

Data Migration using Cloud Technology and its Comparison with Traditional Methods

Raghav Gupta¹ and Sanjay Kumar²

¹⁻²National Institute of Technology Raipur

Email: rgupta.mtech2022.it@nitrr.ac.in, skumar.it@nitrr.ac.in

Abstract—A comparison of cloud-based data transfer strategies with traditional methods is presented in this research. Along with this which method is most suitable for data migration is also presented with facts. It assesses techniques including database migration, streaming, and bulk transfer in terms of cost, efficacy, scalability, security, reliability and efficiency. Various factors are taken into account, including data volume, network capacity, bandwidth, latency, and regulatory compliance. The study contributes to a better knowledge of the potential and difficulties in this field by providing insights to help decision-making for organizations undergoing data migration.

Index Terms— AWS-Amazon Web Service, SSL-Secure Socket Layer, CAP3-Converged Application Platform, PBE-Protection Based Encryption.

I. INTRODUCTION

A. Research Background

In order to achieve the full adoption of cloud services by companies, data should be migrated successfully. Ref. [14] address the difficulties businesses have when moving their data to the cloud because of privacy and security worries. The solution suggested in the paper is to create a Secure Socket Layer (SSL) for secure communication, implement minimal privilege migration tickets, and encrypt data during migration using Prediction Based Encryption (PBE). This method, which tightly separates sensitive and non-sensitive data and encrypts sensitive information, strives to solve privacy and security issues, especially in delicate areas like healthcare and e-commerce. Ref. [1] emphasizes the perks of organizing data and providing resources on the cloud. Along with optimization tools like Cap3, HEP, and Cloudburst, it lists several technologies often used in cloud computing systems, including Hadoop, Dryad, and map reduction frameworks. The referenced paper provides a thorough evaluation of cloud computing systems, including technology and tools, and presents a comparative analysis based on cost and speed.

B. Research Objective

To provide a fair comparison between the data transfer rate in the cloud and traditional ways of transferring data. To evaluate the reliability of Cloud technology in comparison to traditional methods in the context of data migration.

II. LITERATURE REVIEW

Ref. [6] have noted that cloud platforms usually offer scalable infrastructure where progress is frequently

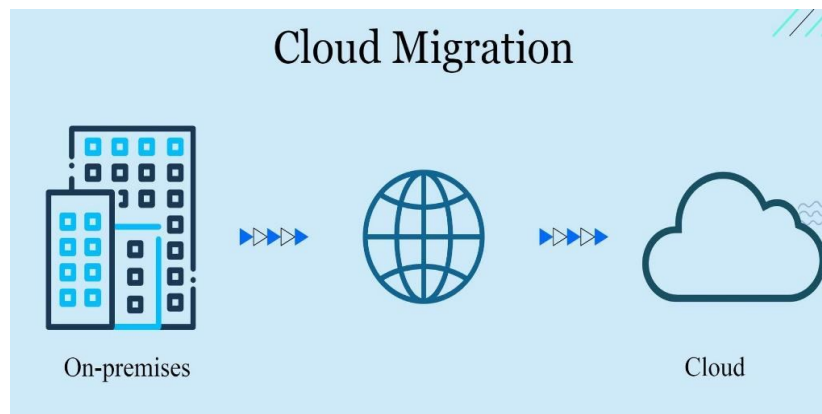


Figure 1. Cloud Migration

accomplished by the cloud-to-cloud migration. This allows faster rates of data transmission. Cloud services usually incorporate advanced data transfer protocols and optimization techniques as well. These even increase the migration speed. On the other hand, old-fashioned data migration methods, like manually moving information or sending storage containers through the mail, have speed limits tied to the amount of data that can be sent within a given time, reducing the speed of the entire transfer. Ref. [7] also point out that data integrity and business continuity rely on reliability. Several advantages of reliability for data migration in a cloud-based solution exist. First, cloud-based solutions have built-in redundancy and fault tolerance mechanisms. Second, the built-in error detection and correction process. Third, in the case of data replication, high availability and data durability are guaranteed by the cloud service provider itself through the architectures of distributed storage and geographical replication. To avoid data loss or damage during the transition, this redundancy is used. Common data transfer methods are not safe because the machine could crash, the internet could go down, or something can go wrong with someone's hands. Ref. [12] insisted cloud migrations are complicated projects with different needs, the paper emphasises how important security is in these situations. In terms of cloud security, it highlights the shared responsibility approach, in which the client and the service provider both have significant responsibilities. The research suggests an inter-cloud knowledge migration technique for short periods and a high-security method for moving massive data files to cloud databases. Performance evaluations against current cloud migration services confirm the suggested method's efficacy. Success depends critically on effective and transparent communication between all parties involved, including IT specialists, legal teams, security authorities, and decision-makers. The suggested approach guarantees a seamless migration process by successfully limiting interruptions, data loss, and other risks by exchanging requirements, goals, and threats. Ref. [3] Comparing the transfer speeds of classic and cloud-based systems is important. Companies need to minimize the period during which data is unavailable and meet deadlines for providing crucial data to users. The efficiency of data migration is a vital concern for organizations transitioning to cloud computing in terms of speed, cloud-to-cloud data migration promises certain advantages over traditional techniques. Ref. [2] Organizations must measure whether they take the risk of using either cloud technology or traditional methods or now and possibly damage their files or stop their day. The data files of the person are not going to be ruined and the day they went through unnecessarily would not be interrupted if the transfer is done right. Ref. [15] In reviewing cloud computing adoption in healthcare, this research addresses data security issues related to cloud storage. It examines current research on cloud solutions for healthcare security and talks about cloud computing features, deployment options, and service providers. The goal of this thorough analysis is to set the stage for further research in this area by offering medical professionals, organisations and specialists valuable insights.

A. Research Gap

This study finds an ample gap in the literature on the effectiveness of data migration, particularly with regard to speed and reliability, comparing traditional methods and cloud technologies. The paper intends to perform thorough and methodical comparisons along with practical tests between these two approaches in order to close this gap. The research looks at metrics including downtime, data transfer rates, and general performance in an effort to give businesses real facts to support their choices on data migration tactics. This paper discussed the advantages of a cloud-based method, as well as the traditional data migration methods in detail, revealing the prominent edge of the first over the second in terms of speed and reliability. Identified literature gaps

demonstrate the necessity for conduction of further study, particularly concerning the specific industry, to make it possible for businesses to effectively make migration decisions.

III. ISSUES AND CHALLENGES

The major issue that arises during the process of data migration is to decide which is the best way to migrate data safely. The current literature lacks studies that compare the operational benefits of cloud-based and traditional data migration methods. Particularly, recent studies have not covered the issues of organizational efficiency and data integrity in the long term after the implementation of these strategies. Also, proper comparison of bandwidth, time taken, latency delay of data migration through both methods is not available. Moreover, the area of study mainly ignores industry, especially sector-specific issues that might require more detailed research on how to maximally utilize and apply different data transfer methods.

IV. METHODOLOGY

A. Theoretical Framework

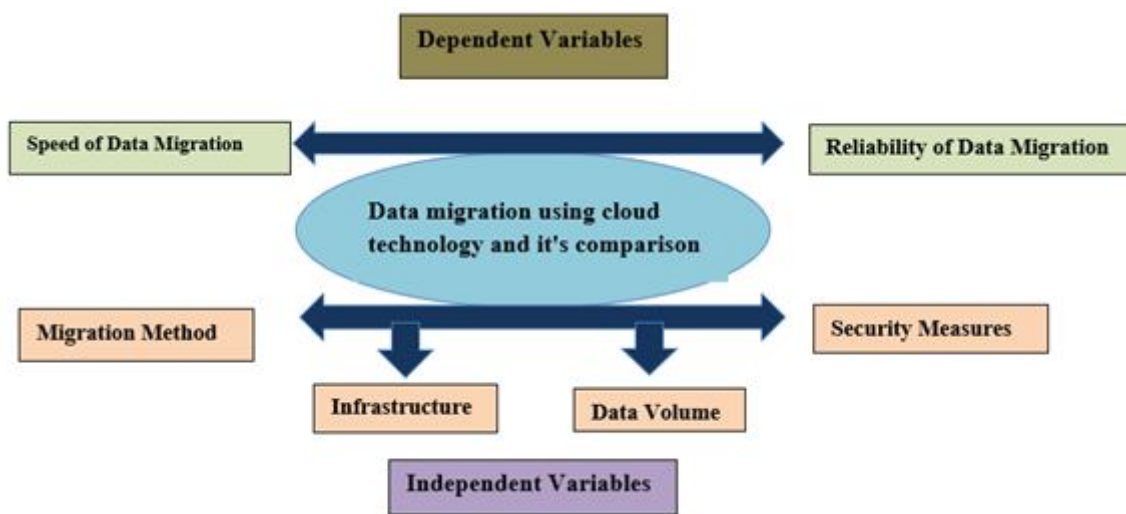


Figure 2. Dependency of data migration

B. Research Approach

The present study employs a deductive methodology to carefully analyze existing research and derive findings about the relative efficacy of Cloud-Based Migration and traditional data migration techniques. Using a deductive approach, theoretical ideas and hypotheses drawn from the body of existing literature are the starting point, and conclusions are reached by testing them against empirical data as well as the practical data collected through experiments. To further enhance the study, secondary qualitative data extension is also included. The research attempts to establish and understand patterns and principles underlying transfer techniques in data migration through the application of this scheme. The study aims to enhance its comprehension of diverse transfer strategies and their consequences by using secondary qualitative data. This approach contributes to a more thorough evaluation of the efficacy and ramifications of cloud-based migration in contrast to conventional methodologies.

C. Research Strategy

The research is based upon a systematic literature review and practical experiments and records as a method where the previous studies are compared before and during the implementation of cloud and traditional methods data migration methods. The instances of data were created on a cloud-based platform and then data is migrated to various other applications and then all the factors like speed of migration, latency delay, bandwidth are recorded. The study utilizes a qualitative mono-method approach where a thematic analysis is used to examine secondary data and practical data to check the efficiency and reliability of data migration strategies. The current research is cross longitudinal design i.e. existing literature evaluation which checks present data migration practices as well as based on experimental result analysis [5].

V. IMPLEMENTATION

A. Data Collection

In this study, data acquisition is done through a systematic literature review. Also, practical data migration of various text files and image files is done using Amazon web Services (a cloud-based platform) on Linux operating system as well as on windows. By this method the speed of data migration, quality of migration, reliability of data migration and consistency of data migration on the cloud platform were recorded. And data for the traditional data migration methods is collected from the various papers and records available. Here, library research using academic journals, industry reports and case studies which mainly center on cloud and traditional data migration strategies is used. In short, this secondary data is continually collected in a multi-perspective and multi-dimensional manner, which then would also show different aspects and methodologies, thus resulting in the circulation of the data through the internet. Consequently, the replication speed and reliability are studied through the methods of data migration by adopting these methodologies.

B. Data Analysis

The use of cloud technology for communication that sends information faster and is reliable compared to the conventional ways of data transmission makes it a major factor in determining the performance and reliability when applying the data migration strategies being employed. This analysis is built on a thorough review of literature that already exists with its comparison with the data that is collected using Amazon Web Services migration tool, which directs on the operational dynamics of both options.

Speed of Data Migration:

Speed is very important in data migration specially when handling massive amounts of data. Cloud technology, with its scalable architecture, has many advantages over traditional techniques. Cloud-to-cloud data migration uses scalability and cutting-edge data transfer techniques to guarantee high-speed transmission. This process is made possible by the development of links between clouds. The speed at which data is transmitted is further increased by the use of optimised protocols.

On the other hand, slower migration speeds are frequently the outcome of using traditional techniques like manual transfers or physical storage devices. These methods have limits because they rely on tangible medium and because bodily movement has inherent limitations.

Reliability of Data Migration:

Data integrity includes data mix up and data flow. The redundancy and fault tolerance mechanisms that are built into cloud-based solutions are what make them stand out. Data loss and corruption are thus made unlikely. The role of these components is of utmost importance as they ensure the persistence of data through distributed storage architectures and geographical replication. On the other hand, traditional data migration techniques are subject to several dangers which may include the malfunction of hardware, software failures, and human mistakes that can cause data loss or damage [13]. Technological methods that miss out on redundancy and error correction bear the risk of low data migration reliability.

Analysis:

TABLE I. DATA RECORD OF MIGRATING 50 KB OF DATA USING AWS

Method	Transfer Speed (Mbps)	Transfer Time (Seconds)	Latency (ms)
AWS	98	0.41	21
Traditional Approach	55	0.9	-

TABLE II. DATA RECORD OF MIGRATING 1 MB OF DATA USING AWS

Method	Transfer Speed (Mbps)	Transfer Time (Seconds)	Latency (ms)
AWS	458	16	24
Traditional Approach	95	70	-

A remarkably fair comparison of cloud and traditional methods in terms of speed and reliability shows that cloud-based data migration does have a greater edge. Cloud services carry their infrastructures and technologies, the basis of which is rapid and secure data transfers, which are important for every digital business. Nevertheless, it is vital to note that when switching to a cloud-based migration, one is required to have a stable internet connection, and it can be affected by bandwidth limitations. However, contrarily, conventional methods,

which are imperfect, might still be used in situations where a cloud is not accessible or in the case of highly sensitive data which needs physical access control during transfer.

VI. RESULT

Table III shows the comparison outlines how cloud and traditional data migration methods contrast with regard to the average speed of the data transfer using real observations.

Cloud-based solutions migrate data faster than traditional techniques due to several factors. Cloud platforms provide innovative data transfer techniques that are optimised for high-speed transmission along with scalable infrastructure. They make use of several computers running parallel processing and feature low-latency, optimised network connectivity between data centres through various protocols. Additionally, data can be moved closer to its destination, decreasing latency and increasing transfer speeds, due to cloud providers' global data centre dispersion. The migration process is streamlined by automation and management technologies, which increases efficiency even more. When compared to conventional techniques, cloud-based data migration is substantially faster and more effective because to these combined qualities.

Table IV summarizes the reliability aspects of both methods. Data migrated through cloud-based platforms is more reliable as compared to traditional methods because a lot of cloud platforms come equipped with strong redundancy and backup systems that guarantee data integrity and reduce the possibility of data loss or corruption. Furthermore, cloud providers make significant investments in security protocols, such as encryption, access controls, and ongoing audits, to safeguard data against cyberattacks and unauthorised access. In addition to providing high availability and uptime guarantees and robust architecture, cloud platforms also minimise downtime and guarantee continuous data access. Moreover, automated procedures and integrated monitoring tools are frequently used in cloud-based data migration, which lowers the possibility of human error and promotes proactive problem detection and resolution. All things considered, these elements support the higher dependability of data transferred via cloud-based platforms in contrast to conventional techniques.

VII. CONCLUSION

This study shows that the modern approach to cloud-based data migration is more effective and trustworthy than the traditional data migration process. Cloud specifications of increased speed and reliability are in line with current business needs for quick, secure data transfer and incorporate a transition to cloud-based strategies in order to achieve better performance and risk reduction.

TABLE III. COMPARISON BETWEEN BOTH METHODS IN TERMS OF AVERAGE SPEED

Method	Average Speed
Cloud-based migration	5x (approx.)
Traditional Approach	x (approx.)

TABLE IV. COMPARISON BETWEEN BOTH METHODS IN TERMS OF AVERAGE SPEED

Method	Reliability Features
Cloud-based migration	High (built-in redundancy, error detection, and correction processes)
Traditional Approach	Low (prone to human and technical errors)

FUTURE WORK

Research could be done in the new developments in cloud computing, like server less architectures and edge computing. Furthermore, investigating the effects of multi-cloud deployments and hybrid cloud environments on the efficacy and efficiency of data migrations may be beneficial. Also, it would be advantageous to evaluate the dependability and long-term performance of various data transfer methods in practical settings. Further studies and work could be done to see how machine learning and artificial intelligence can be combined to optimise data migration procedures and anticipate possible problems or bottlenecks.

REFERENCES

- [1] Alzakholi, O., Shukur, H., Zebari, R., Abas, S., & Sadeeq, M. (2020). Comparison among cloud technologies and cloud performance. *Journal of Applied Science and Technology Trends*, 1, 40–47.

- [2] Arpaci, I., Masrek, M. N., Al-Sharafi, M. A., & Al-Emran, M. (2023). Evaluating the actual use of cloud computing in higher education through information management factors: A cross-cultural comparison. *Education and Information Technologies*, 28, 12089–12109.
- [3] Bonci, A., Caizer, E., Giannini, M. C., Giuggioloni, F., & Prist, M. (2023). Ultrawide band communication for condition-based monitoring, a bridge between edge and cloud computing. *Procedia Computer Science*, 217, 1670–1677.
- [4] Brown, D., & Opie, C. (2019). Getting started in your educational research: Design, data production and analysis.
- [5] Busetto, L., Wick, W., & Gumbinger, C. (2020). How to use and assess qualitative research methods. *Neurological Research and practice*, 2, 14.
- [6] Charapko, A., Ailijiang, A., & Demirbas, M. (2018). Adapting to access locality via live data migration in globally distributed datastores. 2018 IEEE International Conference on Big Data (Big Data), 3321–3330.
- [7] Duc, T. L., Leiva, R. G., Casari, P., & Östberg, P.-O. (2019). Machine learning methods for reliable resource provisioning in edge-cloud computing: A survey. *ACM Computing Surveys (CSUR)*, 52, 1–39.
- [8] Kaur, K., Bharany, S., Badotra, S., Aggarwal, K., Nayyar, A., & Sharma, S. (2023). Energy-efficient polyglot persistence database live migration among heterogeneous clouds. *The Journal of Supercomputing*, 79, 265–294.
- [9] Kirongo, A., & Odoyo, C. (2020). Research philosophy design and methodologies: A systematic review of research paradigms in information technology.
- [10] Malla, P. A., & Sheikh, S. (2023). Analysis of qos aware energy-efficient resource provisioning techniques in cloud computing. *International Journal of Communication Systems*, 36, e5359.
- [11] Oliva, R. (2019). Intervention as a research strategy. *Journal of Operations Management*, 65, 710–724.
- [12] Rao, G., Srinivas, K., Samee, S., Venkatesh, K., Dadheech, P., Raja, L., & Yagnik, G. (2021). A secure and efficient data migration over cloud computing. *IOP Conference Series: Materials Science and Engineering*, 1099, 012082. <https://doi.org/10.1088/1757-899X/1099/1/012082>
- [13] Shahid, M. A., Alam, M. M., & Su'ud, M. M. (2023). Performance evaluation of load balancing algorithms with different service broker policies for cloud computing. *Applied Sciences*, 13, 1586.
- [14] Shakya, S. (2019). An efficient security framework for data migration in a cloud computing environment. *Journal of Artificial Intelligence*, 1, 45–53.
- [15] Yin, B. L. B., & Rana, M. E. (2024). A critical review of cloud computing adoption, data security concerns, and impact in the healthcare landscape. 2024 ASU International Conference in Emerging Technologies for Sustainability and Intelligent Systems (ICETSYS), 1–7.