Exam Prep AZ-305

Designing Microsoft Azure Infrastructure Solutions

Lalit Rawat

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Dedicated to

My beloved parents:

Narendra Kumar Rawat

and

Narmada Rawat

Thank you for your unconditional support in every situation.
Thanks for your blessings and support

Radhika** and **Mayra Rawat

My daughters who have made my life easy!

To my wife

Punita Rawat

without her support, the book could not have been possible

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About the Author

Lalit Rawat stands as a distinguished Azure Most Valuable Professional (MVP) and Microsoft Certified Trainer (MCT), boasting authorship of two acclaimed Azure books. His expertise shines through active contributions to the global Azure community, where he shares invaluable insights via his blog, azure4you.com. With over 1,000 Azure training sessions under his belt, conducted through traditional and online platforms, Lalit has firmly established himself as a sought-after speaker, gracing significant events like the MS Global Bootcamp. His technical acumen and unwavering commitment to cutting-edge technologies set him apart, earning him recognition, such as the esteemed 2017 Azure Master award. Lalit's impact extends beyond speaking engagements; he has organized numerous events through ITCrowdFest and Global Azure, while serving as a distinguished judge for various Microsoft Azure hackathons. His dedication to nurturing talent is evident in his role as a mentor to industry experts in Azure, facilitating their professional growth. Notably, Lalit's contributions have been recognized through awards like the Azure Blogothon, organized by ID8NXT with Microsoft's support.

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Divit's mission transcends personal achievement. He is dedicated to uplifting others and fostering their pursuit of excellence, with the overarching goal of creating a skilled and inclusive future in the tech industry.

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Preface

In the ever-evolving landscape of cloud computing, Microsoft Azure has emerged as a pivotal platform for businesses aiming to leverage the benefits of scalable, secure, and efficient infrastructure solutions. *Exam Prep AZ-305: Designing Microsoft Azure Infrastructure Solutions*, stands as a critical certification for IT professionals aspiring to validate their expertise in architecting and implementing robust solutions on Azure.

This guide is crafted to serve as a comprehensive resource for those embarking on the journey to become a Microsoft Certified: Azure Solutions Architect Expert. Whether you are an experienced cloud professional or someone transitioning from traditional IT roles, this material is designed to equip you with the necessary knowledge and skills to excel in the AZ-305 exam.

The primary aim of this guide is to provide a structured approach to mastering the concepts and practicalities involved in designing Azure infrastructure solutions. It meticulously covers the exam objectives, encompassing the design of monitoring, identity and security, data storage, business continuity, and infrastructure. Each section is thoughtfully curated to not only prepare you for the exam but also to enhance your practical understanding of implementing Azure solutions in real-world scenarios.

Key features:

Detailed coverage: Each chapter delves into specific domains of the AZ-305 exam, offering in-depth explanations, diagrams, and real-life examples to elucidate complex concepts.

Hands-on labs: Practical exercises are integrated throughout the guide, enabling you to gain firsthand experience with Azure services. These labs are designed to reinforce theoretical knowledge through practical application.

Exam tips and strategies: Insights and strategies for tackling the various types of questions you will encounter on the exam are provided. This includes tips for managing time, understanding question formats, and avoiding common pitfalls.

Practice questions: To simulate the exam environment and test your knowledge, a series of practice questions are included at the end of each chapter. These questions are reflective of the exam's structure and difficulty.

This guide is the culmination of extensive research, practical experience, and insights from Azure experts and certified professionals. We extend our gratitude to the Microsoft Learn

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community, Azure engineers, and fellow educators who have contributed their knowledge and expertise, which has been used in the AZ-305 exam book.

As you embark on this path to certification, remember that the AZ-305 exam is not merely a test of knowledge but a testament to your capability to design innovative solutions in the dynamic world of cloud computing. This guide is your companion in achieving certification, but more importantly, it is a tool to help you grow as a proficient Azure Solutions Architect.

We wish you success in your studies and your future endeavors in the cloud!

By adhering to the structured approach outlined in this guide, you are setting yourself on a trajectory toward mastering Azure infrastructure solutions and achieving excellence in your professional career. Happy learning, and good luck on your journey to becoming a Microsoft Certified: Azure Solutions Architect Expert.

The book is divided into 13 chapters:

Chapter 1: Designing Governance – Governance in Microsoft Azure involves setting up policies, procedures, and controls to manage resources effectively, ensuring security, compliance, and cost-efficiency. Key components include Azure Policy, which enforces rules for resource compliance; Azure Blueprints, which automate the deployment of compliant environments; and **Role-Based Access Control** (**RBAC**), which manages access by defining roles and permissions. Resource tags categorize resources for better management and billing, while management groups allow for unified management across multiple subscriptions. Cost management tools help track, allocate, and optimize expenses, with strategies such as budgeting and cost alerts. Best practices involve defining clear governance policies, implementing RBAC and least privilege access, using Azure Policy and Blueprints for automation, regularly reviewing, and updating policies, leveraging management groups for efficient oversight, and continuously monitoring and optimizing costs. By following these practices, organizations can maintain secure, compliant, and cost-effective Azure environments.

Chapter 2: Designing Authentication and Authorization Solutions – Designing robust authentication and authorization solutions in Microsoft Azure is crucial for securing resources and managing user access. **Azure Active Directory** (**Azure AD**) serves as the core identity management service, offering capabilities like **single sign-on** (**SSO**), **multi-factor authentication** (**MFA**), and conditional access policies to enhance security. Authentication methods supported by Azure AD include password-based, certificate-based, and token-based authentication. For authorization, Azure employs **Role-Based Access Control** (**RBAC**) to ensure users have appropriate permissions based on their roles,

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minimizing security risks. Azure AD **Privileged Identity Management** (**PIM**) is used to manage, control, and monitor access to critical resources, reducing the risk of excessive, unnecessary, or misused access permissions. Integration with external identity providers, such as Microsoft accounts or social logins, is also possible, enabling flexible and secure authentication scenarios. Best practices involve implementing MFA, using conditional access policies to enforce access controls based on user and device risk levels, and regularly reviewing and updating RBAC roles and permissions.

Chapter 3: Designing a Solution Monitor of Azure Resources – Effective monitoring and high availability are essential for maintaining reliable and performant Azure environments. Azure Monitor provides comprehensive monitoring and diagnostics, collecting metrics and logs from Azure resources to offer insights through dashboards, alerts, and automated responses. Key components include Azure Log Analytics, which helps analyze log data, and Azure Application Insights, designed for monitoring live applications. High availability is achieved through strategies like deploying resources across multiple regions and using Azure services like Availability Sets and Availability Zones to ensure redundancy and failover capabilities.

Chapter 4: Designing an Azure Compute Solution – This chapter focuses on designing robust and scalable compute solutions in Microsoft Azure. It covers a range of Azure compute services, providing insights into selecting the appropriate service for various scenarios. Topics include designing solutions with Azure **Virtual Machines** (**VMs**), ensuring optimal sizing to balance performance and cost. The chapter also explores container-based solutions, detailing the design for **Azure Container Instances** (**ACI**) and **Azure Kubernetes Service** (**AKS**). Additionally, serverless compute options are discussed, with guidance on designing solutions using Azure Functions, Azure Logic Apps, Azure Batch, and Azure App Service. These services enable efficient execution of code without managing infrastructure, allowing for dynamic scaling and cost optimization. Through practical examples and best practices, this chapter equips you with the knowledge to design effective compute solutions that meet diverse business needs.

Chapter 5: Designing a Data Storage Solution for Non-relational Data – This chapter delves into the intricacies of crafting efficient data storage solutions tailored specifically for non-relational data within the Azure environment. It navigates through the design intricacies of Azure storage accounts, delving into the nuances of Azure blob storage, a fundamental component for storing unstructured data such as images, videos, and documents. Additionally, the chapter provides insights into ensuring data redundancy, a critical aspect for safeguarding against data loss and ensuring high availability. Design considerations for Azure files and disk solutions are also explored, offering guidance on

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structuring storage architecture to meet diverse business requirements. Furthermore, emphasis is placed on storage security measures, highlighting encryption techniques for data at rest, in transmission, and in use, bolstering data protection and compliance adherence. As scalability is paramount in modern data architectures, the chapter examines strategies for scaling storage solutions to accommodate evolving business needs seamlessly. By navigating through these topics, readers gain a comprehensive understanding of designing resilient, secure, and scalable non-relational data storage solutions within the Azure ecosystem.

Chapter 6: Designing Data Integration – This chapter is a comprehensive guide to designing efficient data integration solutions within Azure, providing practical insights into various tools and techniques. Readers will gain a deep understanding and practical knowledge of platforms like Azure Data Factory, Azure Data Lake, Azure Databricks, and Azure Synapse Analytics. The chapter covers design considerations for integrating and analyzing data, including strategies for hot, warm, and cold data paths. It explores the architecture of Azure Stream Analytics for real-time data analysis and emphasizes designing solutions for data protection and durability. Additionally, readers will learn how to balance features, performance, and cost when designing data storage solutions within Azure. By navigating through these topics, readers will be equipped with the necessary skills and knowledge to architect robust data integration solutions that meet the diverse needs of modern businesses within the Azure ecosystem.

Chapter 7: Designing Data Storage Solution for Relational Data – This chapter explores the intricate world of designing data storage solutions tailored specifically for relational data within the Azure environment. Readers will gain an in-depth understanding of platforms such as Azure SQL Database, Azure SQL Managed Instance, and SQL Server on Azure Virtual Machines, enabling them to architect robust and scalable database solutions. Additionally, the chapter explores recommendations for database scalability and availability, crucial aspects for meeting the dynamic demands of modern enterprises. Emphasis is placed on designing comprehensive protection measures for data at rest, in transmission, and in use, ensuring stringent security and compliance adherence. Furthermore, readers will gain insights into designing for Azure SQL Edge and Azure Cosmos DB, expanding their knowledge of advanced relational data storage solutions. Through practical guidance and best practices, this chapter equips readers with the expertise to architect resilient, secure, and high-performance relational data storage solutions that meet the evolving needs of today's enterprises.

Chapter 8: Designing Network Solutions – This chapter explores the realm of designing network solutions tailored for enterprise environments, providing readers with a

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comprehensive understanding of networking concepts and technologies within the Azure ecosystem. Topics covered include designing network architecture solutions based on workload requirements, ensuring seamless on-premises connectivity to Azure Virtual Network, and optimizing network performance for applications. Additionally, readers will gain insights into designing solutions for Azure network connectivity services, with a focus on enhancing network security measures. The chapter explores strategies for load balancing and routing, as well as designing application delivery and protection services to ensure optimal performance and security for applications. By navigating through these topics, readers will be equipped with the knowledge and skills to architect robust and efficient network solutions that meet the diverse needs of modern enterprises, leveraging software-defined networking and hybrid connectivity principles for enhanced agility and scalability.

Chapter 9: Designing a Solution for Backup and Disaster Recovery – This chapter is dedicated to designing robust solutions for backup and disaster recovery, essential components of business continuity planning. Readers will gain a comprehensive understanding of backup and recovery strategies, with a focus on Azure Backup and its capabilities. Topics covered include designing solutions for Azure blob, Azure Files, virtual machine, and Azure SQL backup and recovery, ensuring data protection across various Azure services. Additionally, the chapter explores designing solutions for Azure Site Recovery, enabling organizations to orchestrate and automate the recovery of applications and workloads in the event of a disaster. Hands-on labs provide practical experience with object replication, backup solution tools, and recovery options, allowing readers to implement and test their disaster recovery plans. By navigating through these topics, readers will be equipped with the knowledge and skills to architect resilient backup and disaster recovery solutions that safeguard critical data and ensure business continuity in the face of unforeseen disruptions.

Chapter 10: Designing Migration – This chapter focuses on designing effective migration strategies for transitioning workloads and data to the Azure cloud environment. Readers will learn to evaluate migrations using the Microsoft Cloud Adoption Framework for Azure and leverage the Azure Migration and Modernization Program (Azure Migration Framework) for guidance. The chapter covers assessing on-premises workloads, selecting appropriate migration tools, and executing the migration process for applications, virtual machines, databases, and unstructured data. Additionally, readers will gain insights into selecting online storage migration tools and migrating offline data, ensuring a seamless transition to the Azure cloud. Practical guidance and best practices are provided to facilitate smooth migrations, enabling organizations to leverage Azure's scalability, reliability, and cost-effectiveness. By navigating through these topics, readers will be equipped with the

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knowledge and tools to plan and execute successful migrations to Azure, unlocking the full potential of cloud computing for their businesses.

Chapter 11: Azure Well-Architected Framework – This chapter introduces the Azure Well-Architected Framework, providing readers with insights into building robust and scalable architectures on Azure. Topics include an overview of the framework's pillars, which encompass reliability, security, performance efficiency, cost optimization, and operational excellence. Readers will learn key principles for establishing a solid architectural foundation, incorporating modern practices for designing, building, and orchestrating resources on Azure. Emphasis is placed on gaining operational insights through monitoring and analytics, reducing effort and error through automation, and identifying issues and improving application quality through testing. By navigating through these topics, readers will be equipped with the knowledge and tools to design and deploy resilient, secure, and efficient solutions on Azure, aligning with best practices and industry standards for cloud architecture.

Chapter 12: Exam Preparation Guidelines and Assessment Questions – This chapter serves as a comprehensive guide for preparing for the *Exam Prep AZ-305: Designing Microsoft Azure Infrastructure Solutions*. It outlines the exam preparation process, offering insights into effective study strategies, resources, and time management techniques. The chapter includes a section of dummy questions and answers to help familiarize readers with the exam format and types of questions they may encounter. Additionally, the author shares personal exam learning experiences, providing valuable tips and lessons learned from their own journey. By navigating through these topics, readers will gain a clear understanding of what to expect from the exam and how to best prepare for success. With practical guidance and firsthand insights, this chapter equips aspiring Azure Solutions Architects with the knowledge and confidence needed to excel in the AZ-305 exam and advance their careers in cloud computing.

Chapter 13: Azure Architect Exam Mock Test – In this mock test, we offer scenario-based questions and answers to aid in your exam preparation.

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Chapter 1
Designing Governance

Introduction

This chapter will focus on designing Azure governance using various Azure services such as Azure management groups, Azure subscriptions, resource groups, resource tagging, Azure Policy, and Azure role-based access control. We will discuss the importance of designing for governance and management groups, as well as the role of Azure subscriptions and resource groups ineffective governance. Additionally, we will explore the use of resource tagging in order to manage resources effectively and how to design and implement Azure Policy and Azure RBAC to enforce governance requirements. Finally, we will examine the benefits of Azure Blueprints in automating the deployment of Azure resources and enforcing governance policies at scale.

Structure

In this chapter, we will go over the following topics:

- Designing for effective governance
- Importance of governance in Azure
- Overview of key Azure governance concepts
- Management groups to organize and manage resources
- Designing for Azure subscriptions to control access and manage costs

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- Designing for resource groups to manage resources effectively
- Designing for resource tagging to identify and organize resources
- Designing for Azure Policy to enforce compliance and governance requirements
- Designing for Azure role-based access control to manage access to resources

Objectives

By the end of this chapter, the reader will learn about Azure governance, which is a set of processes, policies, and tools that organizations use to manage their Azure cloud resources. It helps organizations maintain control over their Azure environment, ensure compliance with regulations and industry standards, and manage security risks.

Designing for effective governance

While designing for effective governance in Azure, it is essential to have a deep understanding of the organization's goals, compliance requirements, and security policies. This will involve defining policies and procedures for managing Azure resources, identifying stakeholders, and establishing a governance framework. A well-defined governance framework should clearly outline the governance model, roles and responsibilities, policies, and controls to ensure compliance and mitigate risks. This approach will help organizations establish a set of best practices and standards for managing Azure resources, allowing for effective resource management at scale.

Importance of governance in Azure

The importance of governance in Azure cannot be overstated. Without proper governance, an organization's Azure environment can quickly become disorganized and difficult to manage, leading to increased costs, security risks, and compliance issues. Effective governance can help organizations in the following ways:

- **Control costs:** Azure governance helps organizations keep their Azure costs under control by implementing policies that enforce spending limits, reduce waste, and optimize resource usage.
- **Ensure security:** Azure governance helps organizations maintain a secure Azure environment by implementing policies that control access to resources, monitor for security risks, and enforce compliance with security standards.
- **Ensure compliance:** Azure governance helps organizations meet regulatory and compliance requirements by implementing policies that enforce compliance with industry-specific regulations and standards.

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Overview of key Azure governance concepts

There are several key Azure governance concepts that organizations should be familiar with, in order to effectively manage their Azure environment. These include:

- **Azure Policy:** Azure Policy is a service in Azure that allows organizations to create, assign, and manage policies that enforce compliance with regulatory and organizational requirements. Policies are sets of rules that define specific constraints or requirements for Azure resources.
- **Azure Role-Based Access Control (RBAC):** Azure RBAC is a method for managing access to Azure resources, based on the user's role within the organization. It allows organizations to control access to Azure resources at a granular level and enforce the principle of least privilege.
- **Azure Management Groups:** Azure Management Groups provide a hierarchical structure for managing Azure resources at scale. Organizations can use management groups to apply policies and RBAC at a higher level in the hierarchy, which can help simplify the management of large Azure environments.
- **Azure Blueprints:** Azure Blueprints is a service in Azure that allows organizations to automate the deployment of Azure resources and enforce governance requirements across multiple Azure subscriptions. It provides a repeatable, consistent, and scalable way to deploy and manage Azure resources.

In conclusion, Azure governance is critical for organizations that want to manage their Azure environment effectively. The key Azure governance concepts, including Azure Policy, Azure RBAC, Azure Management Groups, and Azure Blueprints, provide organizations with the tools they need to ensure compliance, maintain security, and control costs in their Azure environment.

Management groups to organize and manage resources

Azure management groups provide a hierarchical structure for organizing and managing resources at scale. When designing for management groups, consider the organizational structure, governance requirements, and resource management needs. Define the management group hierarchy, assign policies and **Role-Based Access Control** (**RBAC**) at different levels, and delegate management responsibilities to appropriate groups or individuals.

For more information, refer to the following *Figure 1.1* and analyze how you can design the management groups:

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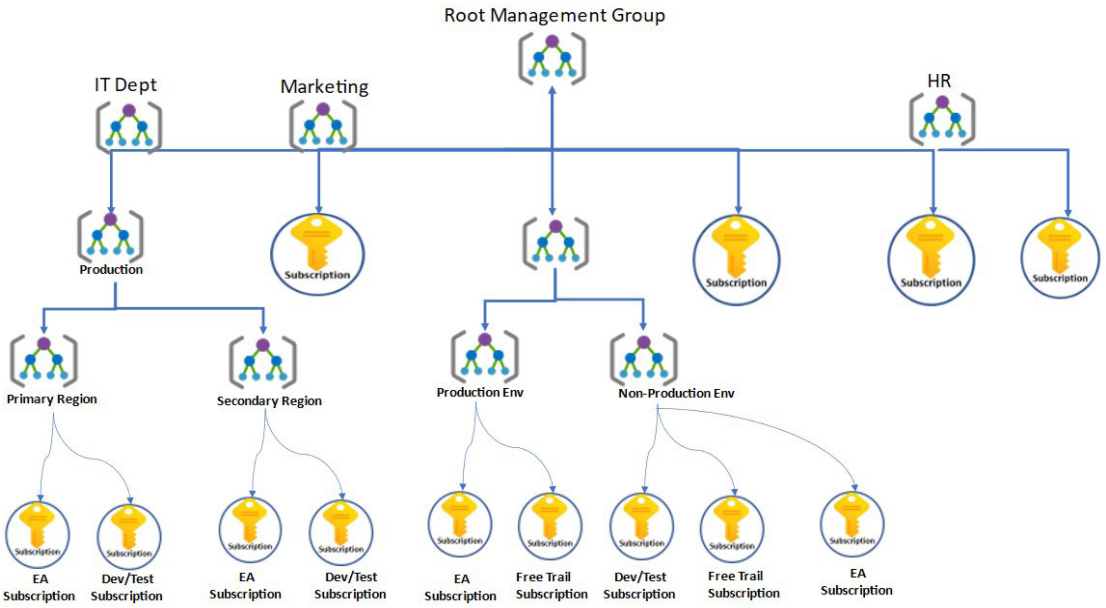

Figure 1.1: *Management group Hierarchy*

Designing for Management Group

To design for management groups, keep the following points in mind:

- **Management Group hierarchy:** When designing the management group hierarchy, it is important to keep it reasonably flat, with no more than three or four levels. This will provide flexibility without adding unnecessary complexity to the organization.
- **Azure policies:** Define and create the Azure policies at the management group level for all workloads that require the same security, compliance, connectivity, and feature settings.
- **Top-level management group:** Implement a top-level management group to support common platform policy and Azure role assignments across the entire organization.
- **Organizational or departmental structure:** Design management groups based on the organizational structure, making it easy to understand. Separate the management groups for each department like Sales, Corporate, and IT.
- **Geographical structure:** Build management groups using a geographical structure to allow for compliance policies in different regions. Allocate unique management groups for governance in the West and East sales regions.
- **Production management group:** Institute a production management group to create policies that apply to all corporate products.

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- **Isolating sensitive information:** Secure sensitive data by using a corporate management group for You Traders. The separate management group provides both standard and enhanced compliance policies for the main office.

Refer to the following *Figure 1.2* to visualize the design of Azure Management group with Azure Policy and compliance. This will also help you understand the hierarchy from Management group → Azure Subscription→Resources group→Resources.

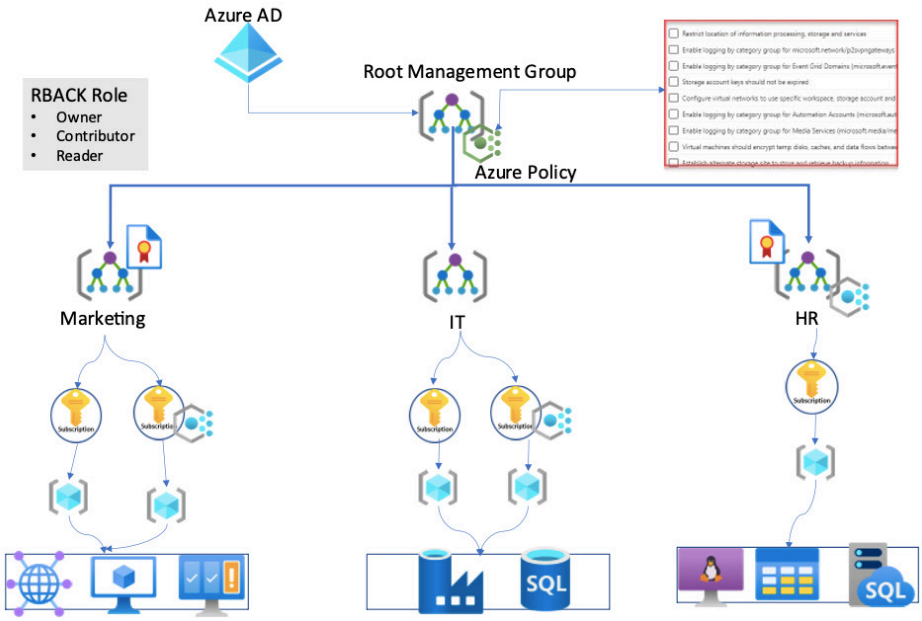

Figure 1.2: *Management group with Azure Policy*

Creating and configuring management groups

The management group will help you manage multiple subscriptions in a single tenant. We can efficiently manage the access, policies, and compliance for these subscriptions.

A single policy can also be applied within the tenant group. The first management group will act as a tenant, and the policy that applies on this subscription will be inherited to other subscriptions as well.

If you want to create and configure the management group, follow the given steps:

1. Click on **All services**.
2. Type **`management`** in the search box.
3. Click on the **Management groups** option, as shown in *Figure 1.3*:

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