



# OptimizeSQL<sup>TM</sup>

## Technologies

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## Microsoft SQL Server Database Administration

### Course Overview

- **This is 100% hands-on course; students will learn SQL Server database administration.**
- **Helps to prepare 70-462 Microsoft exams.**
- **We will discuss all the concepts with our on-premises data center**
- **This course will cover best practices for SQL Server high availability features and performance tuning.**

### Target Participants

- Working people, Students
- IT Professionals

### Learning Formats

- Class Room and Online

### Our Trainer (s)

This course is delivered by SQL Server expert and SME Mr. Kareem Syed. He has hands on working experience on various SQL Server versions and recent cloud platforms. Having 12+years hand on experience he is technical consultant for some of the MNCs. You can visit his blog at [www.sql-talk.com](http://www.sql-talk.com) for more details.

## Topic 1: Starting with SQL Server

- Responsibilities of Database Administrator
- Types of DBAs
- History of SQL Server -versions
- What's New in SQL Server 2005, 2008R2, 2012 and 2014 for Administrators?
- Tools and components of SQL Server
- SQL Server Services
  - Instance-aware Services
  - Instance-unaware Services
  - Start & Stopping Services
- Instances
  - Advantages of Instances
  - Types
    - Default Instance
    - Named Instances
- Requirements
  - Hardware
  - Software
- Installing SQL Server
  - Pre – installation steps
  - Installations
  - Viewing installation process with LOG files.
  - Adding or removing components.
- **Troubleshooting SQL Server installation common issues**

## Topic 2: Configuring SQL Server

- Why configuration?
  - Advantages
  - Main Configuration Features
- Configuration of
  - Configuring various Services.
  - Backup folders.
  - Configuring data file and log file paths.
  - Configuring ErrorLogs
  - Patching SQL Server
  - Remote connections
  - Tempdb Configurations
  - Memory configuration
  - Configuring max worker threads
  - Configuring DAC
  - Configuring service accounts
- **Case Study**
  - **Patching issues**
  - **Connectivity issues**
  - **How to rollback service packs**

## Topic 3: Working with Databases

- Working with databases.
  - System Defined databases
  - Moving system databases
  - Handling **TempDB** database.
- **Database Architecture.**
  - Data Files
  - Log Files
  - Filegroups
  - Extents
  - Pages –types
  - Page architecture
  - Tracking frees pace
- Transaction Log file architecture and common issues
- Creating Databases.
- Adding files, filegroups.
- **Case Study**
  - **Recovering suspect database**
  - **Moving system databases**
  - **Troubleshooting TempDB issues**
  - **Log file full – how to solve the problem.**
  - **Rebuilding system databases**

## Topic 4: Implementing Security.

- Security in SQL Server 2008 R2/2012/2014
- Security Enhancements
- Types of Authentications.
  - Windows Authentication
    - Creating logins from windows users and groups
    - Orphan logins.
  - SQL Server Authentication
    - Creating SQL logins and testing logins
- Setting authentication Mode Security Auditing.
- Understanding server roles. Working with users.
- Resolving orphan users.
- Working with
  - User defined roles
  - Contained databases
  - Auditing
  - Policy based management
- Understanding database roles, custom and application roles. Understanding permissions.
- Encryption and decryption.
- Working with certificates and schemas.
- Security catalog views and stored procedures.
- **Case Study**
  - Connecting to instance without login credentials
  - Resolving orphan users

## Topic 5: Backup and Restoration

- Understanding Transaction Log file.
- Understanding checkpoints & Lazy writer. Truncating log file.
- Recovery Models
  - Full
  - Bulk Logged
  - Simple
- Setting recovery model.
- Database Backups
  - Backup Types.
  - Full
  - Differential
  - Transaction Log
  - File or Filegroup
  - Copy-only, Mirrored, Split, Tail Log backups
- Performing Restoration
- Backup system databases.
- Compressions
  - Row Compression
  - Page Compression
  - Data Partitions
  - Table Compression via T-SQL
  - Compressing Backups
- Viewing complete details of backup process.

### Case Study

- **Recovering a crashed database.**
- **Common backup and restore issues.**

## Topic 6: Automating Administrative Tasks

- Working with Database Mail.
  - Mail architecture.
  - Configuring Profiles and Accounts
  - Sending Mail
- Configuring linked servers.
- Implementing Automation
  - Configuring SQL Server Agent.
  - Creating Operators, Alerts, Jobs
  - Managing jobs and resolving errors.
  - Monitoring jobs.
  - Auto alert when jobs are enabled, disabled or failed.
  - Database Snapshots.

### Case Study

- **Configuring TempDB growth alerts**
- **Configuring T.Log growth alerts**

## Topic 7: High Availability

- Introduction to High Availability.
- **Working with Log Shipping.**
  - Features
  - Log Shipping Architecture
  - Jobs
  - Requirements to implement Log Shipping. Configuring Log Shipping.
  - Monitoring Log Shipping.
  - Manually Performing Fail Over. Transferring logins.
  - Log shipping tables and stored procedures.
  - **Handling out of sync issues**
- **Working with Database Mirroring.**
  - Advantages
  - Architecture
  - Operating Modes
  - Servers involved in Mirroring
  - Requirements for Mirroring
  - Configuring
  - Monitoring
    - Using Mirroring Monitor
    - Using System Monitor
    - Using Profiler
    - Using System views and SPs.
  - Mirroring Fail Over
  - Mirroring system tables and stored procedures.
  - **Case Study**
    - **Handling suspect issues**
    - **How to patch mirrored instances**
    - **How to move mirrored database files**

## Topic 8: Replication

- Replication and advantages
- New features 2008 R2/ 2012/2014/2016
- Replication Entities
- Replication Architecture.
- Replication Agents.
- Types of Replications
- Configuring Replication
  - Snapshot Replication
  - Transactional Replication
  - Merge
- Peer to peer replication.
- Managing replication.
- Monitoring and Tuning Replication
- Case Study**
  - **Troubleshooting Primary Key violation error in Transactional Replication**
  - **Troubleshooting T.Log file growth issues.**
  - **Troubleshooting out of sync/ latency issues**

## Topic 9: SQL Server Performance Tuning

- **What is database maintenance and performance tuning**
- **SQL Server Architecture**
  - Layers of SQL Server architecture
  - Protocol Layer
  - Relational engine
  - Storage Engine
  - Buffer Cache
  - What is Lock and Latch
  - SQL Server background processes
  - Page Life Expectancy
- **Execution Plan Basics**
  - How plans are generated
  - Estimated execution plans
  - Actual execution plans
  - Check information about execution plans
  - When the plans are recompiled
  - Plan life time
  - How to remove execution plans
  - Events causing plans to remove from buffer cache
- **Working with indexes**
  - Table Scan
  - Index
  - Types of Index
    - Clustered
    - NonClustered
  - Index Management
    - Index Fragmentation
    - Index Reorganizing
    - Index Rebuilding
- **Statistics**
  - Statistics basics
  - How the statistics are created
  - How to check statistics
  - What is stale statistics?
  - How to update
  - Incremental Statistics in SQL Server 2014
  - Patching to clear statistics bugs
- Transactions and Locks
- Isolation Levels
- **Blocking and deadlocks in SQL Server**
- Tools
  - Profiler, DTA, Activity Monitor
- **Case Study**
  - **Troubleshooting slowly running queries  
Using DTA**

## Topic 10: Clustering SQL Server

- Introduction to cluster environment & features.

- Overview of Windows Clustering.
- How SQL Server supports clustering.
- Requirements
- Installing and configuring SQL Server clustering.
- Testing Failover
- Applying service packs and hot fixes.
- Active Passive and Active - Active Cluster
- Adding virtual disks
- **Troubleshooting cluster issues**

## **Topic 11: SQL Server 2012/2014 DBA Concepts**

- Introduction to SQL Server 2012 environment Always On (HA/DR) features
- Column Store Indexes Contained Databases
- User defined server roles. Database recovery advisor.
- New/Updated DMVs (Dynamic Management Views)Overview of Windows Clustering.
- Buffer pool extensions
- Resource Governor IO enhancements
- Delayed durability
- New cardinality estimation
- In Memory OLTP

## **Troubleshooting Covered in the program**

- Troubleshooting and Common Issues
  - CPU Issues
  - Memory Issues
  - IO Issues
  - Regular Wait tasks
  - Log file full Issue
  - Database Suspect issue
  - Backup failures
  - Troubleshooting Replication Issues
  - Troubleshooting Logshipping
  - Troubleshooting Mirroring
  - Troubleshooting Clustering
  - 2012 Always On Troubleshooting Issues
  - Troubleshooting Slow running Queries
  - Troubleshooting TempDB Issues
  - Monitor Buffer Pool
  - Monitor Buffer cache