Developing a Virtual Machine

Cloud Essentials (Lovely Professional University)

Developing a Virtual Machine: A Comprehensive Guide

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INTRODUCTION

A Virtual Machine (VM) in Microsoft Azure is an on-demand, scalable computing resource offered through Azure's cloud infrastructure. It allows users to run applications, host websites, or simulate various operating environments without the need for physical hardware. Azure VMs are highly customizable, enabling users to choose their operating system, resource allocation (CPU, memory, and storage), and networking configurations.

Microsoft Azure's virtual machines are integral to its Infrastructure as a Service (IaaS) offerings, designed to support diverse workloads, from simple development and testing scenarios to complex, high-performance computing tasks. The key benefits of Azure VMs include cost efficiency, high availability, and integration with other Azure services, making them versatile tools for modern cloud-based operations.

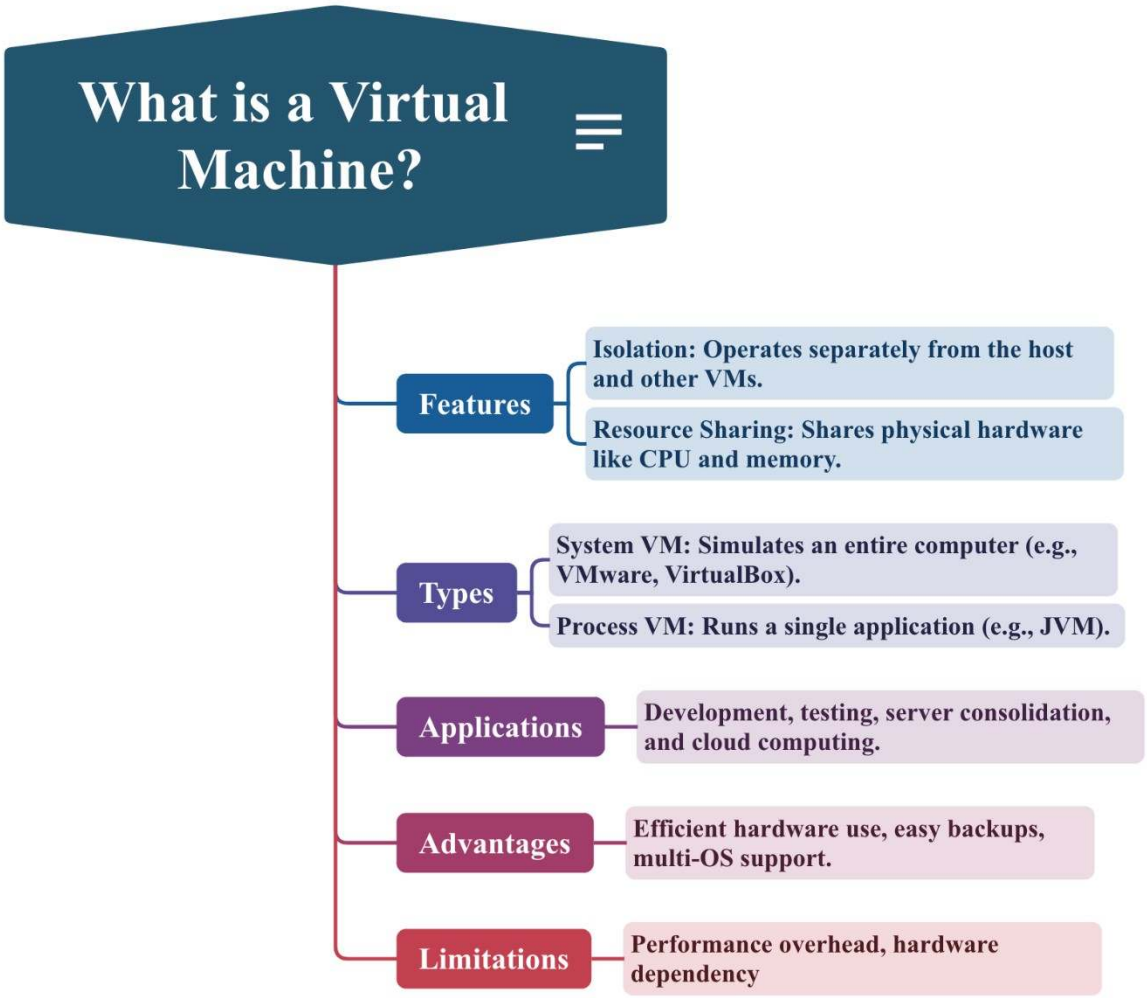


Figure 1: Virtual Machine

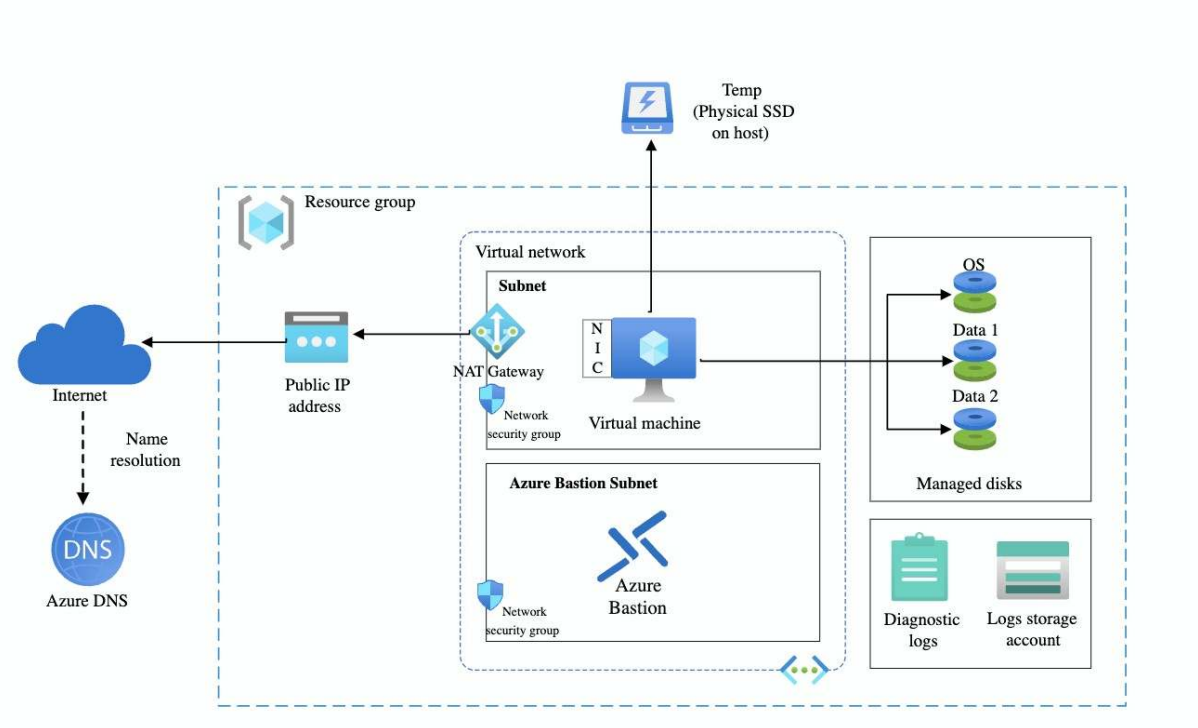


Figure 2: how to work virtual machine in azure

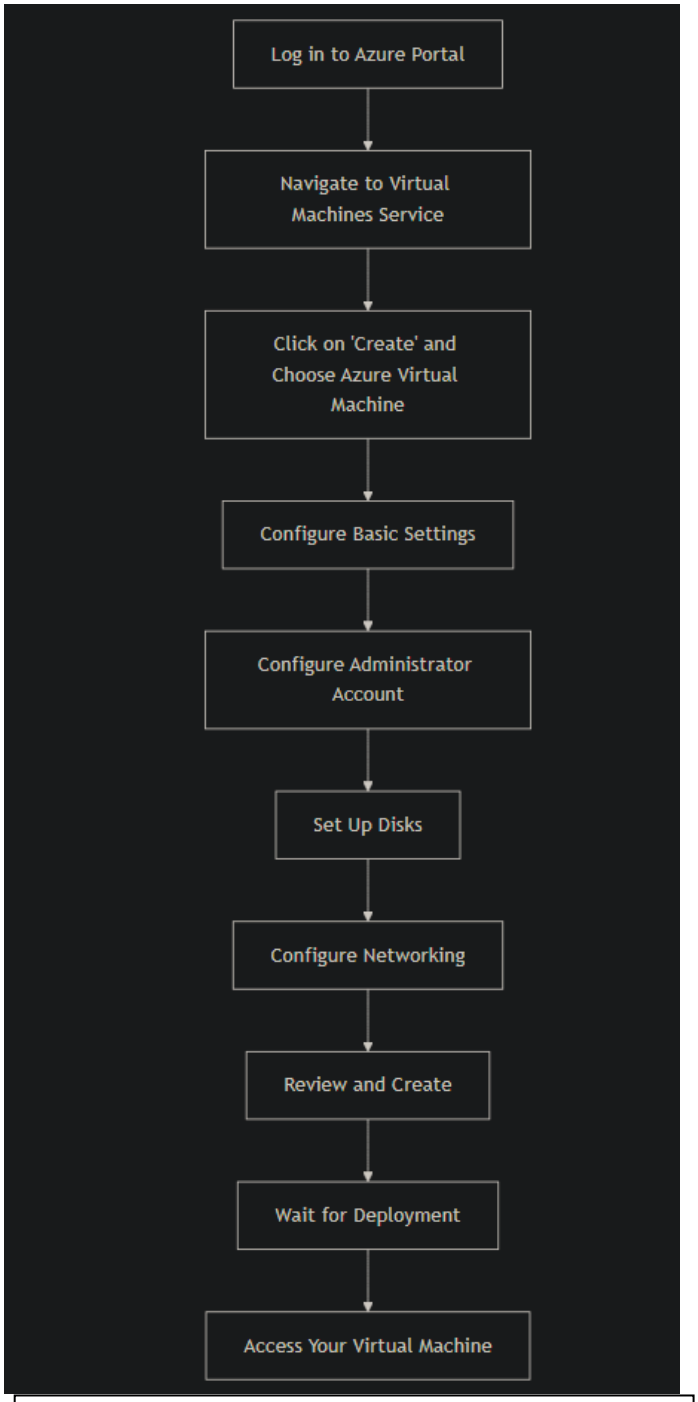
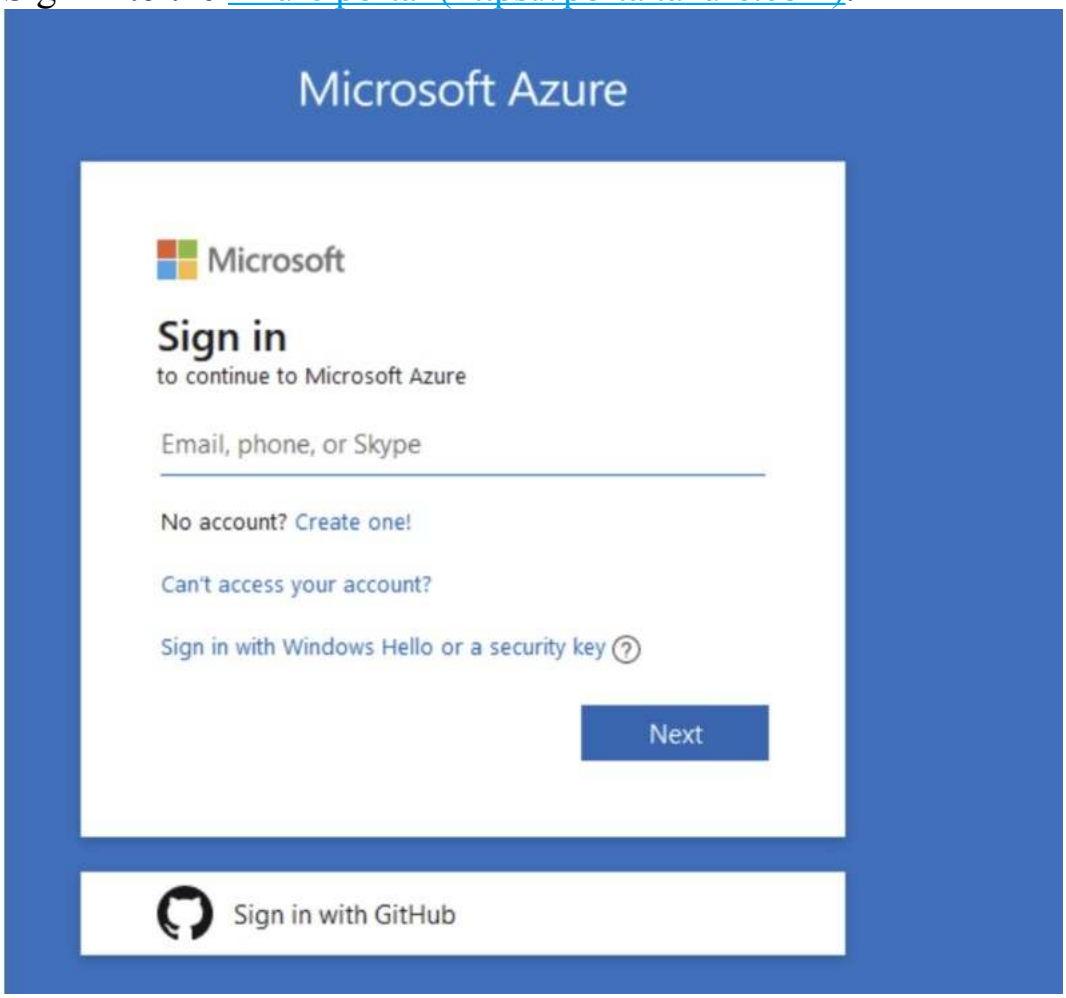


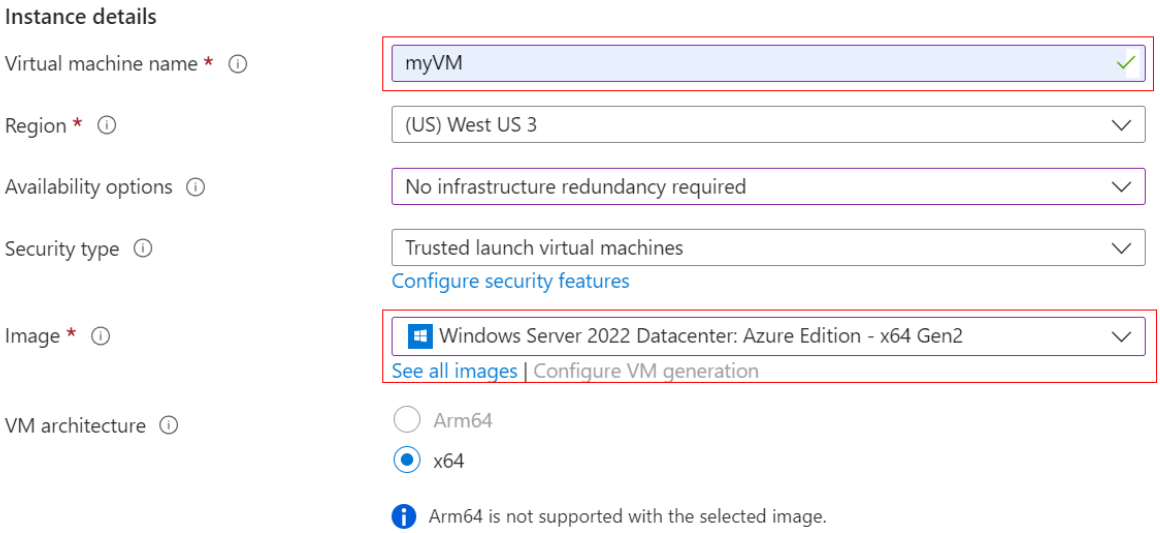
Figure 3: Flow Chart of Creating VM

How to Create a Virtual Machine

1. Sign in to the [Azure portal (https://portal.azure.com)](https://portal.azure.com).

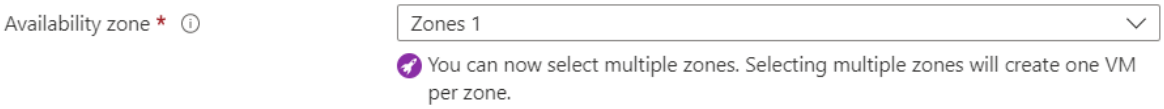


1. Enter *virtual machines* in the search.
2. Under **Services**, select **Virtual machines**.
3. In the **Virtual machines** page, select **Create** and then **Azure virtual machine**. The **Create a virtual machine** page opens.
4. Under **Instance details**, enter *myVM* for the **Virtual machine name** and choose *Windows Server 2022 Datacenter: Azure Edition - x64 Gen 2* for the **Image**. Leave the other defaults.

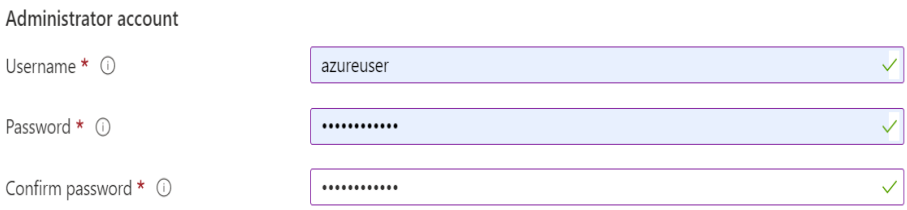


Note

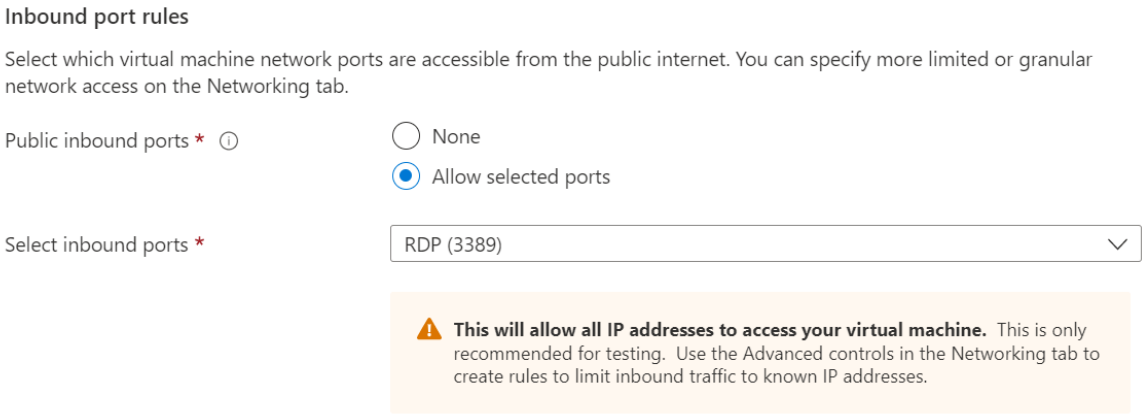
Some users will now see the option to create VMs in multiple zones. To learn more about this new capability, see **Create virtual machines in an availability zone**.



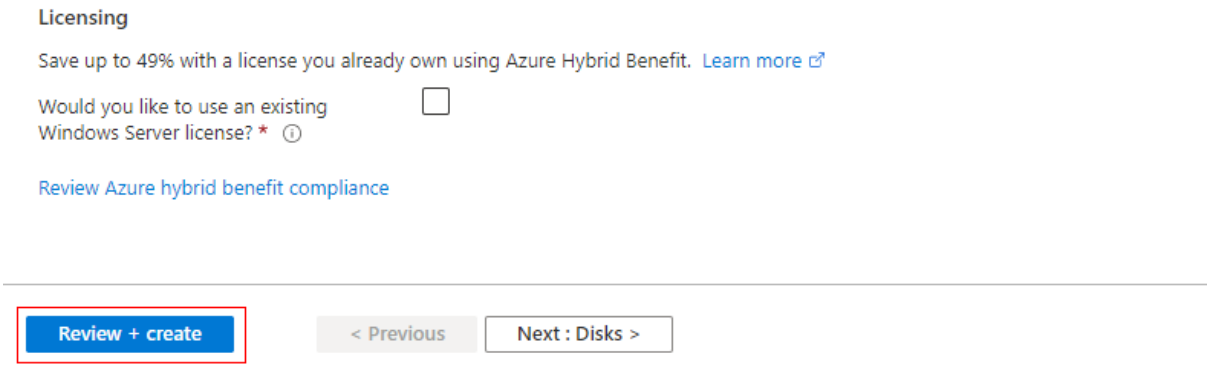
5. Under **Administrator account**, provide a username, such as *azureuser* and a password. The password must be at least 12 characters long and meet the defined complexity requirements.



6. Under **Inbound port rules**, choose **Allow selected ports** and then select **RDP (3389)** and **HTTP (80)** from the drop-down.



7. Leave the remaining defaults and then select the **Review + create** button at the bottom of the page.



8. After validation runs, select the **Create** button at the bottom of the

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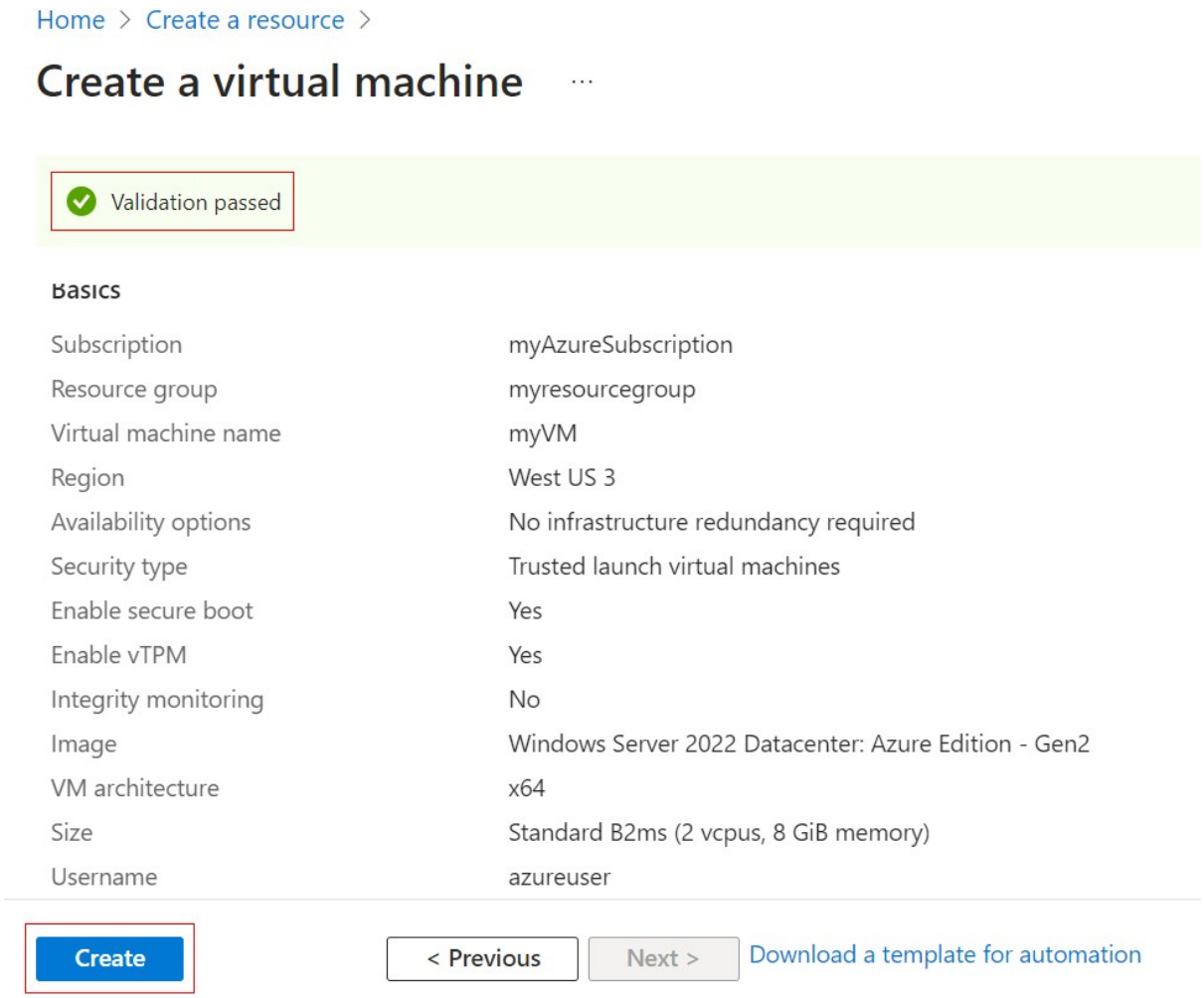
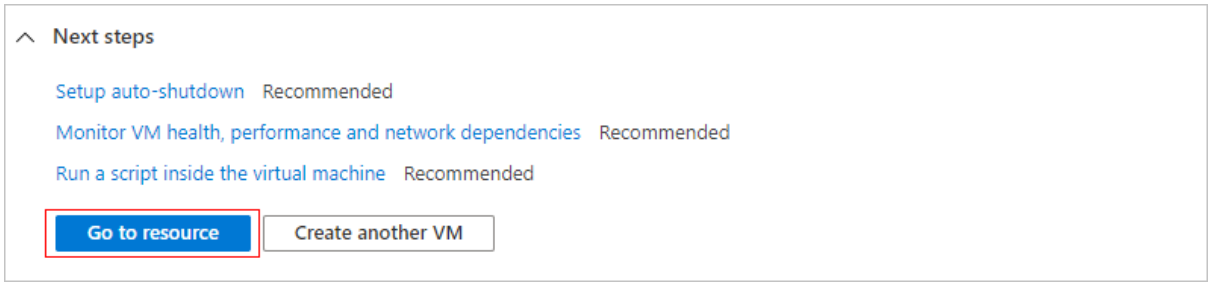


9. After deployment is complete, select **Go to resource**.



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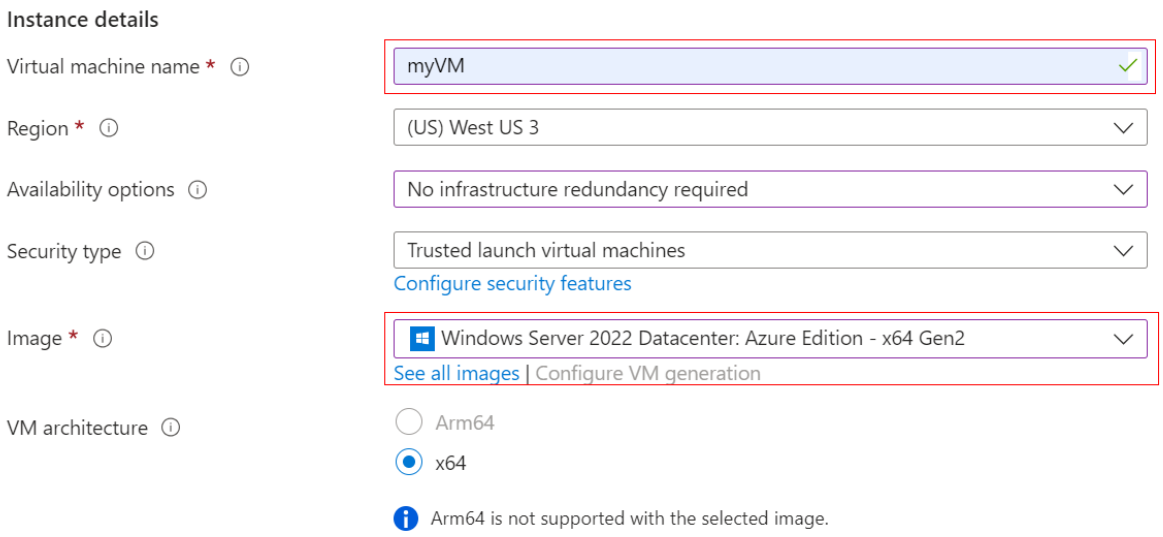

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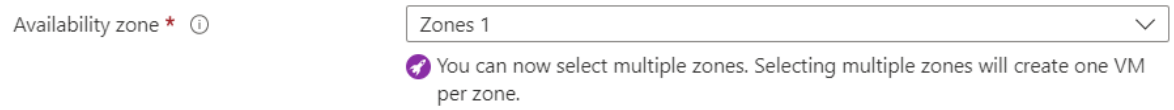

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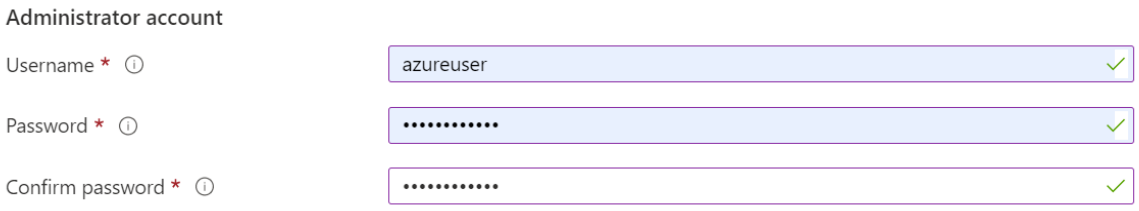

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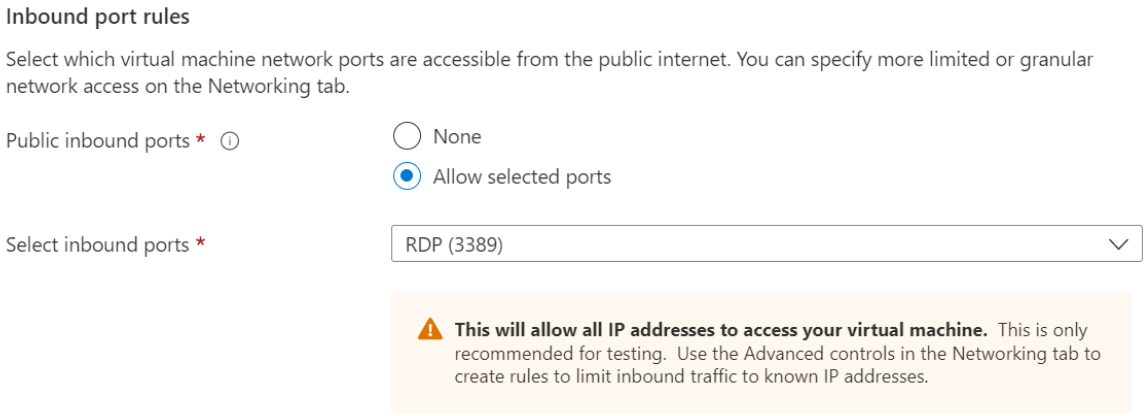

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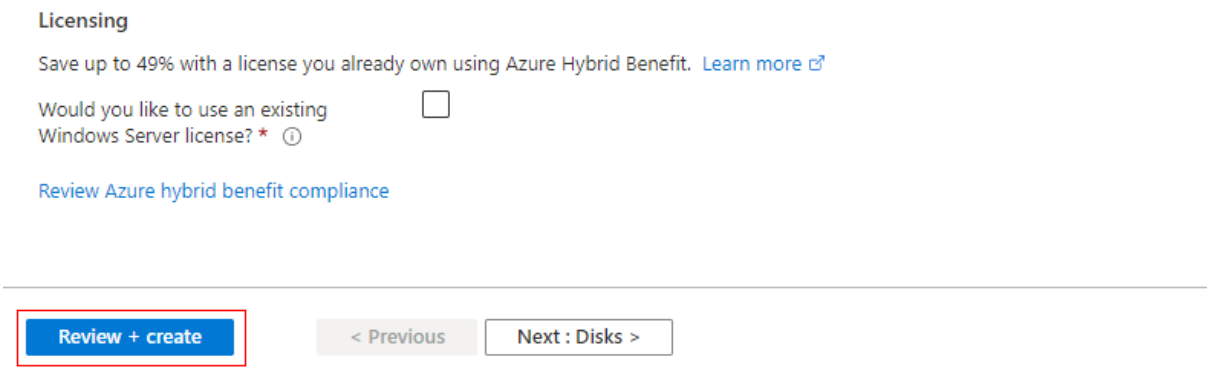

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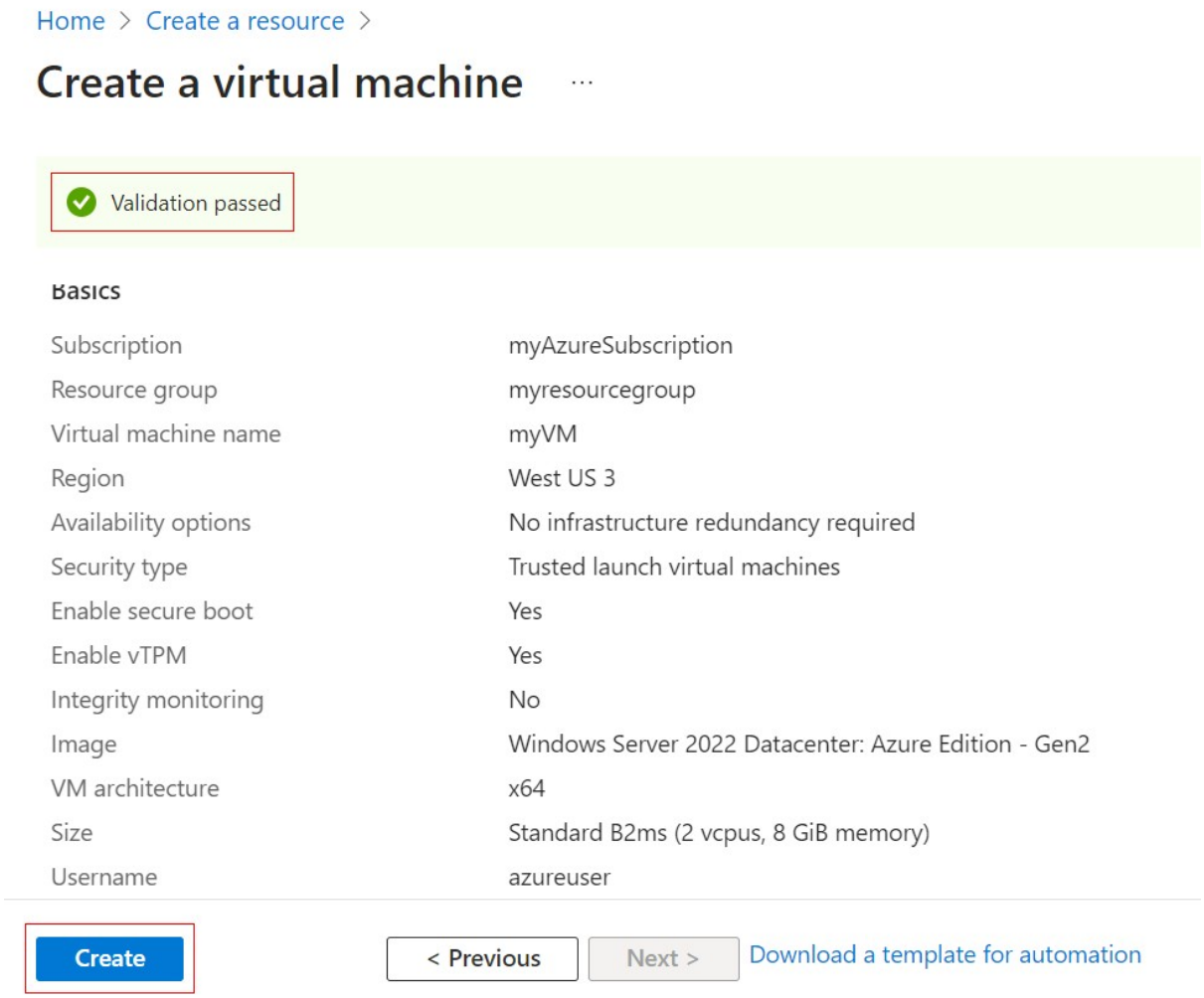

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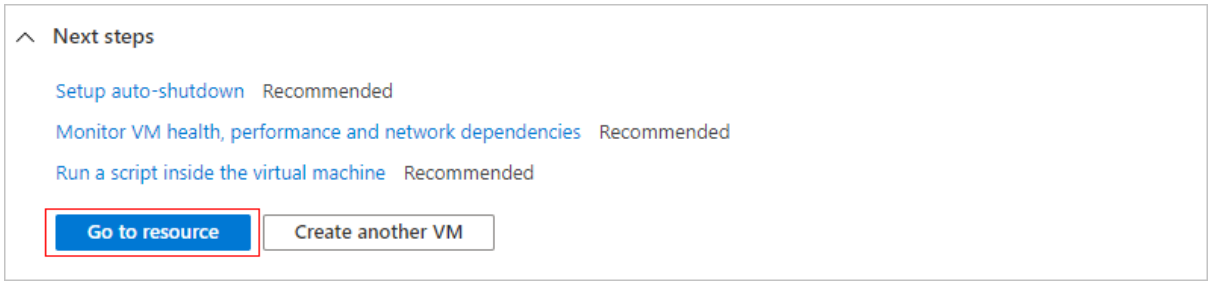

Advantages and Disadvantages of Azure Virtual Machines

Advantages:

1. You can easily increase or decrease resources as needed (scalable).
2. Allows you to run multiple operating systems and custom setups (flexible).
3. Accessible from Azure's global network of data centers.
4. You only pay for what you use, making it cost-efficient.
5. Integrates well with other Azure services like backup and monitoring.
6. Provides options for fault tolerance and disaster recovery (high availability).

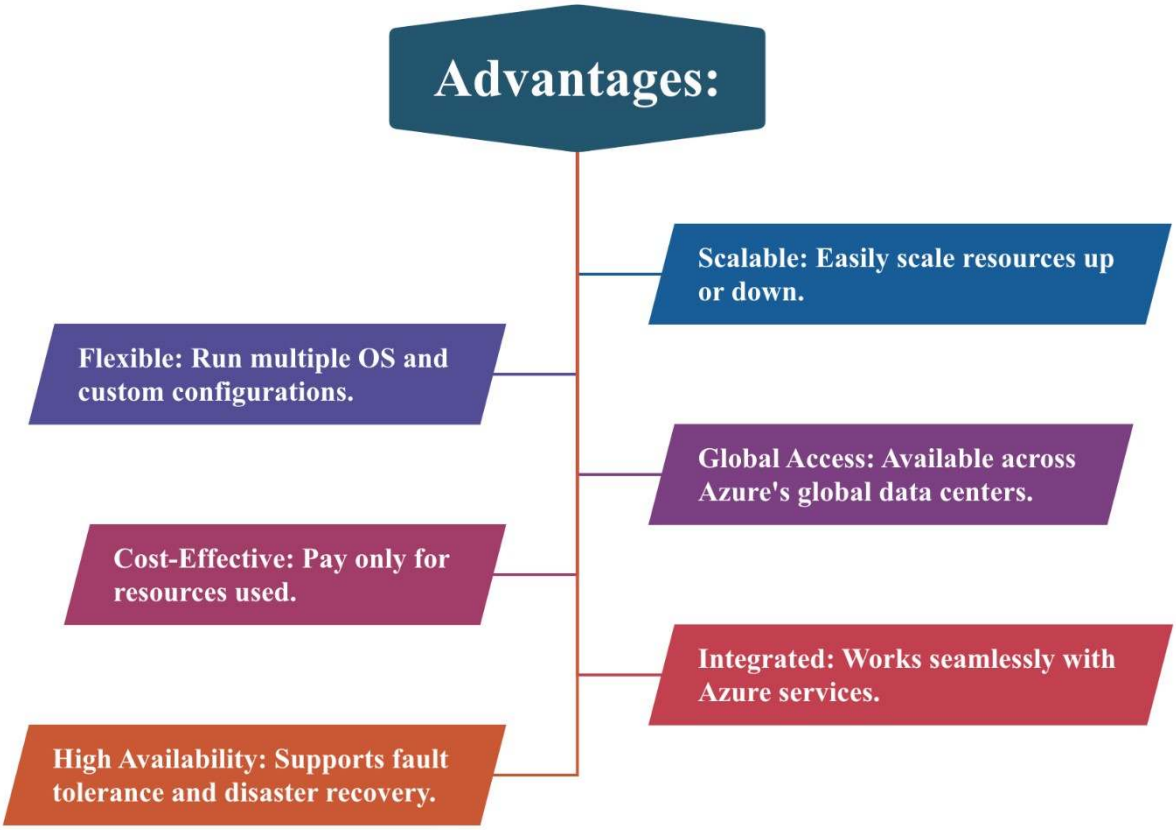

Figure 3: Advantages

Disadvantages:

1. Long-term use may become expensive.
2. Performance depends on the VM size and shared infrastructure.
3. Managing and optimizing VMs can be complex without expertise.
4. Users are responsible for security updates and patches.
5. Some advanced hardware options may not be available in all regions.

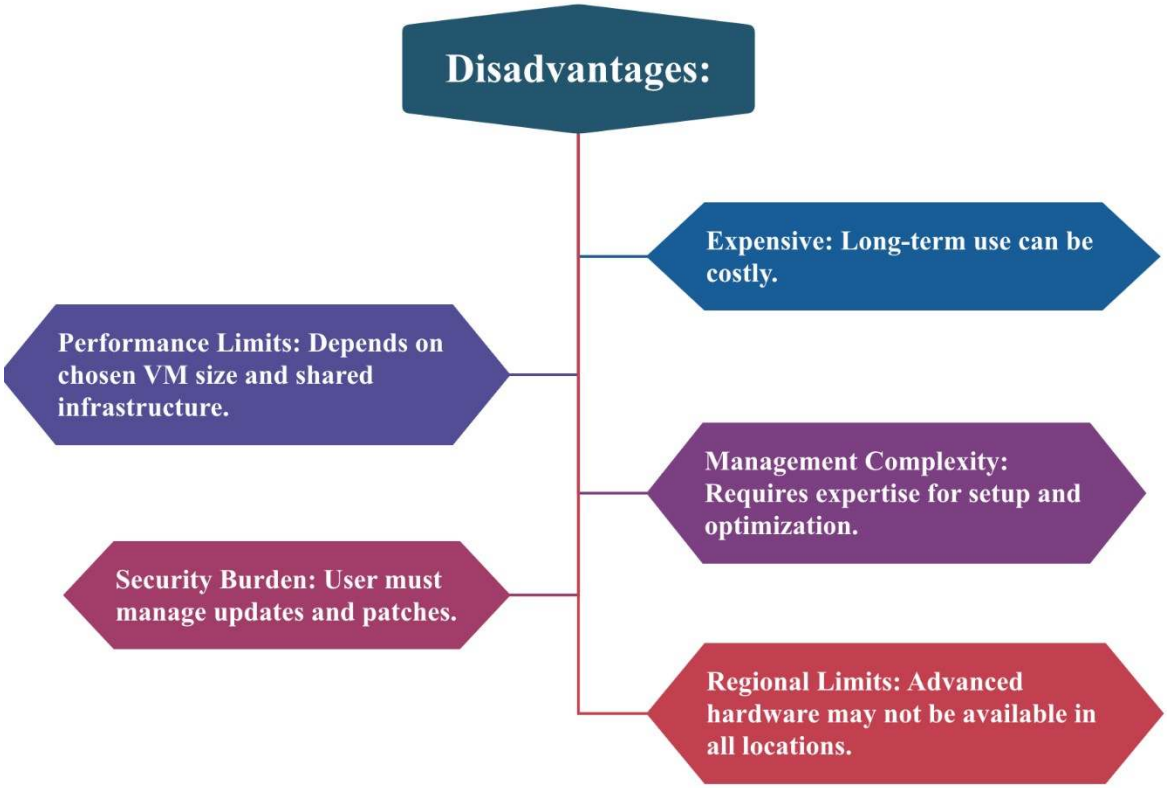

Figure 4: Disadvantages

Literature Review in Tabled Form

Author(s)	Year	Title	Objective	Methodology	Key Findings
Smith et al.	2020	Virtual Machines in Cloud Computing	To analyze the role of VMs in cloud services	Comparative analysis	VMs enhance scalability, flexibility, and resource utilization in cloud environments.
Johnson & Clark	2019	Cost Efficiency of Azure VMs	Assess cost savings using Azure VMs	Case studies	Azure VMs reduce upfront costs with pay-as-you-go models but can escalate with long-term use.
Lee and Wong	2021	Virtual Machine Performance Optimization	Evaluate performance strategies for VMs	Experimental setup with real workloads	Optimization techniques like right-sizing improve performance and reduce costs.
Ahmed et al.	2018	Security Challenges in Virtual Environments	Identify security risks in virtual machines	Threat modeling and analysis	VMs are vulnerable to misconfigurations, requiring strict access controls and patch management.
Patel and Kumar	2022	Hybrid Cloud Solutions with Virtual Machines	Explore hybrid cloud solutions with VMs	Simulation and surveys	Hybrid models with VMs enhance flexibility for organizations transitioning to the cloud.

Key Security Considerations for Virtual Machines in Microsoft Azure

🎬 **Access Control and Authentication**: Configuring strong authentication methods (e.g., SSH keys or passwords) and utilizing Role-Based Access Control (RBAC) ensures that only authorized users can access and manage the Virtual Machines (VMs) in Azure, thereby preventing unauthorized access.

- **Network Security**: By using Network Security Groups (NSGs) and configuring strict inbound and outbound traffic rules, as well as deploying VMs within isolated virtual networks (VNets), cloud security is enhanced, reducing the risk of malicious traffic and unauthorized access.

- **Data Encryption and Backup**: Azure provides encryption for both data at rest and in transit, ensuring that sensitive information is secure. Additionally, backup solutions like Azure Backup help protect VM data against accidental loss or corruption, ensuring business continuity and disaster recovery.

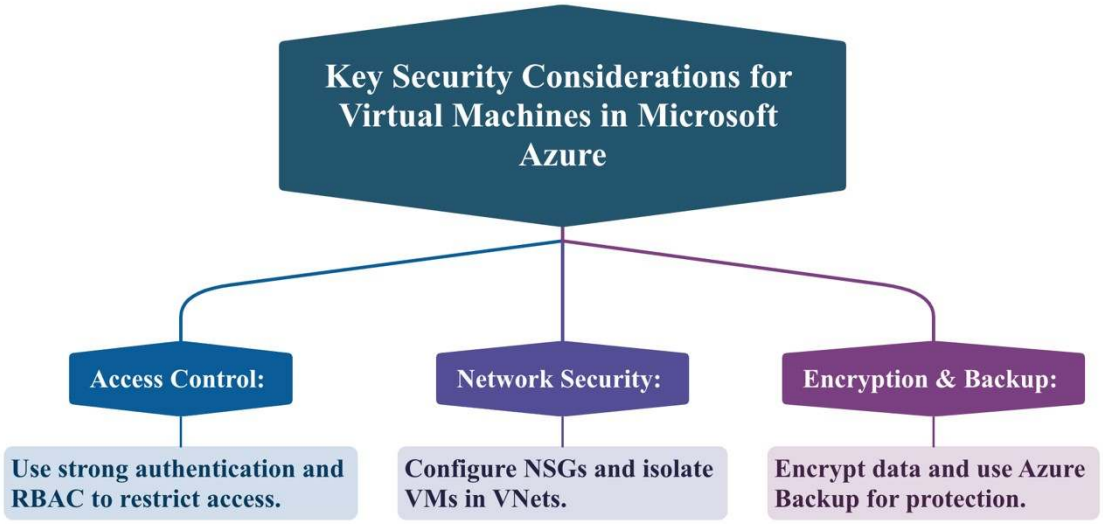

Figure 5: Key Security Considerations for Virtual Machines in Microsoft Azure

References

[1] O. Haffner, E. Kučera and M. Moravčík, "Sales Prediction of Svijany Slovakia, Ltd. Using Microsoft Azure Machine Learning and ARIMA," *2020 Cybernetics & Informatics (K&I)*, Velke Karlovice, Czech Republic, 2020, pp. 1-9, doi: 10.1109/KI48306.2020.9039875.

[2] S. D. BhavaniPeri, A. Ravi and M. Supriya, "Design and Implementation of a Real-time IoT Solution for Smart Meter Data Analysis in Microsoft Azure," *2024 15th International Conference on Computing*

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[3] R. Aljamal, F. Jubair and A. El-Mousa, "Analyzing the Cost-Effectiveness of Running HPC Applications on Microsoft Azure Virtual Machines," *2021 IEEE Jordan International Joint Conference on Electrical Engineering and Information Technology (JEEIT)*, Amman, Jordan, 2021, pp. 78-82, doi: 10.1109/JEEIT53412.2021.9634127.

[4] Subbarao, D., Raju, B., Anjum, F. *et al.* Microsoft Azure active directory for next level authentication to provide a seamless single sign-on experience. *Appl Nanosci* 13, 1655–1664 (2023). https://doi.org/10.1007/s13204-021-02021-0