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DP-420: Designing and Implementing Cloud-Native Applications Using Microsoft Azure Cosmos DB (4 Days)

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This course teaches developers how to create application using the SQL API and SDK for Azure Cosmos DB. Students will learn how to write efficient queries, create indexing policies, manage and provisioned resources, and perform common operations with the SDK.

Audience Profile

Software engineers tasked with authoring cloud-native solutions that leverage Azure Cosmos DB SQL API and its various SDKs. They are familiar with C#, Python, Java, or JavaScript. They also have experience writing code that interacts with a SQL or NoSQL database platform.

Prerequisites
• Familiarity with Azure and the Azure portal.
• Experience programming with C#. If you have no previous programming experience, we recommend you complete the Take your first steps with C# learning path before starting this one.

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Modulo 1: Introduction to Azure Cosmos DB for NoSQL

Learn about the Azure Cosmos DB for NoSQL and determine if it is a good fit for your application.

Learning objectives

After completing this module, you'll be able to:

- Evaluate whether Azure Cosmos DB for NoSQL is the right database for your application.
- Describe how the features of the Azure Cosmos DB for NoSQL are appropriate for modern applications.

Modulo 2: Try Azure Cosmos DB for NoSQL

Learn how to use the Azure Cosmos DB for NoSQL to create an account, and then use the account to create Cosmos DB resources.

Learning objectives

After completing this module, you'll be able to:

- Create a new Azure Cosmos DB for NoSQL account
- Create database, container, and item resources for an Azure Cosmos DB for NoSQL account

Modulo 3: Plan Resource Requirements

Familiarize yourself with the various configuration options for a new Azure Cosmos DB for NoSQL account.

Learning objectives

After completing this module, you'll be able to:

- Evaluate various requirements of your application

Modulo 4: Configure Azure Cosmos DB for NoSQL database and containers

Select between the various throughput offerings in Azure Cosmos DB for NoSQL.

Learning objectives

After completing this module, you'll be able to:

- Compare the various service and throughput offerings for Azure Cosmos DB
- Migrate between standard and autoscale throughput

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Modulo 5 : Move data into and out of Azure Cosmos DB for NoSQL

Migrate data into and out of Azure Cosmos DB for NoSQL using Azure services and open-source solutions.

Learning objectives

After completing this module, you'll be able to:

- Migrate data using Azure services
- Migrate data using Spark or Kafka

Modulo 6: Use the Azure Cosmos DB for NoSQL SDK

Learn about the Microsoft.Azure.Cosmos library, and then download the library to use in a .NET application.

Learning objectives

After completing this module, you'll be able to:

- Integrate the Microsoft.Azure.Cosmos SDK library from NuGet
- Connect to an Azure Cosmos DB for NoSQL account using the SDK and .NET

Modulo 7 : Configure the Azure Cosmos DB for NoSQL SDK

Learn how to configure the Azure Cosmos DB for NoSQL SDK in various ways including how to integrate with the emulator, implement parallelism, and create a custom logger.

Learning objectives

After completing this module, you'll be able to:

- Configure the SDK for offline development
- Troubleshoot common connection errors
- Implement parallelism in the SDK
- Configure logging using the SDK

Modulo 8: Implement Azure Cosmos DB for NoSQL point operations

Write code to create, read, update, and delete items in Azure Cosmos DB for NoSQL.

Learning objectives

After completing this module, you'll be able to:

- Perform CRUD operations using the SDK
- Configure TTL for a specific item

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Modulo 9 : Perform cross-document transactional operations with the Azure Cosmos DB for NoSQL

Perform operations on multiple items in single logical units of work.

Learning objectives

After completing this module, you'll be able to:

- Create a transactional batch and review results
- Implement optimistic concurrency control for an operation.

Modulo 10: Process bulk data in Azure Cosmos DB for NoSQL

Perform bulk operations on Azure Cosmos DB in bulk from code using the SDK.

Learning objectives

After completing this module, you'll be able to:

- Use C# task asynchronous programming model and "bulk" support in the Azure Cosmos DB for NoSQL .NET SDK

Modulo 11 : Query the Azure Cosmos DB for NoSQL

Author queries for Azure Cosmos DB for NoSQL using the SQL query language.

Learning objectives

After completing this module, you'll be able to:

- Create and execute a SQL query
- Project query results
- Use built-in functions in a query

Modulo 12: Configure Azure Virtual Network peering

Create SQL queries for Azure Cosmos DB for NoSQL that uses subqueries or cross-products.

Learning objectives

After completing this module, you'll be able to:

- Implement a correlated subquery
- Create a cross-product query

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Modulo 13 : Define indexes in Azure Cosmos DB for NoSQL

Discover indexes and indexing policies in Azure Cosmos DB for NoSQL.

Learning objectives

After completing this module, you'll be able to:

- Create and execute a SQL query
- Project query results
- Use built-in functions in a query

Modulo 14: Customize indexes in Azure Cosmos DB for NoSQL

Customize indexing policies for a container in Azure Cosmos DB for NoSQL.

Learning objectives

After completing this module, you'll be able to:

- Implement a correlated subquery
- Create a cross-product query

Modulo 15 : Consume an Azure Cosmos DB for NoSQL change feed using the SDK

Process change feed events using the change feed processor in the Azure Cosmos DB for NoSQL .NET SDK.

Learning objectives

After completing this module, you'll be able to:

- Create a change feed processor in the .NET SDK
- Author a delegate to handle a batch of changes in a client-side application

Modulo 16: Handle events with Azure Functions and Azure Cosmos DB for NoSQL change feed

Use Azure Functions bindings to integrate a function with Azure Cosmos DB for NoSQL.

Learning objectives

After completing this module, you'll be able to:

- Create an Azure Function using the Azure Cosmos DB trigger

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Modulo 17 : Search Azure Cosmos DB for NoSQL data with Azure Cognitive Search

Index Azure Cosmos DB for NoSQL data with Azure Cognitive Search.

Learning objectives

After completing this module, you'll be able to:

- Create an indexer to migrate data from Azure Cosmos DB for NoSQL to an Azure Cognitive Search index

Modulo 18: Implement a non-relational data model

Identify an application's key access patterns. Define the entities' data model, along with containers to store the data with a partition key that will result in an efficient and scalable data store for the application.

Learning objectives

In this module, you will:

- Determine access patterns for data.
- Apply data model and partitioning strategies to support an efficient and scalable NoSQL database.

Modulo 19 : Design a data partitioning strategy

Identify strategies for managing relationships between data entities, such as customers and sales data. Improve data-model performance and scaling by pre-aggregating and denormalizing your data. Use change-feed to maintain your data's referential integrity.

Learning objectives

At the completing this module we will learn:

- Manage relationships between data entities by using advanced modeling and partitioning strategies.
- Maintain the referential integrity of your data by using change feed.
- Implement pre-aggregating and denormalizing data strategies to improve data-model performance and scaling.
- Optimizing storage and compute by mixing entity types in a single container

Modulo 20: Configure replication and manage failovers in Azure Cosmos DB

Replicate data across the globe and manage automatic or manual failovers in Azure Cosmos DB.

Learning objectives

After completing this module, you'll be able to:

- Distribute data across global data centers
- Configure automatic failover and perform a manual failover
- Configure the Azure Cosmos DB for NoSQL .NET SDK to use a specific region

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Modulo 21 : Use consistency models in Azure Cosmos DB for NoSQL

Configure consistency on a sliding scale for Azure Cosmos DB for NoSQL.

Learning objectives

After completing this module, you'll be able to:

- Configure default consistency level for an Azure Cosmos DB account
- Change the consistency level on a per-request basis

Modulo 22: Configure multi-region write in Azure Cosmos DB for NoSQL

Write data to multiple regions using Azure Cosmos DB for NoSQL.

Learning objectives

After completing this module, you'll be able to:

- Configure Azure Cosmos DB for multi-region write
- Use the .NET SDK to select a write region for operations.

Modulo 23 : Customize an indexing policy in Azure Cosmos DB for NoSQL

Tune the indexing policy based on your SQL queries in Azure Cosmos DB for NoSQL.

Learning objectives

After completing this module, you'll be able to:

- Customize an indexing policy for read-heavy workloads
- Customize an indexing policy for write-heavy workloads

Modulo 24: Measure index performance in Azure Cosmos DB for NoSQL

Measure the performance of an indexing policy in Azure Cosmos DB for NoSQL.

Learning objectives

After completing this module, you'll be able to:

- Tune an indexing policy for specific queries
- Measure the cost for a query or operation

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Modulo 25 : Implement integrated cache in Azure Cosmos DB for NoSQL

Implement, configure, and monitor integrated cache in Azure Cosmos DB for NoSQL.

Learning objectives

After completing this module, you'll be able to:

- Implement the integrated cache
- Configure integrated cache options

Modulo 26: Measure performance in Azure Cosmos DB for NoSQL

We'll learn to use Azure Monitor to create and analyze monitoring data for Azure Cosmos DB.

Learning objectives

After completing this module, you'll be able to:

- Understand how Azure Cosmos DB uses Azure Monitor to monitor server-side metrics
- Measure Cosmos DB's throughput
- Observe rate-limiting events
- Query telemetry logs
- Measure cross-partition storage distribution throughput

Modulo 27 : Monitor responses and events in Azure Cosmos DB for NoSQL

We will learn to use a rich set of REST response codes returned by Azure Cosmos DB request to help you analyze potential issues.

Learning objectives

- Review common response codes
- Understand transit errors
- Review rate-limiting errors
- Configure Alerts
- Audit Security

Modulo 28: Implement backup and restore for Azure Cosmos DB for NoSQL

We will learn to use the two backup models Azure Cosmos DB provides.

Learning objectives

- Understand the different backup and restore options Azure Cosmos DB provides
- Evaluate periodic backups
- Configure continuous backups
- Do point in time recovery

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Modulo 29 : Implement security in Azure Cosmos DB for NoSQL

We will learn the different security models that Azure Cosmos DB uses.

Learning objectives

- Implement network level access control
- Review data encryption options
- Use role-based access control (RBAC)
- Access Account Resources using Microsoft Entra ID
- Understand Always Encrypted

Modulo 30: Write management scripts for Azure Cosmos DB for NoSQL

Learn how to manage Azure Cosmos DB for NoSQL accounts, databases, and containers using the Azure CLI.

Learning objectives

After completing this module, you'll be able to:

- View arguments, groups, and subgroups for a specific CLI command
- Create Azure Cosmos DB accounts, databases, and containers using the CLI
- Manage an indexing policy using the CLI
- Configure database or container throughput using the CLI
- Initiate failovers and manage failover regions using the CLI

Modulo 31 : Create resource template for Azure Cosmos DB for NoSQL

Learn about automated Azure Cosmos DB for NoSQL resource deployments using the Azure Resource Manager with JSON and Bicep templates.

Learning objectives

After completing this module, you'll be able to:

- Identify the three most common resource types for Azure Cosmos DB for NoSQL accounts
- Create and deploy a JSON Azure Resource Manager template for an Azure Cosmos DB for NoSQL account, database, or container
- Create and deploy a Bicep template for an Azure Cosmos DB for NoSQL account, database, or container
- Manage throughput and index policies using JSON or Bicep templates

Modulo 32 : Build multi-item transactions with the Azure Cosmos DB for NoSQL

Author stored procedures using JavaScript in Azure Cosmos DB for NoSQL.

Learning objectives

After completing this module, you'll be able to:

- Author stored procedure
- Rollback stored procedure transactions

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Modulo 33 : Expand query and transaction functionality in Azure Cosmos DB for NoSQL

Author user-defined functions and triggers using JavaScript in Azure Cosmos DB for NoSQL.

Learning objectives

After completing this module, you'll be able to:

- Create user-defined functions
- Create triggers

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