

## Course 55246-A: SQL 2016 Always On High Availability

### Course Outline

#### **Module 1: Introduction**

This module explains the course and objectives.

##### **Lessons**

- Course introduction

After completing this module, students will be able to:

- Course introduction

#### **Module 2: ALWAYS ON AND HIGH AVAILABILITY CONCEPTS AND TERMINOLOGY**

This module will introduce the participants to the concepts and terminology used in the course.

##### **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)
- Edition Changes from SQL 2012
- SQL Server 2014 Changes
- SQL Server 2016 Changes
- Legacy Solutions prior to Always On
- Failover Cluster Instances

- Log Shipping
- A Typical Log Shipping Configuration
- Monitor Server
- Replication
- Database Mirroring
- Database Mirroring Terminology
- Principle
- Mirror
- Witness (red box in image above)
- Database Snapshots
- Limitations of legacy solutions:
- What do we mean by Always On?
- Table of Always On Comparison

After completing this module, students will be able to:

- Terminology
- SQL 2014 Changes
- SQL2016 Changes
- Understand the role of the SANS

### **Module 3: WINDOWS SERVER 2016 FAILOVER CLUSTERING**

Failover clustering is covered in this module and is a critical feature of Always On High Availability.

#### **Lessons**

- Understanding Failover Clustering in Server 2016
- Statefull High Availability Solution
- Supported in both Standard and Datacenter
- Servers should run similar hardware
- Should run same edition
- Hyper-V best with datacenter
- Certified for Windows server logo
- Shared Storage

- Quorums
- Node Majority
- Node and Disk Majority configuration:
- Node and File Share Majority
- No Majority
- Configuration
- Cluster Networks Best Practices
- Connection to nodes to shared storage
- Private network for internal cluster
- Public network for client connections
- Cluster Aware Updating
- Virtual Machine Failover Clustering
- Preferred Owners
- Failover Failback
- Resources
- Dependences
- Heartbeat

**Lab : Set up iSCSI Server**

**Lab : Install the iSCSI VMS**

**Lab : Add Servers to Server Manager for Ease of Management**

**Lab : Add the Windows Cluster Feature to SQL1, SQL2 And SQL3**

**Lab : Create the iSCSI Initiators to add the shared storage**

**Lab : Create the Windows Cluster**

**Lab : Add a Clustered Service**

**Lab : Test The Failover Of The Windows Service**

**Lab : Delete Role**

**Lab : Examine the Quorum Settings**

After completing this module, students will be able to:

- iSCSI Setup

- Work with Roles
- Understand Quorums
- Understand Windows Failover
- Understand Cluster Service
- Understand Preferred Owners
- Understand Node Majority

#### **Module 4: SQL 2016 FAILOVER CLUSTER INSTANCES**

In this module we move from the generic failover clustering to the specifics involving SQL.

##### **Lessons**

- Failover Cluster Instance
- As A FCI Appears to A Client

**Lab : Create A Configuration File By Running The Advanced Cluster Preparation Wizard**

**Lab : Complete The SQL Cluster Installation On SQL1**

**Lab : Install The Cluster On SQL2 And SQL3**

**Lab : Test the SQL Cluster**

After completing this module, students will be able to:

- Cluster Testing
- Understand Configuration Files
- Install Clusters

#### **Module 5: SQL 2016 ALWAYS ON AVAILABILITY GROUPS**

Within the failover clusters of SQL are the concept of Availability groups and their enhancements with the release of SQL 2016 which is the focus of this module.

##### **Lessons**

- Availability Groups and Replicas
- Primary Replica
- Secondary Replicas
- Availability Group Listener
- Availability Mode
- Synchronous Commit Mode

- Asynchronous Commit Mode
- Failover Modes
- Automatic Failover Without Data Loss
- Automatic Failover Requirements:
- Manual
- Manual Failover Requirements
- Common Topologies

**Lab : Create a SQL Instance For The Availability Group**

**Lab : Enable the SQL Server Always On Availability Group Feature**

**Lab : Set Up For Availability Groups**

**Lab : The Availability Group Wizard**

**Lab : SSMS and Availability Groups**

After completing this module, students will be able to:

- Enable Always On
- Understand and work with availability Groups

## **Module 6: The Dashboard**

Managing Always On High Availability groups with SQL 2016 is accomplished with the Dashboard. This module will demonstrate the skills necessary for the accomplishment of the management tasks.

### **Lessons**

- The Dashboard
- How to view logs
- Using replication with Logins
- Using partially contained databases

**Lab : The Dashboard**

**Lab : Replicating Logins and Jobs**

**Lab : Contained or Partially Contained Databases**

After completing this module, students will be able to:

- Understand the Dashboard
- Perform Logon and Job replication

## **Module 7: Active Secondary Availability Group Actions**

Within Availability groups you may have Active secondary SQL which is covered and demonstrated in this module.

### **Lessons**

- Reporting with Secondary Replicas
- Configuring a Readable secondary
- Read-Only Routing
- Load Balancing
- Lab: Configure a Read-Only Secondary
- Database Backups with Secondary
- Steps of Backup Using secondary
- Backup Preference Options

### **Lab : Database Backup Using Secondary Replica**

### **Lab : Configure a Read-Only secondary**

After completing this module, students will be able to:

- Perform backups with Secondary Replicas
- Configure a Read-Only Replica

## **Module 8: Maintenance**

In this module you explore maintenance procedures for Always On High Availability Groups.

### **Lessons**

- DBCC Checks
- Database Adding and Removing

### **Lab : Add a Database**

### **Lab : Remove a Database**

### **Lab : Add a Replica**

### **Lab : Remove a Replica**

After completing this module, students will be able to:

- Add and Remove Databases
- Add and Remove Replicas

## **Module 9: MONITORING AND TROUBLESHOOTING AVAILABILITY GROUPS**

In this the final module you will learn how to monitor the clusters and Availability groups and various common troubleshooting procedures.

### **Lessons**

- The Dashboard in Depth
- Events
- Policy Based Management for Availability Groups

### **Lab : Dashboard Wizards**

### **Lab : Create an Extended Event Session**

### **Lab : Using T-SQL**

### **Lab : Policy based management for Availability Groups**

### **Lab : Observe a Policy In Action**

### **Lab : Create Three Conditions To Be Used In The RTO And RPO Policies**

### **Lab : Create Two Policies RTO and RPO**

### **Lab : Test The Policies**

### **Lab : Change Endpoint Owner**

- Migrating Settings by using Windows Easy Transfer
- Configuring a Reference Image of Windows 7
- Configuring a Reference Image

After completing this module, students will be able to:

- Change Owners
- Work with Policies
- Work with Extended Events