

# Upgrading Your Skills to MCSA: Windows Server 2016

## **Audience Profile:**

Candidates for this exam are IT professionals who implement the Windows Server 2016 core infrastructure services.

Candidates have already earned an MCSA: Windows Server 2008 or MCSA: Windows Server 2012 R2 certification. This exam covers key aspects of installation, storage, compute, networking, and identity functionality available in Windows Server 2016.

**Note: This document shows tracked changes that are effective as of November 9, 2017.**

## **Install Windows Servers in Host and Compute Environments**

### **Install, upgrade, and migrate servers and workloads**

Determine Windows Server 2016 installation requirements; determine appropriate Windows Server 2016 editions per workloads; install Windows Server 2016; install Windows Server 2016 features and roles; install and configure Windows Server Core; manage Windows Server Core installations using Windows PowerShell, command line, and remote management capabilities; implement Windows PowerShell Desired State Configuration (DSC) to install and maintain integrity of installed environments; perform upgrades and migrations of servers and core workloads from Windows Server 2008 and Windows Server 2012 to Windows Server 2016; determine the appropriate activation model for server installation, such as Automatic Virtual Machine Activation (AVMA), Key Management Service (KMS), and Active Directory-based Activation

### **Install and configure Nano Server**

Determine appropriate usage scenarios and requirements for Nano Server; install Nano Server; implement Roles and Features on Nano Server; [use Nano Server Image Builder](#), manage and configure Nano Server; manage Nano Server remotely using [MMC](#), Windows PowerShell, [and Server Management Tools](#)

### **Create, manage, and maintain images for deployment**

Plan for Windows Server virtualization; [plan for Linux and FreeBSD deployments](#); assess virtualization workloads using the Microsoft Assessment and Planning (MAP) Toolkit; determine considerations for deploying workloads into virtualized environments; update images with patches, hotfixes, [last cumulative updates](#) and drivers; install roles and features in offline images; manage and maintain Windows Server Core, Nano Server images, and VHDs using Windows PowerShell

## Implement Storage Solutions

### Implement [sServer](#) [sStorage](#)

Configure storage pools; implement simple, mirror, and parity storage layout options for disks or enclosures; expand storage pools; configure Tiered Storage; configure iSCSI target and initiator; configure iSNS; configure Datacenter Bridging (DCB); configure Multi-Path IO (MPIO); determine usage scenarios for Storage Replica; implement Storage Replica for server-to-server, cluster-to-cluster, and stretch cluster scenarios

### Implement [dData](#) [dDeduplication](#)

Implement and configure Deduplication; determine appropriate usage scenarios for Deduplication; monitor Deduplication; implement a backup and restore solution with Deduplication

## Implement Hyper-V

### Install and configure Hyper-V

Determine hardware and compatibility requirements for installing Hyper-V; install Hyper-V; install management tools; upgrade from existing versions of Hyper-V; delegate virtual machine management; perform remote management of Hyper-V hosts; [configure virtual machines](#) using Windows PowerShell Direct; implement nested virtualization

### Configure virtual machine (VM) settings

Add or remove memory in [a running a](#) VM; configure dynamic memory; configure Non-Uniform Memory Access (NUMA) support; configure smart paging; configure Resource Metering; manage Integration Services; create and configure Generation 1 and 2 VMs and determine appropriate usage scenarios; implement enhanced session mode; create Linux and FreeBSD VMs; install and configure Linux Integration Services (LIS); install and configure FreeBSD Integration Services (BIS); implement Secure Boot for Windows and Linux environments; move and convert VMs from previous versions of Hyper-V to Windows Server 2016 Hyper-V; export and import VMs; implement Discrete Device Assignment (DDA); [Troubleshoot VM configuration versions](#)

### Configure Hyper-V storage

Create VHDX files using Hyper-V Manager; create shared VHDX files; configure differencing disks; modify virtual hard disks; configure pass-through disks; resize a virtual hard disk; manage checkpoints; implement production checkpoints; implement a virtual Fibre Channel adapter; configure storage Quality of Service (QoS)

### Configure Hyper-V networking

Add and remove virtual network interface cards (vNICs); configure Hyper-V virtual switches; optimize network performance; configure MAC addresses; configure network isolation; configure synthetic and legacy virtual network adapters; configure NIC teaming in VMs; configure virtual machine queue (VMQ); enable Remote Direct Memory Access (RDMA) on network adapters bound to a Hyper-V virtual switch using Switch Embedded Teaming (SET); configure Bandwidth Management

## Implement Windows Containers

### Deploy Windows containers

Determine installation requirements and appropriate scenarios for Windows Containers; install and configure Windows Server container host in physical or virtualized environments; install and configure Windows Server container host to Windows Server Core or Nano Server in a physical or virtualized environment; install Docker on Windows Server and Nano Server; configure Docker ~~daemon~~-start-up options; [install PowerShell for Docker](#); ~~configure Windows PowerShell for use with containers~~; install a base ~~operating system~~container image; tag an image; ~~uninstall an operating system imageremove a container~~; create Windows Server containers; create Hyper-V containers

### **Manage Windows containers**

Manage Windows containers [by using Docker CLI and PowerShell for Docker](#)~~using the Docker daemon~~; ~~manage Windows containers using Windows PowerShell~~; manage container networking; manage container data volumes; manage Resource Control; create new container images using Dockerfile; manage container images using DockerHub repository for public and private scenarios; manage container images using Microsoft Azure

### **Implement High Availability**

#### **Implement high availability and disaster recovery options in Hyper-V**

Implement Hyper-V Replica; implement Live Migration ~~including~~; ~~implement~~ shared nothing Live Migration; configure CredSSP or Kerberos authentication protocol for Live Migration; implement storage migration

#### **Implement failover clustering**

Implement Workgroup, Single, and Multi Domain clusters; configure quorum; configure cluster networking; restore single node or cluster configuration; configure cluster storage; implement Cluster-Aware Updating; implement Cluster Operating System Rolling Upgrade; configure and optimize cluster~~ed~~ shared volumes (CSVs); configure clusters without network names; implement Scale-Out File Server (SoFS); determine different scenarios for the use of SoFS vs. ~~clustered~~ File Server [for general use](#); determine usage scenarios for implementing guest clustering; implement a Clustered Storage Spaces solution using Shared SAS storage enclosures; implement Storage Replica; implement Cloud Witness; implement VM resiliency; implement shared VHDX as a storage solution for guest clusters

#### **Implement Storage Spaces Direct**

Determine scenario requirements for implementing Storage Spaces Direct; enable Storage Spaces ~~D~~irect using Windows PowerShell; implement a disaggregated Storage Spaces Direct scenario ~~in a cluster~~; implement a hyper-converged Storage Spaces Direct scenario ~~in a cluster~~

#### **Manage failover clustering**

Configure role-specific settings, including continuously available shares; configure VM monitoring; configure failover and preference settings; implement stretch and site-aware failover clusters; enable and configure node fairness

#### **Manage VM movement in clustered nodes**

Perform live migration; perform quick migration; perform storage migration; import, export, and copy VMs; configure VM network health protection; configure drain on shutdown

### **Implement Domain Name System (DNS)**

#### **Install and configure DNS servers**

Determine DNS installation requirements; determine supported DNS deployment scenarios on Nano Server; install DNS; configure forwarders; configure Root Hints; configure delegation; implement DNS policies; ~~implement DNS global settings~~[Configure DNS Server settings](#) using Windows PowerShell; configure Domain Name System Security Extensions (DNSSEC); configure DNS Socket Pool; configure cache locking; enable Response Rate Limiting; configure DNS-based Authentication of Named Entities (DANE); configure DNS logging; configure delegated administration; configure recursion settings; implement DNS performance tuning; configure global settings ~~using Windows PowerShell~~

### **Implement and Maintain IP Address Management (IPAM)**

~~Provision IPAM manually or by using Group Policy; configure server discovery; create and manage IP blocks and ranges; monitor utilization of IP address space; migrate existing workloads to IPAM; configure IPAM database storage using SQL Server; determine scenarios for using IPAM with System Center Virtual Machine Manager for physical and virtual IP address space management; manage DHCP server properties using IPAM; configure DHCP scopes and options; configure DHCP policies and failover; manage DNS server properties using IPAM; manage DNS zones and records; manage DNS and DHCP servers in multiple Active Directory forests; delegate administration for DNS and DHCP using role-based access control (RBAC); audit the changes performed on the DNS and DHCP servers; audit the IPAM address usage trail; audit DHCP lease events and user logon events~~

### **Implement IP Address Management (IPAM)**

#### **Install and configure IPAM**

~~Provision IPAM manually or by using Group Policy; configure server discovery; create and manage IP blocks and ranges; monitor utilization of IP address space; migrate existing workloads to IPAM; configure IPAM database storage using SQL Server; determine scenarios for using IPAM with System Center Virtual Machine Manager for physical and virtual IP address space management~~

#### **Manage DNS and DHCP using IPAM**

~~Manage DHCP server properties using IPAM; configure DHCP scopes and options; configure DHCP policies and failover; manage DNS server properties using IPAM; manage DNS zones and records; manage DNS and DHCP servers in multiple Active Directory forests; delegate administration for DNS and DHCP using role-based access control (RBAC)~~

### **Implement Network Connectivity and Remote Access Solutions**

#### **Implement virtual private network (VPN) and DirectAccess solutions**

Implement remote access and site-to-site (S2S) VPN solutions using remote access gateway; configure different VPN protocol options; configure authentication options; configure VPN reconnect; create and configure connection profiles; determine when to use remote access VPN and site-to-site VPN and configure appropriate protocols; install and configure DirectAccess; implement server requirements; implement client configuration; troubleshoot DirectAccess

### **Implement an Advanced Network Infrastructure**

### **Implement high performance network solutions**

Implement NIC Teaming or the Switch Embedded Teaming (SET) solution and identify when to use each; enable and configure Receive Side Scaling (RSS); enable and configure network Quality of Service (QoS) with Data Center Bridging (DCB); enable and configure SMB Direct on Remote Direct Memory Access (RDMA) enabled network adapters; ~~enable and~~ configure SMB Multichannel; enable and configure virtual Receive Side Scaling (vRSS) on a Virtual Machine Queue (VMQ) capable network adapter; enable and configure Virtual Machine Multi-Queue (VMMQ); enable and configure Single-Root I/O Virtualization (SR-IOV) on a supported network adapter

### **Determine scenarios and requirements for implementing Software Defined Networking (SDN)**

Determine deployment scenarios and network requirements for deploying SDN; determine requirements and scenarios for implementing Hyper-V Network Virtualization (HNV) using Network Virtualization Generic Route Encapsulation (NVGRE) encapsulation or Virtual Extensible LAN (VXLAN) encapsulation; determine scenarios for implementation of Software Load Balancer (SLB) for North-South and East-West load balancing; determine implementation scenarios for various types of Windows Server Gateways, including L3, GRE, and S2S, and their use; determine requirements and scenarios for ~~distributed-Datacenter~~ firewall policies and network security groups

## **Install and Configure Active Directory Domain Services (AD DS)**

### **Install and configure domain controllers**

Install a new forest; add or remove a domain controller from a domain; upgrade a domain controller; install AD DS on a Server Core installation; install a domain controller from Install from Media (IFM); resolve DNS SRV record registration issues; configure a global catalog server; transfer and seize operations master roles; install and configure a read-only domain controller (RODC); configure domain controller cloning

## **Implement identity federation and access solutions**

### **Install and configure Active Directory Federation Services (AD FS)**

Upgrade and migrate previous AD FS workloads to Windows Server 2016; implement claims-based authentication, including Relying Party Trusts; configure authentication policies; configure multi-factor authentication; implement and configure device registration; integrate AD FS with Microsoft Passport; configure for use with Microsoft Azure and Office 365; configure AD FS to enable authentication of users stored in LDAP directories

### **Implement Web Application Proxy (WAP)**

Install and configure WAP; implement WAP in pass-through mode; implement WAP as AD FS proxy; integrate WAP with AD FS; configure AD FS requirements; publish web apps via WAP; publish Remote Desktop Gateway applications; configure HTTP to HTTPS redirects; configure internal and external Fully Qualified Domain Names (FQDNs)