Administering Relational Databases on Microsoft Azure: DP-300T00

Course Overview

This course provides students with the knowledge and skills to administer a SQL Server database infrastructure for cloud, on-premises, and hybrid relational databases and who work with the Microsoft PaaS relational database offerings. Additionally, it will be of use to individuals who develop applications that deliver content from SQL-based relational databases.

Audience Profile

The audience for this course is data professionals managing data and databases who want to learn about administering the data platform technologies that are available on Microsoft Azure. This course is also valuable for data architects and application developers who need to understand what technologies are available for the data platform with Azure and how to work with those technologies through applications.

Skills gained

Successful Azure Database Administrators start this role with professional experience in database management and technical knowledge of cloud technologies.
Specifically:

- Working with, maintaining, and developing with SQL Server
- Experience with Azure, such as deploying and managing resources
- At a minimum, you should know the information in the following online training before attending the course:
- AZ-900 Azure Fundamentals
- DP-900 Azure Data Fundamentals

Prerequisites

There are no prerequisites for taking this course. Familiarity with cloud computing is helpful but isn't necessary.

Duration: 24 Hours (8 x 3hrs)

Course Outline

Module 1: Introduction to Azure Database Administration

This module explores the role of a database administrator in the world of Azure SQL. It also provides some foundational information relevant to the overall content. This includes a review of the various SQL Server-based options (SQL Server in a VM, SQL Managed Instance, and Azure SQL Database).

Lessons

- Prepare to maintain SQL databases on Azure
- After completing this module, students will be able to:
- Understand the role of Azure Database Administrator as it fits in with other data platform roles
- Be able to describe the key differences between the SQL Server-based database options
- Describe other features for Azure SQL platforms available

Module 2: Plan and Implement Data Platform Resources

This module introduces methods for deploying data platform resources in Azure SQL. You will learn about options for both upgrading and migrating existing SQL databases to Azure. You will learn how to set up Azure resources to host SQL Server on a Virtual Machine, a SQL Managed Instance, and SQL Database. You will learn how to determine which options are best based on specific requirements including the High Availability and Disaster Recovery (HADR) needs. They will learn to calculate resource requirements and understand hybrid approaches.

Lessons

- Deploy IaaS solutions with Azure SQL
- Deploy PaaS solutions with Azure SQL
- Evaluate strategies for migrating to Azure SQL
- Migrate SQL workloads to Azure SQL Databases
- Migrate SQL workloads to Azure Managed Instances

Lab: Provision SQL Server on an Azure Virtual Machine

- Explore the Azure Portal
- Deploy a SQL Server on an Azure Virtual Machine
- Connect to SQL Server on an Azure Virtual Machine

Lab: Provision an Azure SQL Database

- Create a Virtual Network
- Deploy an Azure SQL Database
- Connect to an Azure SQL Database using Azure Data Studio
- Query an Azure SQL Database using SQL Notebook
- After completing this module, students will be able to:
- Explore the basics of SQL Server in an Infrastructure as a Service (IaaS) offering
- Understand PaaS provisioning and deployment options
- Evaluate migration scenarios to SQL Managed Instance and SQL Database
- Evaluate and implement a strategy for moving a database to Azure

Module 3: Implement a Secure Environment for a Database Service

This module explores the practices of securing your SQL Server Database as well as an Azure SQL database. This includes a review of the various SQL Server-based options as well as the various Azure options for securing Azure SQL Database. Students will lean why security is crucial when working with databases and explain authentication options for Azure SQL Database.

Lessons

- Configure database authentication and authorization
- Protect data in-transit and at rest
- Implement compliance controls for sensitive data

Lab: Configure a server-based firewall rule using the Azure portal

- Configure Azure SQL Database firewall rules
- Validate access

Lab: Authorize Access to Azure SQL Database with Azure Active Directory

- Create users
- Manage access to database objects
- Validate access

Lab: Enable Microsoft Defender for SQL and Data Classification

- Enable Microsoft Defender for Azure SQL Database
- Configure Data Classification for Azure SQL Database
- After completing this module, students will be able to:
- Understand the differences between Windows, SQL Server, and Azure Active Directory Authentication
- Describe and configure both data-at-rest encryption solutions as well as data-in-transit encryption
- Implement a data sensitivity solution

Module 4: Monitor and Optimize Operational Resources

This module will teach you about resource optimization for your databases created using either IaaS or PaaS services. The module also covers monitoring server and hardware resources. It will familiarize you with the various tools available for monitoring performance and establishing a baseline. You will learn how to interpret performance metrics for the most critical resources. You will also learn how to troubleshoot database performance using Azure SQL Insights.

Lessons

- Describe performance monitoring
- Configure SQL Server resources for optimal performance
- Configure databases for optimal performance

Lab: Isolate performance problems through monitoring

- Review CPU utilization in Azure portal
- Identify high CPU queries

Lab: Detect and correct fragmentation issues

- Investigate index fragmentation
- Rebuild fragmented indexes
- Validate performance improvements

After completing **this module, students will be able to:**

- Monitor activity and compare to a baseline
- Identify major causes of performance problems
- Configure resources for optimal performance
- Configure a user database for optimal performance

Module 5: Optimize Query Performance

Query execution plans are potentially the most important aspect of database performance. Improving bad plans is certainly an area where a small amount of effort can bring huge improvements. While hardware issues can limit query performance, improving hardware usually yields performance improvements in the 10-20% range, at most. More commonly database administrators encounter queries that are not optimized, have stale or missing statistics, have missing indexes, or poor database design choices that lead to the database engine doing more work than is necessary to return results for a given query. Improving the plans can sometimes yield performance improvements in the 100-200% range or even more, meaning that after improving a plan with better indexes or statistics, a query could run twice or three times as fast! This module provides details on how to analyze individual query performance and determine where improvements can be made.

Lessons

- Explore query performance optimization
- Explore performance-based database design
- Evaluate performance improvements

Lab: Identify database design issues

- Examine the query and identify the problem
- Identify ways to fix the warning message
- Improve the code

Lab: Identify and resolve blocking issues

- Run blocked queries report
- Enable Read Commit Snapshot isolation level
- Evaluate performance improvements

Lab: Isolate problem areas in poorly performing queries in a SQL Database

- Generate actual execution plan
- Resolve a suboptimal query plan
- Use Query Store to detect and handle regression
- Examine Top Resource Consuming Queries report
- Force a better execution plan
- Use query hints to impact performance

After completing this module, students will be able to:

- Analyze query plans and identify problem areas
- Evaluate potential query improvements using Query Store
- Review table and index design
- Determine whether query or design changes have had a positive effect

Module 6: Automate database tasks

A common goal for database administrators in many environments is to automate as many of their repetitive tasks. This can be as simple as using scripting to automate a backup process, and as complex as building a fully automated alerting system. This module provides details of automating tasks to simplify the DBA's job. Methods include scheduling tasks for regular maintenance jobs, as well as how to use elastic jobs and Azure Automation runbooks.

Lessons

- Automate deployment of database resources
- Create and manage SQL Agent jobs
- Manage Azure PaaS tasks using automation

Lab: Deploy an automation runbook to automatically rebuild indexes

- Create an Automation Account
- Connect to an existing Azure SQL Database
- Configure Automation Account assets
- Create a PowerShell runbook
- Create a schedule for a runbook

Lab: Deploy Azure SQL Database using an Azure Resource Manager template

- Explore Azure Resource Manager template

Lab: Create a CPU status alert for a SQL Server

- Create an alert when a CPU exceeds an average of 80 percent

After completing this module, students will be able to:

- Deploy resources using automated deployment scripts
- Create scheduled tasks
- Create notifications and alerts
- Configure automation for PaaS services

Module 7: Plan and Implement a High Availability and Disaster Recovery Solution

Data must be available when the business needs it. That means the solutions hosting the data must be designed with availability and recoverability in mind. Suppose you work for a company that sells widgets both in stores and online. Your main application uses a highly transactional database for orders. What would happen if the server or platform hosting the transactional database had a problem that made it unavailable or inaccessible for some reason? What impact would it have on the business? If the right solution is put in place, the database would come online in a reasonable timeframe with minimal effort, thus allowing business to continue with little-to-no impact. This module and its associated lab cover configuring, testing, and managing a solution for high availability and disaster recovery (HADR) in Azure, for both Infrastructure-as-a-Service (IaaS) and Platform-as-a-Service (PaaS) deployments. This module will not only cover basic requirements, but also the various options available to achieve HADR.

Lessons

- High Availability and Disaster Recovery Strategies
- IaaS Platform and Database Tools for HADR
- PaaS Platform and Database Tools for HADR
- Database Backup and Recovery

Lab: Backup to URL and Restore from URL

- Create a credential
- Backup to URL
- Validate backup through Azure CLI and Storage Explorer
- Restore from URL

Lab: Configure geo-replication for Azure SQL Database

- Enable geo-replication
- Failover to a secondary region

After completing this module, students will be able to:

- The difference between recovery time and recovery point objectives
- The available HADR options for both IaaS and PaaS
- The considerations for planning and configuring HADR solutions including how backup and restore fi
- The factors that comprise a HADR strategy
- How to configure a high availability solution via a hands-on lab