cloud infrastructure is dedicated to a single organization, which may consist of multiple users. It can be managed and operated by the organization itself, a third party, or a combination of both. The infrastructure can be located either on-site or off-site. Private Clouds do not guarantee specific SLA/Uptime, and data redundancy is the organization's responsibility. Building solutions on a Private Cloud can be more time-consuming due to internal development and testing requirements. An example of a Private Cloud in the government sector is the Cloud used by Central and Regional Government Agencies (IPPD), typically serving specific work units or groups.
- Community Cloud:
  This model is designed for use by a community of organizations with shared interests, such as common missions, cybersecurity needs, policies, and compliance requirements. The infrastructure can be managed by one or more community organizations, third parties, or a mix of both, and it can be located either on-premises or off-premises. The service provider guarantees SLA/Uptime and manages data redundancy. Community Clouds offer a "plug and play" capability, allowing for quicker deployment of new solutions.
- Public Cloud:
  This cloud infrastructure is available for use by the general public and can be managed by business entities, academic institutions, government agencies, or a combination of these. Public Clouds are typically operated by major global providers (such as AWS, Google Cloud, Microsoft Azure) or local players (such as regional telecom and ICT companies). SLA/Uptime and data redundancy are handled by the service provider. Public Clouds also offer a "plug and play" model for rapid deployment of new services.
- Hybrid Cloud:
  This model combines two or more different cloud infrastructures (private, community, or public), which remain distinct but are interconnected through standard or proprietary technologies that allow for data and application portability. A similar approach, known as multi-cloud, involves using multiple cloud infrastructures without connectivity or orchestration between them. This method is supported worldwide.
  According to a McKinsey report [14], many government sectors prefer private, or community clouds managed by shared-service units (such as the US Federal Government's General Service Administration). Private Clouds are often seen as more secure and manageable than public sector IT systems because they allow organizations to integrate security and governance into the architecture from the beginning. Public Clouds may be appropriate for the public sector if the organization has advanced capabilities to handle security and governance concerns.

3. Research Methodology

This research design uses a qualitative approach to collect comprehensive and in-depth data regarding challenges, problems and strategies in preparing the Government Cloud First Policy in Indonesia. This approach allows researchers to gain more holistic insights and understand phenomena in greater depth.

3.1 Research Stages

The research process was carried out through several systematic stages, with the aim of providing a comprehensive overview of regulations, challenges and

Identify regulations related to Cloud Computing in Indonesia		
Input	Method	Output
Regulations	1. Study of literature 2. Comparative Analysis	1. List of regulations related to Cloud Computing in Indonesia 2. Regulatory Matrix related to Cloud Computing in Indonesia

Benchmarking Analysis of Government Cloud First Policy in Other Countries		
Input	Method	Output
Regulations, Whitepapers, Journals	Study of literature	Cloud First Policy Benchmarking Analysis Table in Other Countries

Preparation of Recommendations for the National Government Cloud Strategic Framework		
Input	Method	Output
Regulations, white papers, journals, List of Regulations related to Cloud Computing in Indonesia, Regulatory Matrix related to Cloud Computing in Indonesia, List of Cloud Computing Challenges and Problems in the Indonesian Government Sector, Benchmarking Analysis Table of Cloud First Policy in other countries.	Study of literature thematic analysis	Strategic Framework Recommen-dations

Figure 1. Research Stages

best practices from various countries. The following are the stages of the research conducted as shown in the Fig 1:

3.2 Method of Collecting Data

Data collection in this research was carried out through the following methods:

- Literature study
  At this stage, a study of research related to the Cloud First Policy is carried out. Some of the documents analyzed include regulatory documents, white papers, journals, and others.
- Focus Group Discussion:
  This data collection involves stakeholders in the academic, business, government and community sectors. The method is used until the data obtained is sufficient to be taken to the next stage.

3.3 Method of Collecting Data

- Data obtained from literature studies are analyzed and compared to provide a more comprehensive picture of cloud computing policies in various countries. These steps include compiling literature data from countries such as the Philippines, Pakistan, Saudi Arabia, United Kingdom, Singapore. Then the policies, strategies and best practices of these countries are compared to identify patterns, similarities and significant differences. Next, the comparison results are organized into a comparison table.
- Data obtained from focus group discussions with the sources were analyzed using the thematic analysis method. The steps taken included interview transcription, data coding, identification of main themes, and interpretation of results. This analysis aims to identify challenges, problems and strategies that are relevant in preparing the Government Cloud First Policy.

4. Discussion

4.1 Identify Regulations to Cloud Computing in Indonesia

One of the massive developments in information technology is cloud computing. Currently in Indonesia, cloud use has become a major requirement in both the private and government sectors. Especially in the government sector, there are many benefits and opportunities that can be gained when switching to cloud computing. Therefore, regulation is one of the important things in exploiting the opportunities and benefits of cloud computing for Central Regional Government Agencies (IPPD). Many governments in various countries have introduced cloud computing policies under the name cloud first policy. Looking at the current conditions in Indonesia, several IPPDs have succeeded in

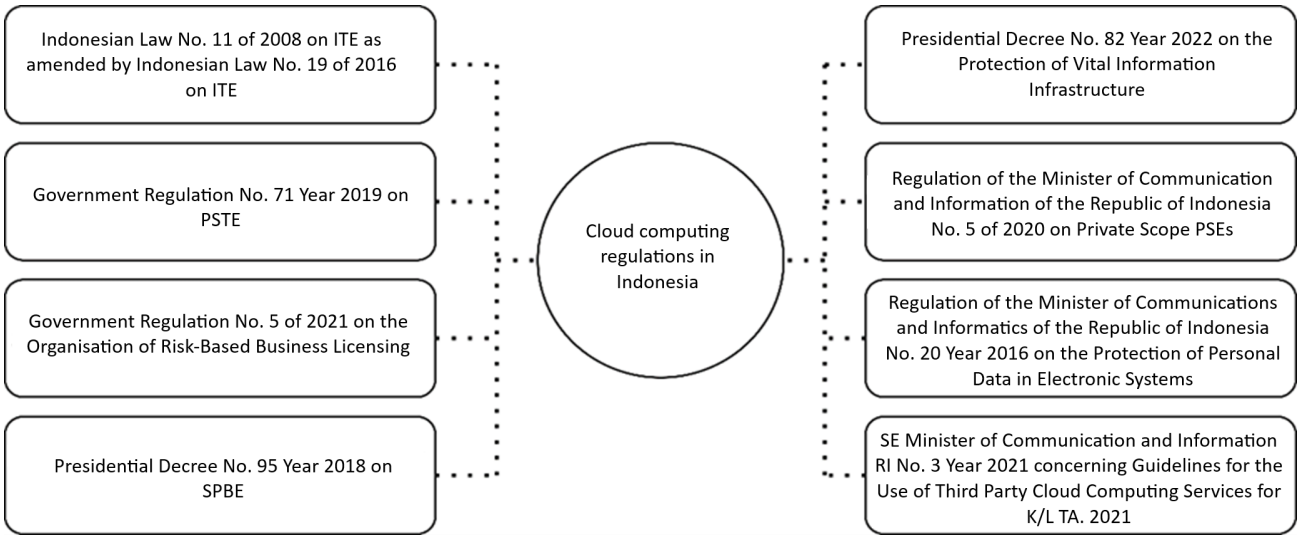

Figure 2. Regulations related to Cloud Computing in Indonesia

adopting cloud computing technology, but the implementation is still not regulated in national regulatory references.

A cloud-first policy or in other words a cloud-first policy requires inistries/Institutions and Regional Governments to prioritize the use and procurement of cloud systems by default where cloud computing options are safe, reliable and cost-effective. Until now, there are several regulations in Indonesia related to cloud computing. Fig 2 are several regulations related to the adoption of cloud computing in the Indonesian Government currently:

The following are several legal bases relating to the current adoption of cloud computing in the Indonesian government:

- Law of the Republic of Indonesia Number 11 of 2008 about Electronic Information and Transactions as amended by Law Number 19 of 2016 about Amendments to Law Number 11 of 2008 about Electronic Information and Transactions. In this Law, there are regulations regarding the operation of electronic systems which are then implemented by the Electronic System Operator or PSE. Basically, cloud service providers/organizers are part of PSE, so all the legal consequences of PSE as regulated in Law no. 19/2016 concerning ITE also applies to cloud service providers/organizers.
- Republic of Indonesia Government Regulation Number 71 of 2019 about Implementation of Electronic Systems and Transactions. In this PP, there are regulations regarding the operation of electronic systems which are then implemented by the Electronic System Operator or PSE. Basically, cloud service providers/organizers in this PP are categorized as public PSE or private PSE, so that all the legal consequences of PSE as regulated in PP No. 71/2019 concerning PSTE also applies to cloud service providers/organizers. In the context of supervision and legal protection, the Indonesian Government regulates terms and conditions for public and private PSEs as providers/organizers of cloud computing services, including registration obligations (article 6), hardware (article 7), software (articles 8-9), experts (article 10), governance (articles 11-21), security (articles 22-33), due diligence (article 34), and supervision (article 35).
- Republic of Indonesia Government Regulation Number 5 of 2021 about Implementation of Risk-Based Business Licensing. Providers/organizers of cloud computing services that are included in the private sector PSE category are required to obtain permits before carrying out activities on a massive scale and/or being used by many people. Through PP no. 5/2021, cloud computing service providers/organizers are included in the Post, Telecommunications and Electronic Transaction Systems sectors with medium-high risk business fields.
- Presidential Regulation of the Republic of Indonesia Number 95 of 2018 about Electronic-Based Government Systems. Through Presidential Decree no. 95/2018 concerning SPBE, there is a policy direction and strategy for SPBE, one of the scopes of which is Information and Communication Technology or ICT. Within the scope of ICT, cloud computing technology can be used to optimize the use of SPBE general applications, so that it is able to share SPBE general applications. Apart from that, the role of cloud computing technology appears in the SPBE

strategic plan map which contains various initiatives used as guidelines for building, developing and implementing the national SPBE. One of them is a strategic initiative in the ICT area related to the National Data Center or PDN. It is said that PDN is directed to use cloud computing technology so that data, applications and infrastructure can be shared.

- Regulation of the Minister of Communication and Information of the Republic of Indonesia Number 5 of 2020 about Private Electronic System Operators. In Minister of Communication and Information Regulation no. 5/2020 concerning Private Scope PSE, is a specific legal basis for cloud service providers/organizers as private scope PSEs that provide, organize, manage and/or operate cloud computing services as regulated in Article 1 point (10). Apart from that, Article 12 also regulates the obligations that must be carried out by cloud service providers/organizers.
- Circular Letter of the Minister of Communication and Information of the Republic of Indonesia Number 3 of 2021 concerning Guidelines for Using Third Party Cloud Computing Services for Ministries/Institutions for Fiscal Year 2021. The Ministry of Communication and Information Technology issued a Circular which aims to serve as a guideline for Ministries/Institutions in using third party cloud computing services and to increase security in the process of managing, processing and/or storing electronic data used by Ministries/Agencies in the use of third-party cloud computing services. This circular regulates definitions, general guidelines, risk mitigation for electronic data, and security controls on cloud computing services used by Ministries/Institutions.
- Minister of Communication and Information Regulation No. 20 of 2016 about Protection of Personal Data on Electronic Systems. This regulation regulates the protection of personal data in electronic systems organized by electronic system operators. In current conditions, cloud service providers/organizers in Indonesia are included as electronic system providers. Through this regulation, it is stated that data protection in electronic systems is carried out regarding the acquisition, collection, processing, analysis, storage, display, announcement, transmission, dissemination and destruction of Personal Data. With this regulation, it is certainly a crucial thing that cloud service providers/organizers in Indonesia need to pay attention to. Furthermore, personal data protection will be strengthened through the draft Personal Data Protection Law.
- Presidential Regulation no. 82 of 2022 concerning Protection of Vital Information Infrastructure. The use of the cloud cannot be separated from its function, namely for data storage and processing. The stored data will of course be processed and then produce information that is useful for the user. Through this regulation, it regulates the protection of vital information infrastructure covering several sectors, including energy and mineral resources, government administration, transportation, health, finance, food, information and communication technology, defense and other sectors determined by the President. The connection between the adoption of cloud computing and the existence of this regulation can be concluded that there is a need to protect data in these sectors. Ultimately, cloud service providers/organizers need to comply with this Presidential Regulation.

Based on the various legal bases described above, the adoption of cloud computing in the Indonesian Government has been regulated through various laws and policies. Each regulation provides clear guidelines and standards for electronic system providers, including cloud service providers, to ensure security, governance and efficiency in the implementation of these technologies. However, some regulations may have overlaps in regulation which can cause confusion and inconsistencies in their implementation. With strong and coordinated regulations, the Government can create a reliable and secure cloud computing ecosystem, which can support digital transformation in public services and improve bureaucratic performance.

4.2 Analysis of Cloud Computing Challenges and Problems in the Indonesian Government Sector

Based on the results of a focus group discussion conducted by resource persons from stakeholders in the field of cloud computing, the following are several challenges and problems that pose challenges in the use of cloud computing in the government sector in Indonesia. The following are the results of the analysis and challenges of cloud computing problems in the Indonesian Government sector:

- Undirected regulations: The rules or regulations governing the use and governance of cloud computing in the government sector are still not clearly defined. As a country with a decentralized government with regional autonomy, the Indonesian government relies on mandates and/or explicit provisions in regulations as the basis for every policy/program/project by any government agency. Without a firm legal basis for regulatory certainty, central or regional agencies can be found guilty when they deploy their data and workloads in the cloud, especially when there are policies

governing IT procurement, especially clouds, that can be considered findings and conflicting by regulators.

- Inequality of local and global cloud industry capabilities: On this specific issue related to business, the local cloud industry has not been able to compete with global cloud companies in cloud procurement in the government sector. This is a result of the lack of capability in IT infrastructure, systems and human resources to support cloud in the local cloud industry. Plus, the experience of local cloud companies is less than that of global companies. Therefore, the challenge that is needed in the future is how the government can regulate the scope of cloud procurement so that the cloud industry continues to grow and develop economically while becoming the best place for global CSP investment.
- Perception of fear of job loss: For IT human resources in K/L/D, migrating from traditional IT systems to cloud computing could threaten the loss of their jobs. On the contrary, prioritizing cloud computing can open new types of jobs and competencies to support the use of the cloud.
- Insufficient understanding of the cloud: This is related to the low level of literacy obtained by human resources in the government sector regarding cloud computing. For example, you still feel afraid of losing data when using the cloud even though the proven and certified reliability and security of the cloud are used in several organizations. Therefore, cloud literacy is still low, so they cannot differentiate the definition of using traditional IT infrastructure from cloud computing and cannot see the positive impact that can be obtained by using the cloud.
- Fear of being blamed: This issue is still related to the immaturity of policies regarding the use of the cloud for the existing government sector. Government agencies, especially in the regions, are still afraid to adopt the cloud even though they have received support from regional leaders. This is a result of the absence of a regulatory umbrella regarding cloud utilization that is defined and can be passed down to each regional government.
- Inappropriate budget: In some government agencies, the budget for cloud procurement is still included in fixed costs. Even though the costs and prices of using the cloud tend to be dynamic according to usage and business conditions. In business terms, that is pay as you go or pay as you go. Apart from that, it was also found that currently public sector institutions in Indonesia that have adopted the cloud end up paying more for their IT budget because they still maintain their traditional IT infrastructure. Therefore, procurement for cloud use needs to be reviewed by the government sector in Indonesia so that the budget spent can be appropriate and effective. One of the massive developments in information technology is cloud computing. Currently in Indonesia, cloud use has become a major requirement in both the private and government sectors. Especially in the government sector, there are many benefits and opportunities that can be gained when switching to cloud computing. Therefore, regulation is one of the important things in exploiting the opportunities and benefits of cloud computing for Central Regional Government Agencies (IPPD). Many governments in various countries have introduced cloud computing policies under the name cloud first policy. Looking at the current conditions in Indonesia, several IPPDs have succeeded in adopting cloud computing technology, but the implementation is still not regulated in national regulatory references.
- Having no experience in using the cloud: This issue is still related to the low human resource capabilities in government agencies to develop cloud utilization strategies, cloud governance, and the budget required for the cloud.
- Lack of publication of cloud success in government agencies: In this latest issue, several central and regional government agencies in Indonesia have succeeded in adopting the cloud well even though they do not yet have binding cloud policies. However, this success is still rarely published because government agencies still have ambiguity regarding current cloud-related regulations.

By considering the various challenges and problems identified in the use of cloud computing in the Indonesian government sector, more targeted strategic and policy steps are needed to optimize the potential of this technology. The government needs to improve governance through a clear and firm regulatory legal basis, standards and governance structure. Apart from that, there is a need to create a trusted cloud ecosystem through capacity building, literacy and a better understanding of cloud computing among government human resources, which is the key to overcoming existing obstacles. Furthermore, the government also needs to develop architecture and consolidation of cloud and data centers in government agencies, which can be achieved through implementing pilot programs to accelerate the adoption of cloud computing in government agencies. With a comprehensive and collaborative approach, it is hoped that the use of cloud computing in the government sector can make a significant contribution to improving efficiency, security

and quality of public services in Indonesia.

4.3 Benchmarking Analysis of Government Cloud First Policy in Other Countries

Table 1. Benchmarking 6 country already have Government Cloud First Policy

Domain	Country					
	Phili -pines	Pakis -tan	Saudi Arabaia	Great Britain	Singa -pore	Nigeria
Definition of Cloud Comput -ing	✓	✓	✓	✓	✓	✓
Cloud Service Model	✓	✓	✓	✓	✓	✓
Cloud Deploy -ment Models	✓	✓	✓	✓	✓	✓
Cloud Security	✓	✓	✓	✓	✓	✓
Data Classifi -cation	✓	✓	✓	✓	✓	✓
Data Control and Privacy	✓	✓	×	✓	✓	✓
Data Sovere -ignty	✓	✓	×	×	✓	✓
Data Residency	✓	×	×	✓	✓	×
Cloud Migration	✓	✓	✓	✓	✓	✓
Data Owner -ship, Retrieval, and Interoper -ability	✓	✓	×	✓	✓	✓
Cloud Service Provider Accredi -tation	✓	✓	×	✓	✓	✓
Cloud Procure -ment	✓	✓	✓	✓	✓	✓
Cloud Auditing	✓	✓	✓	✓	✓	✓
Cloud Manag -ement Organiza - tion/Insti -tution	×	✓	✓	✓	✓	✓

This section discusses the comparison of the implementation of the Government Cloud First Policy in several countries in order to support the use of Cloud Computing in their government agencies. The purpose of this benchmarking is to compare policies related to cloud computing in several countries, so that knowledge and references can be obtained to develop a Government Cloud First Policy in Indonesia. With the benchmarking in this study, it is hoped that we will be able to gain insight regarding what matters need to be included in the Government Cloud First Policy if this policy is prepared by the Indonesian Government and of course while still paying attention to the local context in the country. Several countries chosen to be used as benchmarking in this study include the Philippines, Pakistan, Saudi Arabia, the United Kingdom, Singapore and Nigeria.

The benchmarking carried out in this research selected 6 (six) countries that already have a Government Cloud First Policy, including the Philippines, Pakistan, Saudi Arabia, Great Britain, Singapore and Nigeria.

Table 1 are displays the results of the Government Cloud First Policy benchmarking in six countries, namely the Philippines, Pakistan, Saudi Arabia, United Kingdom, Singapore and Nigeria. This analysis covers various important domains relevant in cloud computing policy in the government sector. The following is an explanation for each domain analyzed:

- Definition of Cloud Computing: All countries analyzed have a clear definition of cloud computing in their policies. This is important to ensure a consistent understanding of the technology being implemented.
- Cloud Service Model: Each country analyzed has a cloud service model that includes SaaS (Software as a Service), PaaS (Platform as a Service), and IaaS (Infrastructure as a Service), demonstrating flexibility in cloud service provision.
- Cloud Deployment Model: All countries have a cloud deployment model that includes public, private, and hybrid cloud. This allows governments to choose the model that best suits their needs.
- Cloud Security: Every country analyzed has integrated aspects of cloud security in their policies, demonstrating a commitment to data and infrastructure protection.
- Data Classification: All countries have policies that cover data classification. Data classification is important to determine the level of protection required.
- Data Control and Privacy: Of all the countries analyzed only Saudi Arabia does not have a policy governing data control and privacy, which is essential for maintaining the confidentiality and integrity of government data.
- Data Sovereignty: Only the Philippines, Pakistan,

Singapore and Nigeria explicitly include data sovereignty in their policies. Data sovereignty is important to ensure data remains under the jurisdiction of the country of origin.

- Data Residency: Data residency policies are found in all countries except Pakistan, Saudi Arabia, and Nigeria. Data residency ensures data is stored in a specific geographic location in accordance with country regulations.
- Cloud Migration: All countries analyzed have policies supporting cloud migration, which facilitates the movement of applications and data to cloud environments.
- Data Ownership, Retrieval, and Interoperability: Most countries have regulated data ownership, data retrieval, and interoperability in their policies, which are important for efficient and effective data management, except Saudi Arabia.
- Cloud Service Provider Accreditation: All countries analyzed except Saudi Arabia have policies that include cloud service provider accreditation, which ensures that service providers meet certain standards and criteria.
- Cloud Procurement: All countries analyzed also have policies covering cloud procurement, governing the selection and contracting process with cloud service providers.
- Cloud Audits: All countries analyzed have policies that include cloud audits. Cloud audits are important to ensure that the cloud services used comply with established security, privacy and performance standards. Through these audits, government agencies can identify and address potential risks, as well as ensure that cloud service providers comply with applicable regulations.
- Cloud Management Organizations/ Agencies: All countries analyzed except the Philippines, have organizations or agencies specifically designated to manage government cloud services. The existence of this organization is important for coordinating cloud initiatives, ensuring consistent policy implementation, and providing technical and administrative support to government agencies in implementing cloud services. Cloud management organizations play a key role in ensuring the successful adoption of cloud computing in the government sector.

Through this analysis, we can see that although there are some differences in policy implementation in various countries, there are also many similarities that can be used as a reference for preparing the Government Cloud First Policy in Indonesia. The results of this benchmarking provide valuable insights into best practices and strategies that can be adapted to improve the effectiveness and efficiency of cloud services in the Indonesian government sector.

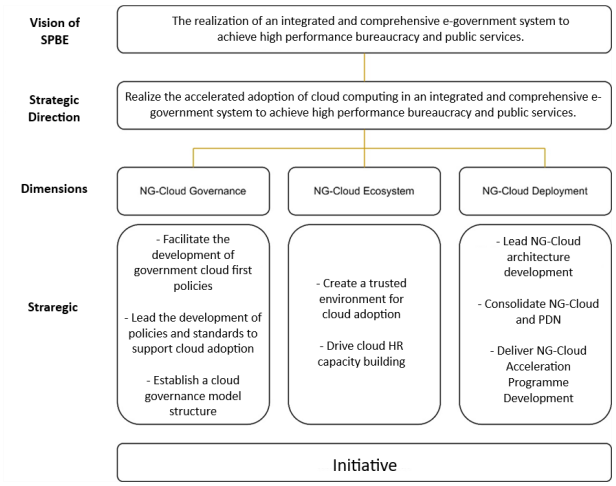

Figure 3. Recommendations for the NG-Cloud Strategic Framework

4.4 Preparation of Recommendations for the National Government Cloud Strategic Framework

Among the digital transformation processes of the government sector in several countries, an important role is played by cloud computing technologies, which make it possible to optimize and simplify the management of IT resources and facilitate the new digital technologies adoption. The need for cloud technology in the future will increase considering the significant growth in the volume of data processed and the many digital services that require computing infrastructure that can be expanded and scaled quickly and flexibly. These things are difficult for the government to achieve if it still uses traditional data centers. Therefore, to accommodate the use and management of government cloud in Indonesia, recommendations need to be prepared in the form of a National Government Cloud Strategic Framework which will hereafter be called NG-Cloud. The main objective of implementing NG-Cloud is to ensure that the Indonesian Government's IT spending is driven by cloud services and seamless IT procurement by all IPPDs that utilize cloud infrastructure. With the implementation of NG-Cloud by the Indonesian Government, it is hoped that it will be able to accelerate the adoption and governance of the government cloud to support the implementation of the Electronic Based Government System in IPPD. Recommendations for the National Government Cloud Strategic Framework for the Government of Indonesia are illustrated in the Fig 3.

Fig 3 shows the vision and strategic direction of the Electronic Based Government System (SPBE) with a focus on the adoption of cloud computing in government. Here is a detailed explanation of each

element in the image:

- SPBE Vision: Vision is a long-term goal that guides to achieve ideal conditions in the desired future. The vision proposed in this framework is taken from the strategic direction which refers to the SPBE Vision stated in Presidential Regulation no. 95 of 2018. This vision provides guidance for realizing an integrated and comprehensive electronic-based government system, with the aim of achieving high-performance bureaucracy and public services. This vision emphasizes the importance of digitalization in increasing the efficiency and effectiveness of government administration and services to the community. Strategic Direction: The proposed strategic direction is to accelerate the adoption of cloud computing in electronic-based government systems. With the adoption of cloud computing, it is hoped that government systems will become more integrated and efficient, which will ultimately improve bureaucratic performance and the quality of public services.
- Strategic Direction: Strategic direction is a long-term guide that determines how an organization achieves its vision. The strategic direction proposed in this framework is to accelerate the adoption of cloud computing in electronic-based government systems. With the adoption of cloud computing, it is hoped that government systems will become more integrated and efficient, which will ultimately improve bureaucratic performance and the quality of public services.
- Dimensions: The dimensions in this framework are the main aspects which are divided into three categories, namely NG-Cloud Governance, NG-Cloud Ecosystem, and NG-Cloud Deployment. Each dimension includes specific strategies designed to support SPBE's strategic direction and vision, namely:
  - NG-Cloud Governance: The NG-Cloud Governance dimension focuses on developing the policies, governance and standards needed to support the adoption of cloud computing in government.
  - NG-Cloud Ecosystem: The NG-Cloud Ecosystem dimension focuses on creating an environment that supports the widespread adoption and use of cloud computing in government. This includes aspects of security, trust and human resource capacity development.
  - NG-Cloud Deployment: The NG-Cloud Deployment dimension focuses on the technical and operational aspects of implementing cloud computing in government. This includes architectural development, system consolidation, and implementation of programs to accelerate cloud adoption.
- Strategy: Strategy is a structured and coordinated long-term plan to achieve a specific strategic direction or vision. Each strategy in this framework is designed to ensure that the adoption of cloud technology in government is smooth and effective. The strategy in this framework includes steps to create policies, standards and cloud governance model structures, create a trusted cloud environment, and develop human resource (HR) capacity. Apart from that, this strategy also involves developing cloud architecture, consolidating NG-Cloud with the National Data Program (PDN), and accelerating cloud adoption.
- Initiative: Initiative is an action or activity designed based on strategy to achieve strategic direction and vision. Initiatives are at the bottom and serve as concrete steps to implement strategies in each dimension. Various initiatives will be generated from these three strategic dimensions to support the implementation of NG-Cloud in government.

5. Conclusion

This research discusses the importance of adopting cloud computing in the Indonesian government sector by identifying regulations, analysis and challenges, studying best practices from other countries and developing strategic framework recommendations to support the implementation of the Government Cloud First Policy. With the increasingly strategic benefits of cloud adoption in Indonesia, this research provides comprehensive guidance for the Indonesian government in accelerating its digital transformation based on cloud computing.

The results of this research are related to the identification of regulations related to cloud computing in Indonesia. These regulations include various regulations governing the implementation of electronic systems, protection of personal data, and vital information infrastructure. Several important regulations include Law no. 11 of 2008 concerning Information and Electronic Transactions (ITE) and its amendments, Government Regulation no. 71 of 2019 concerning Implementation of Electronic Systems and Transactions, Presidential Regulation no. 95 of 2018 concerning SPBE, as well as several ministerial regulations regarding the implementation of private electronic systems and the protection of personal data. This regulation provides the legal framework needed for the use of cloud computing, but there needs to be harmonization and refinement to better support the

effective implementation of the Government Cloud First Policy.

Then this research also produces an analysis of challenges and problems in formulating policies related to cloud computing in government agencies. The government in Indonesia faces various challenges in developing a Government Cloud First policy. These challenges include undirected regulations, imbalance in local and global cloud industry capabilities, perception of fear of job loss, lack of understanding of the cloud, fear of being blamed, inappropriate budgets, lack of experience in using the cloud, and lack of publicity of cloud success in government agencies. This analysis shows that without a firm legal basis and sufficient understanding, the adoption of cloud computing in the Indonesian government will be difficult to achieve its potential.

Through benchmarking with other countries, this research found that countries such as the Philippines, Pakistan, Saudi Arabia, United Kingdom, Singapore, and Nigeria have adopted Cloud First policies with a variety of different approaches. This policy covers important aspects such as the definition of cloud computing, cloud service and deployment models, security, data classification, data control and privacy, data sovereignty, data residency, cloud migration, data ownership, cloud service provider accreditation, cloud procurement, cloud audit, and cloud management organizations. Even though there are differences, the similarities in these policies can be used as a reference for Indonesia to develop policies that are appropriate to the local context.

This research also produces recommendations for implementing the Government Cloud First Policy in Indonesia including developing policies and standards that support cloud adoption, creating a trusted environment in cloud adoption, developing human resource capacity, developing NG-Cloud architecture, consolidating NG-Cloud with the National Data Center (PDN), as well as the implementation of the NG-Cloud acceleration program. This recommendation aims to ensure that the Indonesian Government's IT spending is driven by cloud services as well as seamless IT procurement by all central and regional agencies that utilize cloud infrastructure.

By addressing existing challenges and implementing the recommended strategic framework, the Indonesian Government can accelerate the adoption of cloud computing in the government sector. Effective implementation of the Government Cloud First policy will increase bureaucratic efficiency, quality of public services, and support national digital transformation. It is hoped that the results of this research can provide useful guidance for policy makers and IT practitioners in formulating and implementing cloud computing policies in Indonesia

References

[1] B. Zwattendorfer, K. Stranacher, A. Tauber, and P. Reichstädter, "Cloud computing in e-government across europe," in *Technology-Enabled Innovation for Democracy, Government and Governance*, A. Kő, C. Leitner, H. Leitold, and A. Prosser, Eds. Berlin, Heidelberg: Springer Berlin Heidelberg, 2013, pp. 181–195.

[2] R. van der Meulen, "Understanding cloud adoption in government," https://www.gartner.com/smarterwithgartner/understanding-cloud-adoption-in-government, 2018, accessed: 2018-04-11.

[3] M. Rimol, "Gartner forecasts worldwide public cloud end-user spending to reach nearly $500 billion in 2022," https://www.gartner.com/en/newsroom/press-releases/2022-04-19-gartner-forecasts-worldwide-public-cloud-end-user-spending-to-reach-nearly-500-billion-in-2022, 2022, accessed: 2022-04-19.

[4] S. Moore, "Gartner says more than half of enterprise it spending in key market segments will shift to the cloud by 2025," https://www.gartner.com/en/newsroom/press-releases/2022-04-19-gartner-forecasts-worldwide-public-cloud-end-user-spending-to-reach-nearly-500-billion-in-2022, 2022, accessed: 2022-04-19.

[5] R. Amin, "Government migration to cloud ecosystems : Multiple options, significant benefits, manageable risks (english)," *Washington, D.C. : World Bank Group*, 2022.

[6] D. for Digital Transformation and N. C. Agency, "Italian cloud strategy policy document for implementation and control of the cloud in the public administration 2," Department for Digital Transformation and National Cybersecurity Agency, Tech. Rep., 2021.

[7] F. Rahmawati, "Kominfo builds 4 national data centers in indonesia," https://aptika.kominfo.go.id/2022/06/kominfo-bangun-4-tengah-data-nasional-di-indonesia, 2022, accessed: 2022-06-27.

[8] U. F. Government, "Federal cloud computing strategy," https://bidenwhitehouse.archives.gov/wp-content/uploads/2019/06/Cloud-Strategy.pdf, 2019.

[9] UK Government Digital Service, "Government cloud first policy," https://www.gov.uk/guidance/government-cloud-first-policy, 2013.

[10] D. T. Agency, "Australian government secure cloud strategy," https://www.dta.gov.au/sites/default/files/2023-11/DTA%20Secure%20Cloud%20Strategy_1.pdf, 2021.

[11] M. of Communications and S. A. Information Technology, "National cloud computing policy," https://www.mcit.gov.sa/sites/default/files/cloud_policy_en.pdf, 2020.

[12] D. of Information and P. Communication Technology (DICT), "The philippine government cloud first policy," https://www.dataguidance.com/sites/default/files/department_circular_no_10_amendments_to_dc_no_2017_002_re_prescribing.pdf, 2017.

[13] N. National Information Technology Development Agency (NITDA), "Nigeria cloud computing policy," https://nitda.gov.ng/wp-content/uploads/2020/11/NCCPolicy_New1.pdf, 2020.

[14] K. Nicholas and K. Sprague, "How governments can get ahead in the cloud," McKinsey & Company, Tech. Rep., 2014. [Online]. Available: https://www.mckinsey.com/~/media/mckinsey/dotcom/client_service/BTO/PDF/MoBT_25_Cloud_MoG.aspx