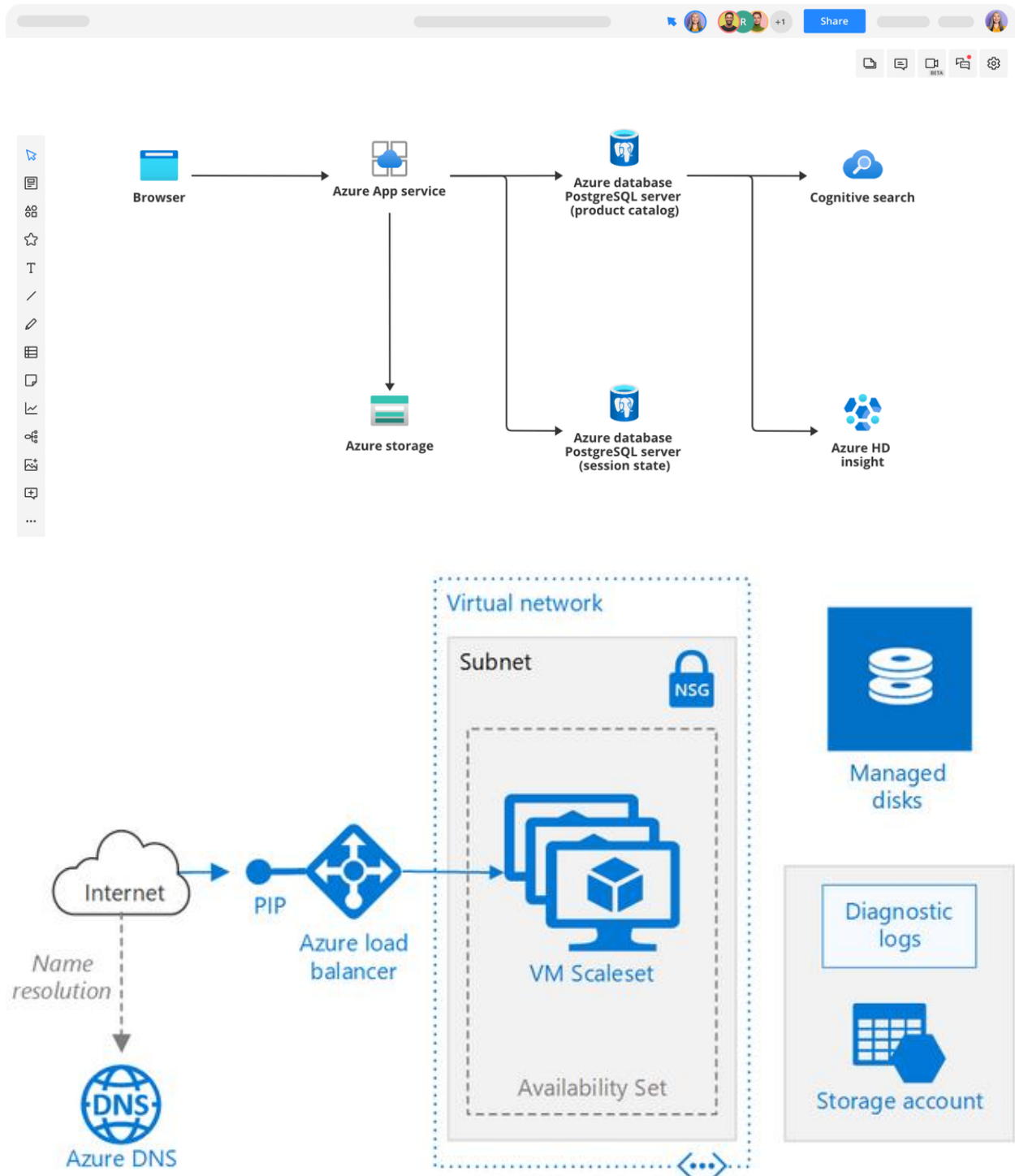
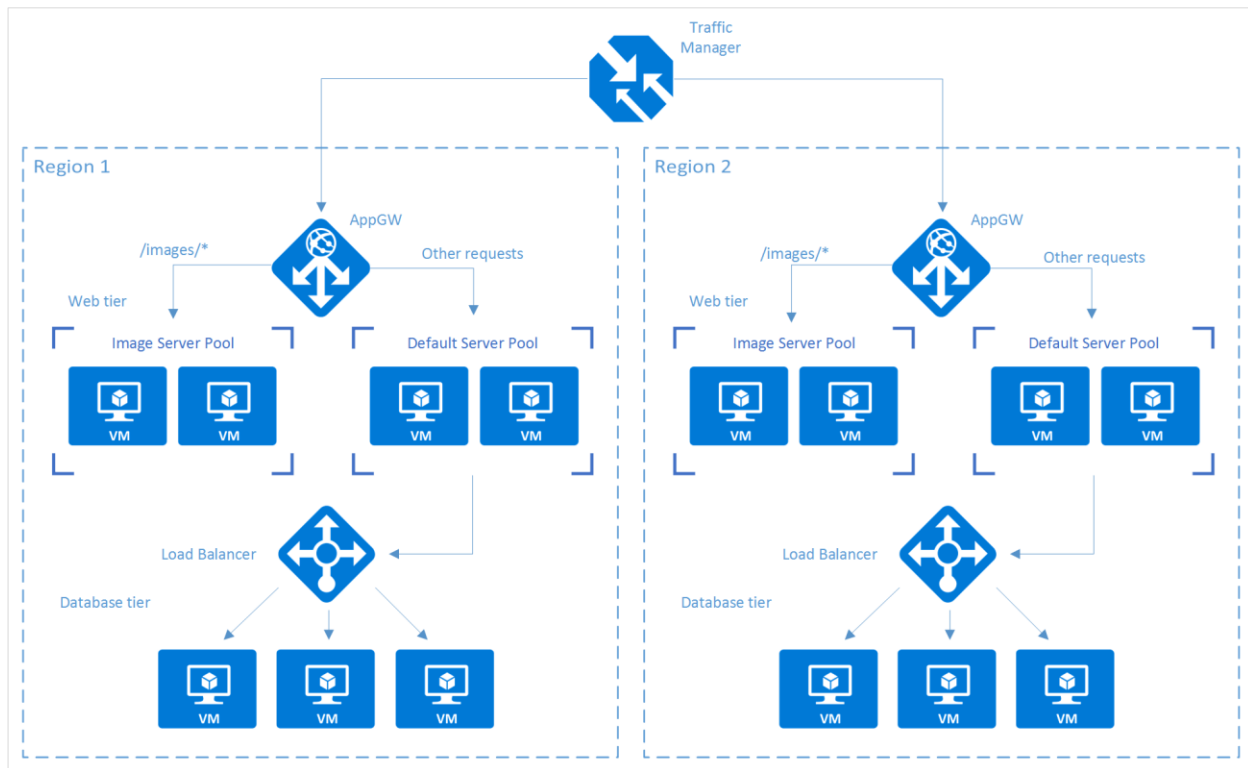


Case Study

Azure Compute and Networking Components : Shop-Ease





Business Overview

ShopEase is a fast-growing e-commerce company that currently operates on an on-premises infrastructure. During peak sales events, the website experiences heavy traffic, which leads to slow performance and occasional downtime. The existing setup does not scale automatically, making it difficult for the IT team to respond quickly to demand spikes. Hardware failures also impact availability, affecting customer trust and revenue.

To solve these issues, Shop-Ease plans to migrate its core e-commerce application to Microsoft Azure. The objective is to design a cloud architecture that ensures high availability, supports dynamic scaling, distributes traffic efficiently, optimizes costs, and maintains strong network security.

Design Objective

The proposed Azure-based solution focuses on:

- High availability for both web and database layers
- Automatic scaling during traffic surges
- Efficient traffic distribution without downtime
- Secure internal communication with minimal public exposure
- Disaster recovery and business continuity

The design uses Azure compute and networking services in a complementary way rather than relying on a single component.

Proposed Azure Architecture – Conceptual Design

1. Azure Virtual Machines for Application Hosting

The core e-commerce application is hosted on Azure Virtual Machines. This gives the organization full control over the operating system, application stack, and configurations.

Virtual machines are selected based on expected traffic and workload requirements. This approach allows flexibility while migrating from an on-premises model to the cloud.

Reasoning:

Virtual Machines provide control and compatibility for existing applications while allowing Azure-native features such as scaling and availability to be added on top.

2. High Availability Using Availability Sets

To avoid downtime during hardware failures or maintenance events, the web application VMs are placed inside an Azure Availability Set. This ensures that the VMs are distributed across multiple fault domains and update domains.

With this setup, even if one VM becomes unavailable, others continue serving traffic.

Reasoning:

Availability Sets improve resilience and ensure that failures do not affect the entire application at once.

3. Dynamic Scaling with Virtual Machine Scale Sets

To handle traffic spikes during sales events, Azure Virtual Machine Scale Sets are used. The number of VM instances automatically increases when demand rises and decreases during low usage periods.

Scaling is based on metrics such as CPU utilization or incoming requests.

Reasoning:

Scale Sets allow ShopEase to meet peak demand without permanently over-provisioning resources, improving both performance and cost efficiency.

4. Traffic Distribution Using Azure Load Balancer

An Azure Load Balancer is used to distribute incoming customer traffic evenly across all available VM instances.

Health probes continuously monitor VM status, ensuring that traffic is routed only to healthy instances.

For internal communication between the web tier and the database tier, an internal load balancer is used to avoid exposing backend services to the public internet.

Reasoning:

Load Balancers prevent overload on individual VMs and improve reliability by automatically bypassing unhealthy instances.

5. Secure Networking with Virtual Networks and NSGs

All resources are deployed inside an Azure Virtual Network (VNet). The VNet is segmented into subnets:

- Web tier subnet
- Database tier subnet

Network Security Groups (NSGs) are applied to control traffic flow:

- Only HTTPS (port 443) is allowed from the internet to the web tier
- Database access is restricted to internal traffic only

VNet peering is used to securely connect application and database environments if they are hosted in separate VNets.

Reasoning:

This design minimizes attack surfaces while allowing secure, private communication between application components.

6. Disaster Recovery with Azure Traffic Manager

To ensure business continuity, Azure Traffic Manager is used for geo-redundancy. It routes traffic to the primary Azure region and automatically fails over to a secondary region during outages.

Traffic can also be routed based on geographic location to reduce latency for global customers.

Reasoning:

Traffic Manager adds a global resiliency layer, protecting the business from regional failures.

Business Outcomes

By adopting this Azure-based architecture, ShopEase achieves:

- High availability through Availability Sets and Traffic Manager
 - Seamless scalability during peak sales using VM Scale Sets
 - Cost optimization by scaling resources only when needed
 - Secure application design using VNets, NSGs, and internal load balancing
 - Improved customer experience with reduced downtime and faster response times
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Key Takeaways

- Azure Virtual Machines provide control while enabling cloud scalability
- Availability Sets reduce downtime during failures
- VM Scale Sets handle traffic spikes automatically

- Load Balancers and Traffic Manager ensure reliable traffic flow
 - VNets and NSGs secure communication and limit public exposure
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Final Conclusion

This case study demonstrates how Azure Compute and Networking components can be combined to build a scalable, secure, and highly available e-commerce platform. Rather than relying on a single service, ShopEase benefits from an integrated Azure architecture that supports growth, improves resilience, and delivers consistent performance during peak demand.

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