Performance Tuning and Optimizing SQL Databases

32 hours

Course Overview:

This four-day instructor-led course provides students who manage and maintain SQL Server databases with the knowledge and skills to performance tune and optimize their databases.

Course Objectives:

- Describe the high level architectural overview of SQL Server and its various components.
- Describe the SQL Server execution model, waits and queues.
- Describe core I/O concepts, Storage Area Networks and performance testing.
- Describe architectural concepts and best practices related to data files for user databases and TempDB.
- Describe architectural concepts and best practices related to Concurrency, Transactions, Isolation Levels and Locking.
- Describe architectural concepts of the Optimizer and how to identify and fix query plan issues.
- Describe architectural concepts, troubleshooting scenarios and best practices related to Plan Cache.
- Describe architectural concepts, troubleshooting strategy and usage scenarios for Extended Events.
- Explain data collection strategy and techniques to analyze collected data.
- Understand techniques to identify and diagnose bottlenecks to improve overall performance.

Who Should Attend:

The primary audience for this course is individuals who administer and maintain SQL Server databases and are responsible for optimal performance of SQL Server instances that they manage. These individuals also write queries against data and need to ensure optimal execution performance of the workloads.

The secondary audiences for this course are individuals who develop applications that deliver content from SQL Server databases.

Required Skills

In addition to their professional experience, students who attend this training should already have the following technical knowledge:

- Basic knowledge of the Microsoft Windows operating system and its core functionality.
- Working knowledge of database administration and maintenance
- Working knowledge of Transact-SQL.

Course Contents:

Module 1: SQL Server Architecture, Scheduling, and Waits

This module covers high level architectural overview of SQL Server and its various components. It dives deep into SQL Server execution model, waits and queues.

- SQL Server Components and SQL OS
- Windows Scheduling vs SQL Scheduling
- Waits and Queues

Module 2: SQL Server I/O

This module covers core I/O concepts, Storage Area Networks and performance testing. It focuses on SQL Server I/O operations and how to test storage performance.

- Core Concepts
- Storage Solutions
- I/O Setup and Testing

Module 3: Database Structures

This module covers Database Structures, Data File and TempDB Internals. It focuses on architectural concepts and best practices related to data files for user databases and TempDB.

- Database Structure Internals
- Data File Internals
- TempDB Internals

Module 4: SQL Server Memory

This module covers Windows and SQL Server Memory internals. It focuses on architectural concepts and best practices related to SQL Server Memory Configuration.

- Windows Memory
- SQL Server Memory
- In-Memory OLTP

Module 5: Concurrency and Transactions

This module covers Transactions and Locking Internals. It focuses on architectural concepts and best practices related to Concurrency, Transactions, Isolation Levels and Locking.

- Concurrency and Transactions
- Locking Internals

Module 6: Statistics and Index Internals

This module covers Statistics and Index Internals. It focuses on architectural concepts and best practices related to Statistics and Indexes.

- Statistics Internals and Cardinality Estimation
- Index Internals
- Columnstore Indexes

Module 7: Query Execution and Query Plan Analysis

This module covers Query Execution and Query Plan Analysis. It focuses on architectural concepts of the Optimizer and how to identify and fix query plan issues.

- Query execution and optimizer internals
- Analyzing query plans

Module 8: Plan Caching and Recompilation

This module covers Plan Caching and Recompilation. It focuses on architectural concepts, troubleshooting scenarios and best practices related to Plan Cache.

- Plan cache internals
- Troubleshooting plan cache issues
- Query store

Module 9: Extended Events

This module covers Extended Events. It focuses on architectural concepts, troubleshooting strategy and usage scenarios for Extended Events.

- Extended events core concepts
- Implementing extended events

Module 10: Monitoring, Tracing, and Baselining

This module covers tools and techniques to monitor, trace and baseline SQL Server performance data. It focuses on data collection strategy and techniques to analyze collected data.

- Monitoring and tracing
- Baselining and benchmarking

Module 11: Troubleshooting Common Performance Issues

This module covers common performance bottlenecks related to CPU, Memory, IO, TempDB and Concurrency. It focuses on techniques to identify and diagnose bottlenecks to improve overall performance.

- Troubleshoot CPU performance
- Troubleshoot memory performance
- Troubleshoot I/O performance
- Troubleshoot Concurrency performance
- Troubleshoot TempDB performance