

Microsoft SQL High Availability with Replication

Duration: 32 Hours (4 Days)

Course Overview

The Microsoft SQL High Availability with Replication course is designed to equip learners with the knowledge and skills necessary to implement and manage high availability and disaster recovery solutions in Microsoft SQL Server environments. The course covers a wide range of topics from the basics of High availability concepts and terminology to the implementation of advanced features like Always on Availability Groups and Windows Server Failover Clustering. Students will learn how to address various causes of downtime, plan for disaster recovery, and understand key objectives such as Recovery Time Objective (RTO), Recovery Point Objective (RPO), and Recovery Level Objective (RLO). The course includes both theoretical lessons and practical labs, allowing learners to gain hands-on experience with SQL Server's high availability features such as Log shipping, Database mirroring, and replication strategies like transactional and merge replication. By the end of the course, participants will have a solid understanding of how to ensure SQL Server instances are highly available, how to monitor and troubleshoot availability groups, and how to maintain system performance. This knowledge is invaluable for database professionals looking to enhance their skill sets and ensure the stability and reliability of their organization's data infrastructure.

Audience Profile

The Microsoft SQL High Availability with Replication course is designed for IT professionals focused on database and server management.

- Database Administrators
- IT Infrastructure Engineers
- Systems Administrators
- SQL Server Database Developers
- Disaster Recovery Specialists
- Data Architects
- IT Consultants specializing in Microsoft technologies
- Technical Support & Maintenance Personnel
- Business Intelligence Professionals
- Database Managers
- IT Professionals preparing for Microsoft Certification exams related to SQL Server
- Cloud Solutions Architects working with SQL on cloud platforms

Course Syllabus

Module 1: Introduction

This module provides an overview of the course and its objectives.

Lessons

- Course Introduction

Learning Outcomes

After completing this module, students will be able to:

- Understand the course objectives and structure.

Module 2: Always-On and High-Availability Concepts and Terminology

This module introduces key concepts and terminology used in high-availability systems.

Lessons

- Concepts and Terminology
- Table of Availability
- High Availability
- Causes of Downtime
- Planned Downtime
- Unplanned Downtime
- Disaster Recovery
- Recovery Time Objective (RTO)
- Recovery Point Objective (RPO)
- Recovery Level Objective (RLO)
- Storage Area Networks (SAN)
- SQL Server Edition Changes:
- SQL Server 2012
- SQL Server 2014
- SQL Server 2016
- Legacy Solutions:
- Failover Cluster Instances
- Log Shipping and Typical Configuration
- Monitor Server
- Replication
- Database Mirroring and Terminology
- Principal
- Mirror
- Witness
- Database Snapshots
- Limitations of Legacy Solutions
- Introduction to Always On
- Table of Always On Comparison

Learning Outcomes

After completing this module, students will be able to:

- Understand high-availability terminology.
- Identify changes in SQL Server 2014 and SQL Server 2016.
- Understand the role of SANs in high availability.

Module 3: Windows Server 2016 Failover Clustering

This module covers failover clustering, a critical feature of Always On High Availability.

Lessons

- Understanding Failover Clustering in Windows Server 2016

- Stateful High-Availability Solution
- Features of Failover Clustering:
- Supported in both Standard and Datacenter editions
- Hardware and software prerequisites
- Shared Storage
- Quorum Configurations:
- Node Majority
- Node and Disk Majority
- Node and File Share Majority
- No Majority
- Cluster Network Best Practices:
- Connection to nodes and shared storage
- Private network for internal cluster communication
- Public network for client connections
- Cluster Aware Updating
- Virtual Machine Failover Clustering
- Preferred Owners, Failover, and Failback
- Cluster Resources and Dependencies
- Heartbeat Mechanism

Labs

- Set up iSCSI Server
- Install iSCSI VMs
- Add Servers to Server Manager for Easy Management
- Add the Windows Cluster Feature to SQL1, SQL2, and SQL3
- Create iSCSI Initiators for Shared Storage
- Create a Windows Cluster
- Add a Clustered Service
- Test Failover of a Windows Service
- Examine Quorum Settings

Learning Outcomes

After completing this module, students will be able to:

- Set up iSCSI and shared storage.
- Configure and manage Windows Server Failover Clusters.
- Understand quorum and failover principles.

Module 4: SQL 2016 Failover Cluster Instances

This module transitions from general failover clustering to SQL-specific clustering.

Lessons

- Understanding Failover Cluster Instances (FCI)
- How FCIs Appear to Clients

Labs

- Create a Configuration File Using the Advanced Cluster Preparation Wizard

- Complete the SQL Cluster Installation on SQL1
- Install Clusters on SQL2 and SQL3
- Test the SQL Cluster

Learning Outcomes

After completing this module, students will be able to:

- Test and configure SQL Clusters.
- Use configuration files effectively.

Module 5: SQL 2016 Always-On Availability Groups

This module focuses on availability groups and their enhancements in SQL Server 2016.

Lessons

- Availability Groups and Replicas:
- Primary Replica
- Secondary Replicas
- Availability Group Listener
- Availability Modes:
- Synchronous Commit Mode
- Asynchronous Commit Mode
- Failover Modes:
- Automatic Failover (with no data loss)
- Manual Failover

Labs

- Create a SQL Instance for the Availability Group
- Enable the AlwaysOn Availability Group Feature
- Set Up Availability Groups
- Use the Availability Group Wizard
- Work with SSMS and Availability Groups

Learning Outcomes

After completing this module, students will be able to:

- Enable and configure AlwaysOn Availability Groups.
- Manage failover and replicas.

Module 6: The Dashboard

This module demonstrates managing AlwaysOn High Availability Groups using the Dashboard.

Lessons

- Introduction to the Dashboard
- Viewing Logs
- Using Replication with Logins
- Using Partially Contained Databases

Labs

- Explore the Dashboard
- Replicate Logins and Jobs
- Configure Contained or Partially Contained Databases

Learning Outcomes

After completing this module, students will be able to:

- Navigate the Dashboard for management tasks.
- Perform login and job replication.

Module 7: Active Secondary Availability Group Actions

This module covers actions related to active secondary SQL within availability groups.

Lessons

- Reporting with Secondary Replicas
- Configuring Readable Secondaries
- Read-Only Routing and Load Balancing
- Backups with Secondary Replicas

Labs

- Configure a Read-Only Secondary Replica
- Perform Database Backups Using Secondary Replicas

Learning Outcomes

After completing this module, students will be able to:

- Configure read-only replicas.
- Perform backups using secondary replicas.

Module 8: Maintenance

This module explores maintenance tasks for AlwaysOn High Availability Groups.

Lessons

- DBCC Checks
- Adding and Removing Databases and Replicas

Labs

- Add and Remove Databases
- Add and Remove Replicas

Learning Outcomes

After completing this module, students will be able to:

- Perform database and replica maintenance tasks.

Module 9: Monitoring and Troubleshooting Availability Groups

This module teaches monitoring and troubleshooting skills for clusters and availability groups.

Lessons

- Dashboard in Depth
- Events and Policy-Based Management

Labs

- Use Dashboard Wizards
- Create Extended Event Sessions
- Use T-SQL for Management Tasks
- Implement Policy-Based Management

Learning Outcomes

After completing this module, students will be able to:

- Monitor availability groups.
- Implement policy-based management.

Module 10: Replication

This module introduces replication techniques.

Lessons

- Transactional Replication
- Merge Replication

Module 11: Performance Monitoring

This module covers tools and techniques for monitoring performance.

Lessons

- Using DMVs
- Dashboard Metrics
- Performance Monitor Counters