Module: Database Administration using MS SQL Server 2012

Mode: Classroom **Duration:** 40hour

Course Outline:

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
  - o Primary data files
  - o Secondary data files
  - o 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 server2008 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 byusing 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 logshipped 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 Always On Availability Groups
• Always On Overview
• Understanding Concepts and Terminology
• Availability Modes
• Types of fail overs
• Pre requisites for Always On 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 Bidirectional
• 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, Hot fixes
• Introducing Failover Cluster Management
• Monitoring the Cluster Nodes
• Adding volumes to cluster roles
• Clustered SQL Server Administration
• Fail over resources/roles between thenodes
• 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 forrebuilding/re organizing indexes

• Best Practices on Indexing Locking & Concurrency
• Isolation Levels in SQL Server
• Locking in SQL Server
• Resolving concurrency effects in SQLServer
• 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 errorlogs
• SQL Profiler [How to capture events databy 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 hinting SQL Server