Implementing Hybrid Cloud Solutions Using Azure Arc to Integrate on-Premises and Cloud Environments

Upesh Kumar Rapolu

Upeshkumar.rapolu@gmail.com

Abstract- **The following research paper has provided the importance of implementing a hybrid cloud solution using Azzue Arc and integrating it into on-premises and cloud environments. At the same time, the key benefits which have been observed are minimising the overall costs, robust compliance and security, centralised management and being scalable and flexible. Furthermore, challenges have been identified as keeping track and location of the resources and controlling the costs have been mitigated by the augmentation of strategies such as the application of robust security and control and monitoring and troubleshooting in hybrid cloud environments has navigated the path for the organisations to stay sustainable in the upcoming days.**

Keywords: **Azure Arc, Hybrid Cloud Solutions, On-Premises, Cloud Environments, DevOps**

I.   INTRODUCTION

The research paper will nurture a nuanced understanding of the stringent implementation of hybrid cloud solutions by the utilisation of Azure Arc for integrating on-premises and cloud environments. Azure Arc is observed as an important parameter that will be used in a sophisticated manner to implement hybrid cloud solutions. This will be used to get connected with eye on-premises resources to Azure. At the same time, this allows the users to manage the resources and access the environments by the segregation of Azure Services. However, this will be used to establish a protected connection in regards to the on-premises network and Azure cloud. This will be done by using Azure Virtual Networks with a Virtual Private Network or Azure Azure

ExpressRoute. At the same time, the research paper will focus on understanding the key benefits of integrating Azure Arc into the cloud environments. Moreover, this will discuss the challenges which are faced while integrating on-premises and cloud environments and elucidate with effective strategies which will be used to mitigate the challenges.
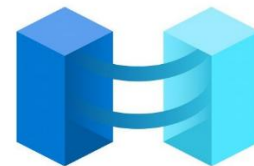

Figure 1: Defining Azure Arc

II.   STATING THE OVERVIEW OF HYBRID CLOUD SOLUTIONS

This section provides a vivid understanding about understanding hybrid cloud solutions. It is defined as a systematic process that is observed in a computing environment. It is used to combine both the public and private clouds fabricated to analyse the data and the applications to move among them. At the same time, the implementation of hybrid cloud solutions is found to be common for setting up organisations[1]. This is achieved by delivering complete flexibility which in turn helps in probably minimising the overall costs. Hybrid cloud solutions functioned in such a manner that they get to combine with an on-premises infrastructure with a public cloud. In this context, both the data and application tend to move among the environments using VMs. However, this can be used

by allowing the cloud solutions to scale up the capacity level and thus take necessary actions to meet the ongoing demands through data transfer rates. This tends to benefit organisations from streamlining their operations within their on-premises network infrastructure. Furthermore, this tends to ensure that the data within a hybrid cloud solution using Azure Arc help with cost and thus monitor the overall performance that can be useful to several elements such as security along with reporting and data analytics and cloud environments.

III. UNDERSTANDING THE KEY BENEFITS OF INTEGRATING AZURE ARC INTO ON-PREMISES AND CLOUD ENVIRONMENTS

The following section understands the key benefits of integration of Azure Aec to on-premises and cloud environments in a systematic manner. These benefits stand to be crucial for organisations as they render complete management of the resources in an efficient and secure manner. At the same time, this can also help them to improve their DevOps. Thus, these key benefits are described below.

Centralised Management: This section observed that integrating hybrid cloud solutions to on-premises and cloud environments helps to nurture centralised management[2]. This is achieved by managing all the resources from one place including multi-cloud and edge environments.

Robust Compliance and Security: The following section states that robust regulatory compliance and security enables it to comply with standardised policies across all the connected resources within the context of on-premises and cloud environments by the integration of Azure Arc.

Scalability and Flexibility: Similarly, in terms of scalability and flexibility, integration of hybrid cloud solutions helps to deploy the resources across the cloud environments and on-premises which seeks to optimise the process. This can be used to exchange the data and the applications among on-premises and cloud environments[3]. This grants leverage with the

remaining landscape and makes curated investments concerning on-premises and cloud environments.

Optimisation of Costs: The integration of hybrid cloud solutions has been considered to be effective as it nurtures to optimise and monitor the overall costs by using Azure Arc. This is identified to be stringent as it tends to automate and collaborate on workflows to reduce time-to-market.
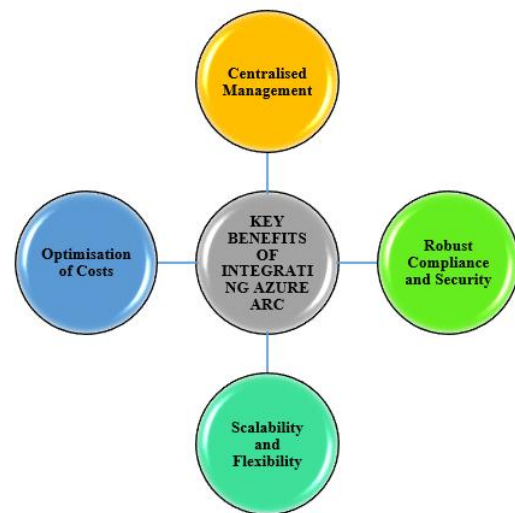

Figure 2: Analysing the Key Benefits of Azure Arc

IV. DISCUSSING THE CHALLENGES FACED WHILE INTEGRATING HYBRID CLOUD SOLUTIONS INTO ON-PREMISES AND CLOUD ENVIRONMENTS

V.

The following section discusses that as hybrid cloud solutions using Azure Arc have been productive in supporting several benefits still it faces various challenges that need to be analysed. These are mentioned below.

Keeping track of resources: It is evident that at times organisations might face difficulty in keeping a track record of the essential resources within multiple clouds and platforms while integrating hybrid cloud platforms through using Azure Arc[4].

Location of the resources: Integration of hybrid cloud solutions using Azure Arc sometimes poses challenges as it is needed to remain on-premises for regularity along with latency and legacy reasons[5]. This needs to

be analysed to maintain a stable equilibrium for the organisations centralising the management.

Controlling the costs: The integration of hybrid cloud solutions using Azure Arc sometimes causes the organisation to face problems in controlling the overall cost in order to make sure that the business continuity can be challenging for the optimisation of the costs.
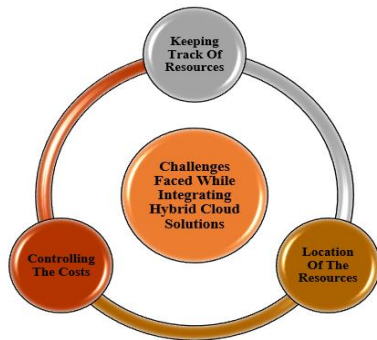

Figure 3: Describing the challenges faced while integrating Hybrid Cloud Solutions

VI. PROPOSING WITH STRATEGIES USED TO CONTROL THE CHALLENGES

The following section provides proposed strategies that are needed to control the challenges in a mediating manner. These strategies can be used to mitigate the challenges to ensure complete compliance with best industry practices. These strategies are provided below.

Application of Robust Security and Compliance: Proposing robust security and compliance has helped the organisation to measure and safeguard its data and its applications while using Azure Arc[6].

Monitoring and Troubleshooting Hybrid Cloud Environments: The integration of continuous monitoring and troubleshooting of hybrid cloud solutions has been effective. This helps in enabling organisations to manage and govern their on-premises and cloud environments[7]. This is done with the help of a unified control plane.

VII. CONCLUSION

This research paper has exemplified the implementation of hybrid cloud solutions using Azure Arc to integrate on-premises and cloud environments. The benefits catered by it have been rendered with positive outcomes like being flexible and scalable along with centralised management and optimising the costs probably. Moreover, identifying the challenges at the initial stages such as keeping a track record of essential resources with locating the resources and optimising the costs. Furthermore, the strategies have been used to mentor and troubleshoot hybrid cloud environments and the application of robust security and compliance. As a result, this has transformed to accelerate the overall hybrid cloud joinery thereby rendering the full potential of the infrastructure for the organisations in the upcoming days.

Abbreviations and Acronyms

- Azure- Microsoft Azure
- DevOps- Development Operations
- VMs - Virtual Machines
- HCS- Hybrid Cloud Solutions

Units

- The data transfer rate is calculated in bits per second

Equations

- Total Cost Calculation (TC) = [Fixed Cost + Variable Cost +Storage Cost] X Time
- Data Transfer Time (T) = [Data Size X 8 / Network Bandwidth]

REFERENCES

[1] A. Nadjaran Toosi, Richard O. Sinnott, and R. Buyya, "Resource provisioning for data-intensive applications with deadline constraints on hybrid clouds using Aneka," *Future Generation Computer Systems*, vol. 79, pp. 765–775, Feb. 2018
.

[2] A. Ullah, H. Dagdeviren, R. C. Ariyattu, J. DesLauriers, T. Kiss, and J. Bowden, "MiCADO-Edge: Towards an Application-level Orchestrator for the Cloud-to-Edge Computing Continuum," *Journal of Grid Computing*, vol. 19, no. 4, Nov. 2021.

[3] B. Gupta, P. Mittal, and T. Mufti, "A Review on Amazon Web Service (AWS), Microsoft Azure & Google Cloud Platform (GCP) Services," *Proceedings of the 2nd International Conference on ICT for Digital, Smart, and Sustainable Development, ICIDSSD 2020, 27-28 February 2020, Jamia Hamdard, New Delhi, India*, vol. 1, no. 2, 2021.

[4] C. Zhang, M. Yu, W. Wang, H. Kong, T. Feng, and F. Yan, "MArk: Exploiting Cloud Services for Cost-Effective, SLO-Aware Machine Learning Inference Serving MArk: Exploiting Cloud Services for Cost-Effective, SLO-Aware Machine Learning Inference Serving," Jul. 2019.

[5] D. Mytton, "Assessing the suitability of the Greenhouse Gas Protocol for calculation of emissions from public cloud computing workloads," *Journal of Cloud Computing*, vol. 9, no. 1, Aug. 2020.

[6] J. Mulder, "Multi-Cloud Architecture and Governance Leverage Azure, AWS, GCP, and VMware vSphere to build effective multi-cloud solutions," Nov. 2020

[7] O. Prila, V. Kazymyr, V. Bazylevych, and O. Sysa, "The Development of the System for Arc Nordugrid Based Grid-Computing Organization Using Virtual Environments of theDockerPlatform,"*Ssrn.com*,Dec.29,2021.