

**SQL Server 2012 Database Administration  
With AlwaysOn & Clustering Techniques**

## **Module: 1**

- **Architecture & Internals of SQL Server Engine**

## **Module: 2**

- **Installing, Upgrading, Configuration, Managing Services and Migration**

## **Module: 3**

- **Security, Automation & Monitoring**

## **Module: 4**

- **Backup & Restore, High Availability & Replication**

## **Module: 5**

- **SQL Server Clustering & AlwaysOn Availability Groups**

## **Module: 6**

- **Performance Tuning, Indexing & Optimizing SQL Server**

## **Module: 7**

- **Corporate Awareness & Handling the Environment**

# **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
  1. Primary data files
  2. Secondary data files
  3. 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
  1. Configuration manager
  2. Net Command
  3. 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

## **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 SQL Server Clustering & AlwaysOn Availability Groups**

### **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

## **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

## **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 policies
- 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

## **Module: 7 Corporate Awareness and handling the environment**

- Defining the process
- How they implement the security
- How they implement process by using CRM tools
- Knowledge on ticketing tools
- Succeeding the interviews.