

MS SQL Server 2012 Database Administration With AlwaysOn & Clustering Techniques

Module 1: SQL Server Architecture

Introduction to SQL Server 2012

- ✓ Overview on RDBMS and Beyond Relational
- ✓ Big picture of SQL Server 2012
- ✓ Components & Services of SQL Server 2012
- ✓ Roles of production DBA
- ✓ System Databases
- ✓ Master, Model, MSDB, Tempdb & Resource

SQL Server 2012 Editions & Capacity Planning

- ✓ Principal Editions [Enterprise, BI, Standard]
- ✓ Specialized Editions [Web]
- ✓ Breadth Editions [Developer, Express]
- ✓ Hardware Requirements
- ✓ OS and Software requirements

Pages & Extents

- ✓ Pages
- ✓ Extents [Uniform & Mixed]
- ✓ Managing Extent Allocations
- ✓ Tracking Free Space

Files and File groups

- ✓ Database Files
 - Primary data files
 - Secondary data files
 - Log files
- ✓ Database File groups [Primary & User-defined]

Thread and Task Architecture

- ✓ Allocating threads to CPU
- ✓ Affinity Mask
- ✓ IO and Processor affinity mask
- ✓ Configuring Affinity masks
- ✓ Boost SQL Server priority
- ✓ Hot Add CPU

Memory Architecture

- ✓ 32-bit Vs 64-bit Architecture
- ✓ Dynamic Memory Management
- ✓ Effects of min and max server memory
- ✓ Buffer Management
- ✓ The Relational Engine
- ✓ The Command Parser
- ✓ The Query Optimizer
- ✓ The Query Executor
- ✓ Using AWE
- ✓ Configuring Memory Settings
- ✓ The Buffer Pool and the Data Cache
- ✓ Checkpoints
- ✓ Hot Addition of memory
- ✓ Difference between Checkpoint & Lazy writer

T-Log Architecture

- ✓ Transaction Log Logical Architecture
- ✓ Transaction Log Physical Architecture
- ✓ Recovery phases [Analysis, Redo & Undo]
- ✓ Checkpoint Operation
- ✓ Write-Ahead Transaction Log
- ✓ Managing T-log
- ✓ Truncating and shrinking the log file
- ✓ Managing T-Log issues by using DBCC commands

Module 2: Installing, Upgrading, Configuration, Managing services and Migration

SQL server 2012 Installation

- ✓ Planning the System/Pre-Requisites
- ✓ Installing SQL server 2008 R2 /2012
- ✓ Installing Analysis Services
- ✓ Installing & Configuring Reporting Services
- ✓ Best Practices on Installation
- ✓ Uninstalling SQL server
- ✓ Common Installation Issues

Upgrading to SQL server 2008 R2/2012

- ✓ Upgrading the server by applying service packs
- ✓ Upgrading the server by applying Hot fixes
- ✓ In-Place Vs. Side-by-Side upgradations
- ✓ Pre-Upgrade Checks/pre-requisites
- ✓ Upgrade advisor
- ✓ In-Place Upgradation from SQL server 2008 R2 to 2012
- ✓ Best Practices to follow while upgrading

Managing services

- ✓ Server/Engine Connectivity issues
- ✓ Security/Firewall access issues
- ✓ Starting and Stopping Services through Configuration manager
- ✓ Net Command
- ✓ Management Studio
- ✓ Start Up parameters
- ✓ Starting SQL server in single user mode
- ✓ Starting SQL server with minimal configuration
- ✓ Case study: Moving System databases from one location to another location.
- ✓ Case Study: Starting the SQL Server without tempdb

Configuring SQL Server 2012

- ✓ Configuring Network Protocols from SQL Server configuration manager
- ✓ Configuring Client Protocols from SQL Server configuration manager
- ✓ Dedicated Administrator Connection
- ✓ Enabling advanced features by using facets
- ✓ Connecting to DAC
- ✓ Configuring Database Mail
- ✓ Configuring Registered servers
- ✓ Configuring Central Management Servers [CMS]
- ✓ Querying data from different servers by using CMS
- ✓ Configuring other settings through SP_Configure
- ✓ Configuring Server memory settings
- ✓ Configuring Database Settings
- ✓ Tempdb configuration
- ✓ Best Practices on configuration tempdb & Database settings

Migrating SQL server

- ✓ Side-By- Side Migration Techniques
- ✓ Difference between in-place & Side by Side Migration/Upgradation
- ✓ Advantages/Disadvantages of In-Place to Side-by-Side
- ✓ Migrating Databases
 1. Migration by using Attach and Detach Method
 2. Migration by using Back and restore method
 3. Migration by using Copy Database Wizard
- ✓ Migrating Logins [Fixing Orphaned Users]
- ✓ Creating and migrating linked servers
- ✓ Migrating Jobs
- ✓ Data movement by using Import & Export wizard
- ✓ Migrating jobs & logins by using SSIS

Module 3: Security, Automation & Monitoring

Automating Administrative Tasks

- ✓ About SQL server Agent
- ✓ Creating Jobs, Alerts and Operators
- ✓ Scheduling the Jobs
- ✓ Working with Job activity Monitor
- ✓ Resolving failure Jobs
- ✓ Configuring Alert system in SQL server agent
- ✓ Best practices on job maintenance

Monitoring SQL Server

- ✓ The Goal of Monitoring
- ✓ Choosing the Appropriate Monitoring Tools
- ✓ Monitoring health status by using server Dashboard & DMV's
- ✓ Monitoring Job activities by job activity monitor
- ✓ Monitoring SQL Server process by server activity monitor
- ✓ Monitoring SQL Server Error Logs/Windows by log file viewer
- ✓ Best Practices on Monitoring

Security

- ✓ Security Principles & Authentications
- ✓ Server and Database Roles
- ✓ User-defined server roles
- ✓ Server and Database Principles
- ✓ Server & Database Securable
- ✓ Creating Logins and mapping Users to databases
- ✓ Creating Schemas & credentials
- ✓ Default Schema for Groups
- ✓ Enabling contained databases
- ✓ Creating users for contained databases
- ✓ Connecting to contained databases from SSMS
- ✓ Role permissions for CMS and SQL Server Agent
- ✓ Granting to Object level Permissions

- ✓ Best Practices on security

Module 4: Backup & Restore, High Availability & Replication

Backup & Restore:

- ✓ Recovery Models [Simple, Bulk-Logged & Full]
- ✓ How Backup Works
- ✓ Types of backups
 1. Full backup
 2. Diff backup
 3. T-log backup
 4. Copy Only
 5. Mirror
 6. Tail-Log
 7. Compressed backups
- ✓ Restoring Modes [With Recovery, No Recovery, Read only/Standby]
- ✓ Disaster Recovery Planning
- ✓ Performing Restore (point-in-time recovery)
- ✓ Partial availability of database.
- ✓ Database Recovery advisor
- ✓ Backup strategy: Developing and executing a Backup Plan
- ✓ Creating Maintenance Plans
- ✓ Resolving Backup failures in Real time scenarios
- ✓ Best Practices on Backup & Recovery

Log Shipping

- ✓ Log-Shipping Architecture
- ✓ Building DRS for log-shipping
- ✓ Pre-requisites/Log-Shipping Process
- ✓ Deploying Log Shipping
- ✓ Working with Log Shipping Monitor
- ✓ Logs hipping Role changing [Fail-Over]
- ✓ Removing Log Shipping
- ✓ Frequently Raised Errors In Log-Shipping

- ✓ Case study: How to add files to a log-shipped database
- ✓ Best Practices on Log-Shipping

Database Mirroring

- ✓ Overview of Database Mirroring
- ✓ Operating Modes in Database Mirroring
- ✓ Pre-Requisites for Database Mirroring
- ✓ Deploying Database Mirroring
- ✓ Fail-Over from Principle to Mirror
- ✓ Working with Database mirroring monitor
- ✓ Advantages & Disadvantages of database mirroring
- ✓ Database Snapshots
- ✓ Using Database Snapshots for reporting purposes.
- ✓ Case study on moving mirrored files
- ✓ Best practices on Mirroring

AlwaysOn Availability Groups

- ✓ AlwaysOn Overview
- ✓ Understanding Concepts and Terminology
- ✓ Availability Modes
- ✓ Types of fail-overs
- ✓ Pre-requisites for AlwaysOn configuration
- ✓ Configuring Availability Groups
- ✓ Monitoring Availability groups
- ✓ Add/remove database/replica
- ✓ Suspend/resume an availability database
- ✓ Backups on Secondary
- ✓ AlwaysOn Failover Cluster Instances
- ✓ Online Operations

Replication

- ✓ Replication Overview
- ✓ Replication Models (snapshot/Transactional/Merge/Peer to Peer)
- ✓ Replication agents
- ✓ Configuring Distributor
- ✓ Deploying Transactional Replication for High Availability
- ✓ Deploying Merge Replication for Bi-directional

- ✓ Creating Subscriptions [Homogeneous / heterogeneous]
- ✓ Monitoring Replication by using replication monitor
- ✓ Scripting & Removing Replication
- ✓ Best Practices on Replication
- ✓ Configuring peer to peer replication
- ✓ Frequently asked questions in replication

Module 5: Windows & SQL Server Clustering

Windows Server 2012 Clustering

- ✓ What is a cluster and Overview of Windows cluster
- ✓ Server cluster technologies
 1. Server clusters
 2. NLB clusters [Network load balancing]
- ✓ Basic architecture of server clusters
- ✓ Networks in clustering [Public & Private]
- ✓ How cluster works
- ✓ Health Detection [Looks alive, Is alive]
- ✓ Introduction to Windows Server 2012
- ✓ Basic elements of a cluster with single quorum.
- ✓ Adding Roles and features by using server manager
- ✓ Introduction to fail-over cluster manger
- ✓ Validating the cluster configuration
- ✓ Creating cluster through fail-over cluster manager
- ✓ Adding Nodes to the cluster [2/3 Node cluster]
- ✓ Configuring MSDTC as a cluster aware application
- ✓ Active - passive Vs Active - Active Clustering
- ✓ Adding/Evicting Nodes to/from the cluster
- ✓ Adding volumes to the roles/services in the cluster
- ✓ Simulating the failover for the resources
- ✓ Failing over the core cluster resources to the another node

Installing SQL Server 2012 Fail-Over Clustering

- ✓ Pre-SQL Server Installation Tasks.
- ✓ Configure SQL Server-Related Service Accounts and Service Account Security
- ✓ Stop Unnecessary Processes or Services
- ✓ Check for Pending Reboots
- ✓ Install SQL Server Setup Support Files
- ✓ SQL Server 2012 Setup
- ✓ Install the First Node
- ✓ Add Nodes to the Instance
- ✓ Perform Post installation Tasks
- ✓ Verify the Configuration
- ✓ Set the Preferred Node Order for Failover
- ✓ Configure a Static TCP/IP Port for the SQL Server Instance

Administering a SQL Server 2012 Failover Cluster

- ✓ Install SQL Server Service Packs, Patches, and Hot fixes
- ✓ Introducing Failover Cluster Management
- ✓ Monitoring the Cluster Nodes
- ✓ Adding volumes to cluster roles
- ✓ Clustered SQL Server Administration
- ✓ Fail over resources/roles between the nodes
- ✓ Automatic failover & Failback
- ✓ Destroying a Cluster- Using Failover Cluster Management
- ✓ Uninstalling a Failover Clustering Instance
- ✓ Best Practices on Clustering

High Availability: Interoperability and Coexistence

- ✓ Database Mirroring and Log Shipping
- ✓ Database Mirroring and Database Snapshots
- ✓ Database Mirroring and Failover Clustering
- ✓ Replication and Log Shipping
- ✓ Replication and Database Mirroring
- ✓ Failover Clustering and AlwaysOn Availability groups

Module 6: Performance Tuning, Indexing & Optimizing SQL Server

Optimizing SQL server

- ✓ Policy based management
- ✓ Policy based management implementation
- ✓ Creating Policy & Condition
- ✓ Evaluating polices
- ✓ Resource governor
- ✓ Resource pool & Workloads
- ✓ Using resource governor from SSMS
- ✓ Monitoring Resource governor
- ✓ Change data capture [CDC]
- ✓ Enabling CDC at Database and table level
- ✓ Compression techniques
- ✓ Data & Backup compression
- ✓ Row compression & Page compression
- ✓ Monitoring data compression
- ✓ Partitioning – A big picture
- ✓ Table and index partitioning
- ✓ Creating a partition function/schema

Indexing

- ✓ Index Architecture
- ✓ How to optimally take advantage of indexes
- ✓ Clustered & Non-Clustered indexes
- ✓ Covering Index or index with included column
- ✓ Creating covering indexes
- ✓ Filtered indexes
- ✓ Creating filtered indexes to minimize the CPU pressure
- ✓ Column store Index Overview
- ✓ Column store Index Fundamentals and Architecture
- ✓ Creating column store index to improve the performance
- ✓ Index Fragmentation
- ✓ How to determine fragmentation
- ✓ Creating maintenance plan for rebuilding/re-organizing indexes

- ✓ Best Practices on Indexing

Locking & Concurrency

- ✓ Isolation Levels in SQL Server
- ✓ Locking in SQL Server
- ✓ Resolving concurrency effects in SQL Server
- ✓ Lock modes – Shared, Update, Exclusive, Intent, Schema, bulk-update, key-range
- ✓ Lock escalation in SQL server
- ✓ Blocking [SP_Who2]
- ✓ Resolving blocking issues in SQL Server
- ✓ Working with Activity Monitor
- ✓ Live & Dead Locks
- ✓ Trace flags to capture dead locks
- ✓ Capturing dead lock information in error logs
- ✓ SQL Profiler [How to capture events data by using Profiler]
- ✓ Capturing deadlock events in profiler
- ✓ Deadlocks and deadlock chain detection.

Performance Tuning

- ✓ Factors That Impact Performance
- ✓ Tools used SQL Profiler, Database Tuning Advisor, System Monitor
- ✓ Introduction to Database Tuning Advisor [DTA]
- ✓ Analyzing the profiler data by using DTA
- ✓ Performance Monitor [System Monitor]
- ✓ Correlate SQL Profiler Data with Performance Monitor Data
- ✓ New Dynamic Management Views (DMV's)
- ✓ Best Practices on Performance Tuning
- ✓ Case Study A: Performance Counters Setup-Collect-Analyze
- ✓ Case Study B: Performance Counters-Thresholds
- ✓ Case study: Effects of MAXDOP query hint in SQL Server

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