Cloud Strategy for Decision Makers

A practical guide to cloud strategy using architecture principles and best practices from the field

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Dedicated to

My mom, wife and daughter

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Preface

Cloud is not a trend or buzzword anymore; it is increasingly becoming a norm and the platform of choice for business-critical applications. Moreover, most enterprises are not limiting themselves to a single cloud platform these days. The concept of multi-cloud (also known as poly cloud) has gained immense popularity. Adopting cloud has never been an easy transformation and going multi-cloud understandably adds to the complexity. One of the reasons for this complexity is that adopting cloud in any form is not a split-second decision, rather a journey that starts from understanding the business goals and executive level motivations. This book aims to take the readers of all skill levels through that journey, talk about the steps, challenges and unravel the complexities of adopting cloud and multi-cloud.

Spread across *14 chapters*, this book starts with the basics of cloud and multi-cloud environments before gradually building up on the foundation by talking about the steps for developing a cloud strategy, technical aspects and considerations for developing a cloud strategy along with a mention of gotchas that executives and technicians should be aware of when making critical decisions.

Upto *Chapter 4*, the focus is on cloud strategy with a special mention of multi-cloud adoption. *Chapter 3* provides at an enterprise view of the cloud adoption which is important to paint a holistic picture for a cloud adoption. These 4 chapters cover the entire journey of a cloud adoption for an organization before moving onto more technical aspects of cloud architecture and operations in further chapters.

From *Chapter 5*, the focus shifts to every aspect of cloud adoption, be it security, networking, resiliency or observability.

The book culminates with *Chapter 14* throwing light on some popular trends in cloud computing that should be good read for people involved in cloud strategy because planning for present can not obliviate the future.

Through practical examples and use cases, this book aims to equip readers with a solid understanding of cloud adoption. Whether you are a novice or an experienced learner, I hope this book will serve as a valuable resource by helping you use the learnngs in real world.

Chapter 1: Understanding Cloud - This chapter will start building the foundations by talking about the basics of cloud and multi-cloud setups. Then the chapter explains 3

cloud service models, i.e SaaS, Paas and IaaS along with the key players in the space. After understanding the basics, we will talk about multi-cloud and its benefits and challenges.

Chapter 2: Cloud Adoption Strategy - A well drafted cloud adoption strategy is absolutely critical to leverage the real value of cloud, especially for large enterprise businesses having diverse functions and huge legacy of on-premises presence. In this chapter, we will look at the ingredients of a good cloud strategy and how it forms the foundation for a successful cloud adoption organisation wide with a future view. Will discuss the steps to define a cloud strategy starting with understanding the business goals and motivation to do so. This leads to next level of details around the various use cases the strategy would tackle and based on that the suitable adoption approach, i.e multi-cloud, SaaS or IaaS, Migration or Greenfields etc. Finally, we will look at the business case preparation stage which is important to get a buy in from program sponsors.

Chapter 3: The Enterprise View - This chapter will talk about the importance of an enterprise view while formulating a cloud strategy and how it can be achieved. Any cloud adoption is not complete without taking an enterprise level view of the journey. Looking at workloads in isolation and then making decisions on the suitability of a cloud platform will be inefficient and most likely pile up technical debt over time. This involves lot of cross communication, formation of centralised governance boards, assessment of skills and capabilities and a long-term roadmap for cloud adoption at the organisation level.

Chapter 4: The Journey - This chapter delves into the details of the end-to-end journey when it comes to cloud adoption at any organisation. There are typically 4 phases, i.e assess, plan, execute and operate which should be very well defined and demarcated to collectively run as a well-planned project end to end. However, there could be practical challenges that can hinder the progress of any phase or the collective project. Apart from talking about these phases, the chapter also talks about some of them based on practical use cases just to give enough information to readers to prepare them for the real world.

Chapter 5: Designing for Cloud - When designing applications for cloud and multi-cloud environments, care must be taken to adhere to certain design principles and guidelines in order to reap the benefits and real value of cloud computing. In this chapter we will look at such principles and how to design a solid foundation to deploy applications onto it. The chapter also talks about a Well-Architected Framework for cloud. All cloud vendors preach similar frameworks and hence we will talk about the common pillars of a well architected framework and how the framework helps in designing applications for cloud.

Chapter 6: Multi-cloud Adoption - This chapter will talk about the multi-cloud management overheads, challenges and best approaches to tackle them. One of the biggest

challenges that organizations face when planning to go to cloud or plan for more than a single cloud environment is the management and administration of the entire setup. Executives need a single pane of glass to look at the consolidated view of their entire footprint and technicians need solutions to be able to manage the entire setup together. This also includes other aspects like networking, security and data flow between multiple platform.

Chapter 7: Cloud Networking - Networking for cloud comes with its own set of challenges as compared to the traditional on-premises networking between or within data centres. In this chapter we will look at cloud networking concepts with a focus on multi-cloud networking. The chapter talks about network security before discussing some popular vendors that provide tools and solutions for cloud networking. At the end of the chapter, we will look at the most common network topologies in cloud – Full mesh and hub and spoke.

Chapter 8: Cloud Security - Security in cloud is a huge consideration. This chapter starts with a description of shared responsibility model which is crucial in getting the security right in cloud because it is important to understand what security is provided by the cloud vendor and what is customer's responsibility. Specifically for multi-cloud environments, a Zero Trust approach is recommended, and we will look at it in this chapter. We will look at application security and infrastructure security separately to cover the entire breadth of cloud security and finally there will be a summary of popular cloud security tools.

Chapter 9: Cloud Observability - When deploying workloads on cloud platforms, monitoring of workloads should be thought through and processes defined around them. Monitoring, logging, alerting and troubleshooting are key to run workloads efficiently and to achieve and maintain the required SLAs. This chapter aims to look at all these components of observability. In a multi-cloud environment, observability is even more challenging. An integrated monitoring solution that provides a cross platform visibility is required. The chapter delves with looks into the challenges of multi-cloud monitoring and strategies to mitigate them. Finally, we will look at some observability solutions.

Chapter 10: Cloud Resiliency - *Everything fails, all the time* is a famous quote from Amazon's Chief Technology Officer Werner Vogels. Hence, it is important to design resilient architectures that can handle failures of every component of the workload. In this chapter, we will start by understanding the requirements around resiliency that should be addressed when designing applications on cloud, the important ones being **Recovery Point Objective** (**RPO**) and **Recovery Time Objective** (**RTO**). We will then look at concepts like **business continuity planning** (**BCP**), **high availability** (**HA**) and **disaster recovery** (**DR**). It is important to understand the difference between them and how to achieve them.

Chapter 11: Interoperability - In this chapter we will understand interoperability and the various aspects of interoperability. This chapter will discuss why interoperability is more prominent in a multi-cloud environment and we will also talk about strategies like open-source technologies to design interoperable workloads. There will be discussion around interoperability challenges and design strategies to overcome them. There are practical use cases and examples that will make the the concepts easily relatable and understandable.

Chapter 12: Data Management - Data is the backbone of every application regardless of the scale and criticality and hence it needs a deeper focus in a cloud environment too. In this chapter, we will also look at the compoennts of an end to end data lifecyle along with data security and governance. There will be a mention of some hot data trends like ML and AI as they are integral to a data strategy on cloud. Finally, we will look at some real life examples of data management in cloud.

Chapter 13: Application Development - In this chapter we will look at 2 common modern application development practices and how they are relevant to cloud adoption. Today the focus is on quick time to market, building **minimal viable products** (**MVP**), faster dev and feedback loops. That is where this chapter looks at concepts like CI/CD pipelines and DevOps frameworks. We then explore cloud-native architectures like microservices, containers and serverless.

Chapter 14: Associated Trends - The final chapter of this will look at some of the key trends and concepts that are closely related to cloud along with typical uses cases to solidify reader's understanding. For example, trends like AIOps, DataOps, CloudOps and FinOps have become integral from a cloud adoption perspective. They are some of the hot trens of present and indispensable elements of future cloud adoption.

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Chapter 1
Understanding Cloud

Introduction

In this chapter, we will start with some basics of cloud computing and introduce key terminologies. The intention is not to teach cloud to beginners but to lay the foundation for more specific and intense strategic and technical content discussed in later chapters. We will talk about the cloud basics required for people to understand at any level involved in the decision-making process. Since we will discuss the general concepts of cloud, even if you are a seasoned cloud practitioner, it is highly recommended to review the topics covered in this chapter before moving on to the next chapter. If you are starting your cloud journey or want to refresh some concepts, this chapter is definitely worth a good read.

Structure

This chapter covers the following topics:

- Distributed systems
- Public vs. private cloud
- Cloud service models
- Tenancy
- Cloud financials

- Licensing on the cloud
- Know the players
- Multi-cloud vs. hybrid cloud
- Challenges of a multi-cloud environment
- Reasons to use multi-cloud

Objectives

By the end of this chapter, you will be able to understand some basic concepts of cloud and get a glimpse of multi-cloud environments. Starting with the types of cloud and service models, you will learn about cloud's financial aspects and how it differs from a traditional on-premises model. You will learn about the key cloud providers. Later, you will also be able to learn the need for a multi-cloud setup, along with its challenges and benefits that make it a compelling proposition.

Distributed systems

We will start with a definition of a very commonly used architecture these days. A distributed system architecture is where the components or functions of the system are spread across multiple nodes in the network. Simply put, the work is split among multiple servers, making the system more efficient. The network is the most integral part of distributed systems as it connects the nodes within the system and ensures that the nodes work independently but collaboratively, as expected. The popularity of such architecture is increasing. Some common examples of distributed systems are mobile networks, video conferencing systems, etc.

Though distributed systems sound like a generic architecture pattern, it is very much relevant to cloud computing. Cloud computing is characterized by several regions and availability zones within the regions. Many cloud services are spread across availability zones within the region, making them naturally distributed. In addition, an availability zone is usually a combination of geographically apart data centers. This means that even if the application is deployed within a region, it is still deployed in a distributed manner.

Public vs. private cloud

As the name suggests, a **private cloud** platform is private to your company. This means that only users and applications in your company can access the resources (e.g., servers, network, storage, etc.) unless you explicitly allow an external party to access them. We will deal with this in later chapters.

This definition makes it obvious that a private cloud resides in your own (on-premises) data center or can also be co-located in a data center provided by a third party, but the

infrastructural resources are internal to your organization. You will have physical servers/hosts in the data center and virtualization technology like *VMware*, to deploy virtual machines on top of physical servers. Similarly, physical routers or virtual networks are also permissible as long as they are within the perimeters of your authority and governance, or as long as you own them.

On the contrary, a **public cloud** platform is owned by a **cloud service provider** (**CSP**), and your company would rent the virtual infrastructure sitting on top of the physical infrastructure provided by the CSP. The underlying resources are typically shared between many tenants, i.e., on the same physical host, you could have neighbors with their virtual server, but isolated and controlled by numerous restrictions and boundaries. We will talk about them in later chapters. For now, it is important to understand how a public cloud differs from the private cloud.

Let us take a closer look at some key differences between private and public cloud platforms, given in the following *Table 1.1*:

	Private cloud	**Public cloud**
Control	Full control within the organization at all layers of the stack.	The underlying physical infrastructure is owned and controlled by the cloud provider.
Security	Since there is no sharing of resources and everything is controlled in-house, the security posture is considered much better. Any external access breach can be avoided much more efficiently. Also, with more control comes more responsibility i.e. all security in a private cloud environment is internal responsibility.	Security in public cloud is much more mature now as compared to a few years back. Cloud providers have made the platforms much more secure and adhere to most global and regional security principles. However, since it is a public platform, there is always an increased risk of security incidents. Note that security on public cloud is a shared responsibility i.e. cloud provider is responsible for the infrastructure security whereas customer is responsible for application and data security.
Access	Since it is the internal network of the company, its access to resources is over the intranet.	Since it is a public cloud platform, the access to resources is over the internet. Note that there are network features provided by cloud providers that make this access over the internet secure and private.