**Microsoft System Center**

Guide to System Center Management Pack for Windows Server 2016 Operating System

Microsoft Corporation

Published: January 2016

If you have an idea or suggestion about this management pack, the Operations Manager team encourages you to share it at the [SCOM Feedback site](http://systemcenterom.uservoice.com/forums/293064-general-operations-manager-feedback/filters/top).

Copyright

Information in this document, including URL and other Internet Web site references, is subject to change without notice. Unless otherwise noted, the companies, organizations, products, domain names, e-mail addresses, logos, people, places, and events depicted in examples herein are fictitious. No association with any real company, organization, product, domain name, e-mail address, logo, person, place, or event is intended or should be inferred. Complying with all applicable copyright laws is the responsibility of the user. Without limiting the rights under copyright, no part of this document may be reproduced, stored in or introduced into a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording, or otherwise), or for any purpose, without the express written permission of Microsoft Corporation.

Microsoft may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from Microsoft, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.

© 2013 Microsoft Corporation. All rights reserved.

Microsoft, and MS-DOS, Windows, Windows Server, and Active Directory are trademarks of the Microsoft group of companies. All other trademarks are property of their respective owners.

Revision History

|  |  |
| --- | --- |
| Release Date | Changes |
| August 2015 | Original release of this guide for Windows Server Technical Preview Management Pack (version 6.0.7298.0). |
| December 2015 | * Various versioning and naming changes correlated with “Windows Server Technical Preview” to “Windows Server 2016” Management Pack rebranding.
* Added topic “Changes in version 10.0.0.0”.
* Updated Revision History.
 |
| December 2015 | * Added topic “Changes in version 10.0.1.0”.
* Updated Revision History.
 |
| January 2016 | * Added topic “Changes in version 10.0.2.0”.
* Updated Revision History.
 |

**Contents**

[System Center Management Pack for the Windows Server 2016 Operating System 4](#_Toc440904985)

[Document Version 4](#_Toc440904986)

[Getting the Latest Management Pack and Documentation 4](#_Toc440904987)

[Changes in version 10.0.2.0 4](#_Toc440904988)

[Changes in version 10.0.1.0 5](#_Toc440904989)

[Changes in version 10.0.0.0 5](#_Toc440904990)

[Supported Configurations 5](#_Toc440904991)

[Getting Started 5](#_Toc440904992)

[Before You Import the Management Pack 5](#_Toc440904993)

[How to Import Management Pack for Windows Server 2016 Operating System 7](#_Toc440904994)

[Create a New Management Pack for Customizations 7](#_Toc440904995)

[Optional Configuration 7](#_Toc440904996)

[Monitoring Physical Disks and Disk Partitions 7](#_Toc440904997)

[Monitoring Logical and Physical Disks 8](#_Toc440904998)

[Management Processors (Windows Server 2016) 10](#_Toc440904999)

[Monitoring Network Adapter 13](#_Toc440905000)

[Monitoring Memory Utilization 14](#_Toc440905001)

[Probe Module: IsFeatureInstalled 14](#_Toc440905002)

[Security Considerations 15](#_Toc440905003)

[Low-Privilege Environments 15](#_Toc440905004)

[Computer Groups 16](#_Toc440905005)

[Objects the System Center Management Pack for Windows Server 2016 Operating System Discovers 16](#_Toc440905006)

[Classes 17](#_Toc440905007)

[How Health Rolls Up 18](#_Toc440905008)

[Key Monitoring Scenarios 20](#_Toc440905009)

[Troubleshooting 23](#_Toc440905010)

[Appendix: Windows Server 2016 Rules, and Monitors Disabled by Default 23](#_Toc440905011)

# System Center Management Pack for the Windows Server 2016 Operating System

The System Center Management Pack for Windows Server 2016 Operating System consists of the following management packs: Microsoft Windows Server 2016 Discovery, Microsoft Windows Server 2016 Monitoring, Microsoft Windows Server Library, Microsoft Windows Server Reports, and Microsoft Windows Server Cluster Shared Volume Monitoring. The Microsoft Windows Server management packs monitor the performance, health, and availability of Windows Server 2016.

By detecting, alerting on, and automatically responding to critical events and performance indicators, management packs reduce resolution times for issues and increase the overall availability and performance of your Windows Server 2016 operating system, thereby helping to reduce the total cost of ownership.

For information about System Center 2012 Operations Manager, see [Microsoft System Center 2012 - Operations Manager](http://go.microsoft.com/fwlink/?LinkID=246684) in the TechNet Library.

## Document Version

This guide was written based on 10.0.2.0 version of the Management Pack for Windows Server 2016 Operating System.

## Getting the Latest Management Pack and Documentation

You can find the Management Pack for Windows Server 2016 Operating System on the [Download Center](http://go.microsoft.com/fwlink/?LinkId=717060).

## Changes in version 10.0.2.0

* Updated Microsoft.Windows.Server.ClusterSharedVolumeMonitoring.ClusterSharedVolume.Monitoring.State monitor alert properties and description. The fix resolved property replacement failure warning being generated on monitor alert firing.

## Changes in version 10.0.1.0

* Script code migration to PowerShell for Windows Server 2016 Nano support

## Changes in version 10.0.0.0

* “Windows Server Technical Preview” to “Windows Server 2016” versioning and naming rebranding changes
* MP used to discover physical CPU, which performance monitor instance name property was not correlated with Windows PerfMon object (expecting instance name in (socket, core) format). That affected related rules and monitors. With this release, MP discovers logical processors, rather than physical, and populates performance monitor instance name in proper format
* Network Adapter performance counters were not collected with accompanying event, and not able to resolve counter instance issue posted to event log; fixed with this release

## Supported Configurations

The System Center Management Pack for Windows Server 2016 Operating System is designed to monitor the following versions of the base operating system:

* Windows Server 2016

Support for these operating systems is also subject to Microsoft’s overall support lifecycle (<http://go.microsoft.com/fwlink/?Linkid=26134>).

All the management packs are supported on System Center 2012, System Center 2012 R2 and System Center 2016 Operations Manager.

## Getting Started

This section provides information about importing System Center Management Pack for Windows Server 2016 Operating System files.

### Before You Import the Management Pack

Before you import the System Center Management Pack for Windows Server 2016 Operating System, mind the following:

* The Management Pack for Windows Server Operating System provides the fundamental monitoring basics for monitoring computers running the Microsoft Windows operating system and Windows-based applications. You should import the Management Pack for Windows Server Operating System before using any other management packs such as Microsoft SQL Server, Active Directory Domain Services (AD DS), and Internet Information Services (IIS).
* This management pack includes newer versions of Windows Server Library and Windows Server 2016 management pack.
* **Importan**t: Please note that you have to import Windows Server OS Library MP (Microsoft.Windows.Server.Library.mp) before importing other Windows Server OS MP files!

Files in This Management Pack

To monitor a Windows Server 2016 operating system by using System Center Operations Manager, you must first download the System Center Management Pack for Windows Server 2016 Operating System from the Management Pack Catalog, located at <http://go.microsoft.com/fwlink/?LinkId=82105>. The Management Pack for Windows Server 2016 Operating System includes the following files:

* Microsoft.Windows.Server.2016.Discovery.mp: Displayed as “Windows Server 2016 Operating System (Discovery)”.This management pack discovers Windows Server 2016 specific classes. This management pack is a prerequisite for Windows Server 2016 management pack, and is required by other management packs that focus their monitoring on systems running Windows Server 2016 specifically.
* Microsoft.Windows.Server.2016.Monitoring.mp: Displayed as “Windows Server 2016 Operating System (Monitoring)“. This management pack defines the rules, monitors, views, tasks, and reports that are used for monitoring the Windows Server 2016 Operating System.
* Microsoft.Windows.Server.Library.mp: Displayed as “Windows Server Operating System Library,” this management pack is the library management pack that defines all of the features and components that are common to all versions of the Windows Server operating systems. This management pack contains no monitoring configuration and is a prerequisite for all other Windows Server operating system management packs. Therefore, this management pack must be imported at the same time or prior to the version-specific management packs.
* Microsoft.Windows.Server.ClusterSharedVolumeMonitoring.mp: Displayed as “Windows Server Cluster Shared Volume Monitoring,” this management pack defines the rules, monitors, views, tasks, and reports that are used for monitoring Cluster Shared Volumes on Windows Server 2016 operating systems.
* Microsoft.Windows.Server.Reports.mp: Displayed as “Windows Server Operating System Reports,” this management pack defines reports on Windows Server operating systems.

Recommended Additional Management Packs

You should import the System Center Management Pack for Windows Server Operating System before using any other management packs, such as Microsoft SQL Server, Active Directory Domain Services (AD DS), and Internet Information Services (IIS).

### How to Import Management Pack for Windows Server 2016 Operating System

For instructions about importing a management pack, see [How to Import an Operations Manager Management Pack](http://go.microsoft.com/fwlink/?LinkID=98348). The System Center Management Pack for Windows Server 2016 Operating System files must be imported together.

### Create a New Management Pack for Customizations

Most vendor management packs are sealed so that you cannot change any of the original settings in the management pack file. However, you can create customizations, such as overrides or new monitoring objects, and save them to a different management pack.

Creating a new management pack for storing overrides has the following advantages:

 It simplifies the process of exporting customizations that were created in your test and pre-production environments to your production environment. For example, instead of exporting a default management pack that contains customizations from multiple management packs, you can export just the management pack that contains customizations of a single management pack.

 It allows you to delete the original management pack without preliminary deletion of the default management pack. A management pack that contains customizations is dependent on the original management pack. This dependency requires you to delete the management pack with customizations before you can delete the original management pack. If all of your customizations are saved to the default management pack, you must delete the default management pack before you can delete an original management pack.

 It is easier to track and update customizations to individual management packs.

For more information about sealed and unsealed management packs, see [Management Pack Formats](http://go.microsoft.com/fwlink/?LinkId=108355) (http://go.microsoft.com/fwlink/?LinkId=108355).

## Optional Configuration

This section contains information about optional configuration changes you can make to the management pack features; for example, you can change the thresholds for monitoring physical and logical disk partitions, processors, and memory. It also contains step-by-step instructions for enabling a number of object discoveries.

### Monitoring Physical Disks and Disk Partitions

By default, Windows Server 2016 operating system management packs do not discover physical disk partitions, only logical disk partitions. If you want to monitor physical disk drives, you can do so by enabling the Object Discoveries feature for the Windows Server 2016 physical disk objects. After the object discovery has been enabled, physical disks will be discovered within 24 hours, after which they will become monitored.

### Monitoring Logical and Physical Disks

The same set of monitors apply to Logical Disks, Cluster Shared Volumes, and Clustered Disks.

|  |  |
| --- | --- |
| Objects | Monitor name |
| Windows Server 2016 Logical Disk | Current Disk Queue Length (Logical Disk) |
| Windows Server 2016 Logical Disk | File system error or corruption |
| Windows Server 2016 Logical Disk | Average Logical Disk Seconds Per Transfer |
| Windows Server 2016 Logical Disk | Logical Disk Free Space |
| Windows Server 2016 Logical Disk | Logical Disk Fragmentation Level  |
| Windows Server 2016 Logical Disk | Logical Disk Percent Idle Time (Disabled by Default) |
| Windows Server 2016 Logical Disk | Average Disk Seconds Per Read (Logical Disk) (Disabled by Default) |
| Windows Server 2016 Logical Disk | Average Disk Seconds Per Write (Logical Disk) (Disabled by Default) |
| Windows Server 2016 Logical Disk | Windows Server 2016 Logical Disk Free Space (MB) Low (Disabled by Default) |
| Windows Server 2016 Logical Disk | Windows Server 2016 Logical Disk Free Space (%) Low (Disabled by Default) |
| Windows Server 2016 Physical Disk | Current Disk Queue Length (Physical Disk) |
| Windows Server 2016 Physical Disk | Average Physical Disk Seconds Per Transfer |
| Windows Server 2016 Physical Disk | Physical Disk Percent Idle Time (Disabled by Default) |
| Windows Server 2016 Physical Disk | Average Physical Disk Seconds Per Read (Disabled by Default) |
| Windows Server 2016 Physical Disk | Average Physical Disk Seconds Per Write (Physical Disk) (Disabled by Default) |

Evaluate the default settings for the following parameters and compare them against your business needs.

Monitoring Logical Disk Free Space using the Logical Disk Free Space monitor

The default health state thresholds for the Logical Disk Free Space monitor are different for system and non-system logical disk volumes. Error and Warning health states are based on both percentage of free space and on an absolute value, designated in megabytes (MB), of free space, as shown in the following sections.

System Partition

|  |  |  |
| --- | --- | --- |
| Health state | Percentage free space | MB free space |
| Error | 5% | 300 MB |
| Warning | 10% | 500 MB |

Important

For health state to change to Error or Warning, the values for both percentage free space and MB free space must drop below the corresponding threshold.

Non-system Partition

|  |  |  |
| --- | --- | --- |
| Health state | Percent free space | MB free space |
| Error | 5% | 1,000 MB |
| Warning | 10% | 2,000 MB |

Important

For health state to change to Error or Warning, the values for both percentage free space and MB free space must drop below the corresponding threshold.

By designing this monitor to evaluate both percentage free and MB free, the monitor works equally well for disks regardless of their storage capacity. This monitor does not alert on warning state, only on error state.

Monitoring Logical Disk Free Space using the Disk Free Space (%) Low and Disk Free Space (MB) Low monitors

The thresholds used in these monitors are exactly the same as the ones used for the Disk Free Space Monitor.

One reason for using these monitors is when you want to alert separately on available MB and %free space. You should then disable the Logical Disk Free Space monitor.

These monitors do not alert on a warning state, only on error state.

Monitoring Logical and Physical Disk Performance

The following monitors can be used to assess disk performance. By default, Average Disk Seconds Per Transfer is enabled. Average Disk Seconds Per Read and Average Disk Seconds Per Write are not enabled by default.

Average Disk Seconds Per Transfer

Average Disk Seconds Per Transfer monitors the time, in seconds, of the disk transfer. The default threshold value is .04. This monitor collects fifteen samples to compute the threshold. The threshold is met when the value of all fifteen consecutive samples is greater than .04. The health state is considered Healthy when it is below the threshold value and Critical when it is above the threshold. We recommend leaving the threshold at its default value of .04 seconds for an average disk transfer, which is considered acceptable performance.

Average Disk Seconds Per Read and Write

Average Disk Seconds Per Read is the average time, in seconds, to read data from the disk. Average Disk Seconds Per Write is the average time, in seconds, to write data to the disk. The threshold for both these monitors is .04 seconds and a sample is taken every minute. These monitors collect fifteen samples to compute the threshold. The threshold is met when the values of fifteen consecutive samples are greater than .04.

### Management Processors (Windows Server 2016)

Windows Server 2016 management pack can monitor individual instances of processors or all instances together. By default, the health of the processors is monitored as a total of all instances. If you are interested in monitoring individual processor instances, you can do so by enabling the Object Discoveries for Windows Server 2016. After Object Discoveries has been enabled, the processors will be discovered within 24 hours after which they will become monitored, and performance data will be collected.

Monitoring Total Processor Performance

Many rules, tasks, and monitors in the management pack are used for monitoring processor performance. We recommend that you at least monitor the items listed in the following table.

|  |  |
| --- | --- |
| Object | Monitor/rule name |
| Windows Server 2016 Operating System | Core Windows Services Rollup |
| Windows Server 2016 Operating System | Computer Browser Service Health |
| Windows Server 2016 Operating System | DHCP Client Service Health |
| Windows Server 2016 Operating System | DNS Client Service Health |
| Windows Server 2016 Operating System | Plug and Play Service Health |
| Windows Server 2016 Operating System | Memory Pages Per Second |
| Windows Server 2016 Operating System | Computer Browser Service Health |
| Windows Server 2016 Operating System | Windows Event Log Service Health |
| Windows Server 2016 Operating System | Available Megabytes of Memory |
| Windows Server 2016 Operating System | Plug and Play Service Health |
| Windows Server 2016 Operating System | RCP Service Health |
| Windows Server 2016 Operating System | Server Service Health |
| Windows Server 2016 Operating System | TCP/IP NetBIOS Service Health |
| Windows Server 2016 Operating System | Total CPU Utilization Percentage |
| Windows Server 2016 Operating System | Workstation Service Health |
| Windows Server 2016 Operating System | Windows Server 2016 Operating System BPA Monitor |
| Windows Server 2016 Operating System | Percentage of Committed Memory in Use (Disabled by Default) |
| Windows Server 2016 Operating System | Total DPC Time Percentage (Disabled by Default) |
| Windows Server 2016 Operating System | Total Percentage Interrupt Time (Disabled by Default) |
| Windows Server 2016 Operating System | Windows Server 2016 Max Concurrent API Monitor |

Evaluate the default settings for the following parameters and compare them against your business needs. If your management strategy could benefit from a change in these values, use overrides to make the necessary changes.

Total CPU Utilization Percentage (Monitor)

CPU utilization is the percentage of elapsed time that the processor spends to run a non-idle thread. It is calculated by measuring the duration of the idle thread that is active in the sample interval and subtracting that time from interval duration. CPU utilization is the primary indicator of processor activity, and this monitor displays the average percentage of busy time observed during the sample interval.

CPU queue length is the current length of the system work queue for this CPU.

By default, the threshold for this monitor is a CPU utilization of 95 percent along with a CPU queue length greater than 15 measured once every 2 minutes using five samples to compute the threshold.

Total Processor % Interrupt Time (Collection Rule)

This rule collects the Total Instance of the % Interrupt Time performance counter. By default, a sample is taken every 5 minutes. % Interrupt Time monitors the overall average processor utilization that occurred in Interrupt mode. Only interrupt service routines (ISRs), which are device driver functions run in Interrupt mode. Excessive % Interrupt Time can identify that a device is malfunctioning and serves as a secondary indicator that a device might be contributing to a processor bottleneck.

Processor % Processor Time Total (Collection Rule)

This rule collects the Total Instance of the % Processor Time performance counter. By default, a sample is taken every 5 minutes. % Processor Time is the percentage of time when the processor is not running the idle thread, and it is assumed that the processor is busy on behalf of real work. % Processor Time is the primary indicator of a processor bottleneck. You should be concerned of sustained periods of % Processor Time over 80 to 90 percent.

Total Processor % DPC Time (Collection Rule)

This rule collects the Total Instance of the % DPC Time performance counter. By default, a sample is taken every 5 minutes. % DPC Time monitors the percentage of time that the processor spent in routines known as deferred procedures calls, which are device driver scheduled routes which are called from ISRs. Excessive %DPC Time might be an indication of a hardware or device driver problem.

Monitoring Individual Processor Performance

The following monitors and rules are enabled when you enable Object Discoveries for processors.

|  |  |
| --- | --- |
| Object | Monitor/rule name |
| Windows Server 2016 Processor | Processor % Interrupt Time |
| Windows Server 2016 Processor | Processor % Processor Time |
| Windows Server 2016 Processor | Processor % DPC Time |
| Windows Server 2016 Processor | CPU Percentage Utilization |
| Windows Server 2016 Processor | CPU DPC Time Percentage (Disabled by Default) |
| Windows Server 2016 Processor | CPU Percentage Interrupt Time (Disabled by Default) |

Processor % Interrupt Time (Collection Rule)

This rule collects the Processor of the % Interrupt Time performance counter. By default, a sample is taken every 5 minutes. % Interrupt Time monitors the overall average processor utilization that occurred in Interrupt mode. Only interrupt service routines (ISRs), which are device driver functions run in Interrupt mode. Excessive % Interrupt Time can identify that a device is malfunctioning and serves as a secondary indicator that a device might be contributing to a processor bottleneck.

Processor % Processor Time (Collection Rule)

This rule collects the Processor of the % Processor Time performance counter. By default, a sample is taken every 5 minutes. % Processor Time is the percentage of time when the processor is not running the idle thread and it is assumed that the processor is busy on behalf of real work. % Processor Time is the primary indicator of a processor bottleneck. You should be concerned of sustained periods of % Processor Time over 80 to 90 percent.

Processor % DPC Time (Collection Rule)

This rule collects the Processor of the % DPC Time performance counter. By default, a sample is taken every 5 minutes. % DPC Time monitors the percentage of time that the processor spent in routines known as deferred procedures calls, which are device driver scheduled routes called from ISRs. Excessive %DPC Time might be an indication of a hardware or device driver problem.

CPU Utilization Percentage (Monitor)

CPU utilization is the percentage of elapsed time that the processor spends to run a non-idle thread. It is calculated by measuring the duration of the idle thread that is active in the sample interval and subtracting that time from interval duration. CPU utilization is the primary indicator of processor activity, and this monitor displays the average percentage of busy time observed during the sample interval.

CPU queue length is the current length of the server work queue for this CPU.

By default, the threshold for this monitor is CPU utilization of 95 percent measured once every 2 minutes using 5 samples to compute the threshold.

### Monitoring Network Adapter

The performance counters measured from network interfaces are key indicators of network issues.

|  |  |
| --- | --- |
| Windows Server 2016 Network Adapter | Percent Bandwidth Used Total |
| Windows Server 2016 Network Adapter | Percent Bandwidth Used Read (Disabled by Default) |
| Windows Server 2016 Network Adapter | Percent Bandwidth Used Write (Disabled by Default) |
| Windows Server 2016 Network Adapter | Network Adapter Connection Health (Disabled by Default) |

### Monitoring Memory Utilization

Sufficient memory is essential for efficient operation of a computer. We recommend that you consider using the following monitor.

|  |  |
| --- | --- |
| Class | Monitor name |
| Windows Server 2016 Operating System | Available Megabytes of Memory |

Available Megabytes of Memory

Available Megabytes of Memory is the amount of physical memory, in megabytes, immediately available for allocation to a process or for system use. It is equal to the sum of memory assigned to the standby (cached), free, and zero page lists.

The default threshold is 2.5MB, a sample is taken every 2 minutes, and three samples are taken to compute the threshold. This monitor is considered Healthy when available memory is above the threshold and Critical when it is below the threshold.

### Probe Module: IsFeatureInstalled

The Microsoft.Windows.Server.IsFeatureInstalled.Probe checks whether a specified feature is installed on a computer running the Windows Server 2016 or later server operating system. This module can be used by developers who need to discover features installed.

Module

|  |  |
| --- | --- |
| ID | Microsoft.Windows.Server.IsFeatureInstalled.Probe |
| Type | ProbeActionModuleType |
| MP | Microsoft.Windows.Server.Library |
| RunAs | System.PrivilegedManagementAccount |
| Accessibility | Public |

Input (Configuration)

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Type | Description | Overrideable |
| TimeoutSeconds | int | Timeout (seconds) | No |
| TargetComputerName | string | Target computer name | No |
| ServerFeature | string | Server component ID or name.The possible values of the ServerFeature property correspond to values of the ID or Name property of the WMI class Win32\_ServerFeature (<http://go.microsoft.com/fwlink/?LinkId=119210>). If ServerFeature is a valid integer, then the module will try to search for a particular feature/role by ID first, and then by Name.Important Win32\_ServerFeature::Name does not correspond to a description field provided in documentation for Win32\_ServerFeature::ID. One way to determine the actual name is to run servermanagercmd.exe -q and find the name in the output. There is also a risk that Win32\_ServerFeature::Name is subject to change without any notice in future operating system versions. | No |

## Security Considerations

This section provides information about using a low-privilege account with the System Center Monitoring Pack for Windows Server 2016 Operating System. It also includes information about the computer groups that are added when this management pack is installed.

### Low-Privilege Environments

The Windows Operating System Management Pack uses the agent action account to perform discovery and run rules, tasks, and monitors. The agent action account can run as Local System or as a named account. When running as Local System, the agent action account has all of the rights needed to perform discovery and run rules, tasks, and monitors.

### Computer Groups

You can delegate authority to a precise level by using user roles.

The following groups are added when you install the System Center Management Pack for Windows Server 2016 Operating System:

|  |  |
| --- | --- |
| Group | Comments |
| Windows Server 2016 Computer Group | A group containing all computers that are running a Windows Server 2016 version of the Windows operating system. |
| Windows Server 2016 Core Computer Group | A group containing all computers that are running a Windows Server 2016 Core version of the Windows operating system. |
| Windows Server 2016 Full Computer Group | A group containing all computers that are running a Windows Server 2016 Full version of the Windows operating system |
| Windows Server Instances Group | A group containing any instance of the Windows Server classes such as logical disk, physical disk, disk partition network adapter, or processor |

## Objects the System Center Management Pack for Windows Server 2016 Operating System Discovers

The System Center Management Pack for Windows Server 2016 Operating System will, by default, discover the following objects:

 Operating systems

 Logical disks

 Cluster Shared Volumes

 Mount point

 Disk partitions containing logical partitions

 Physical disks containing a disk partition

 Network adapter

The following objects are not discovered by default but can be discovered if Object Discoveries is enabled using overrides.

 Physical disks

 Processor

 Disk partitions

Upgrading an Operating System: How to Prevent Discovery Problems

Best Practice: Before you upgrade the operating system on a monitored computer, uninstall the Operations Manager agent. After the upgrade, reinstall the Operations Manager agent.

Explanation: The objects that the management pack discovers, such as logical disks, are hosted by a parent class that is not version-specific. When you upgrade the operating system, the order in which discovery occurs can result in duplicate objects being discovered.

If you upgrade a computer without uninstalling the agent first and then discover duplicate objects, uninstall the agent to mark all hosted objects as deleted in the database. Next, reinstall the agent to only discover existing applications/objects.

### Classes

The following table describes the available classes:

|  |  |
| --- | --- |
| Available Classes | Description |
| Windows Server 2016 Computer | All instances of computers running the Windows Server 2016 operating system. |
| Windows Server 2016 Core Computer | All instances of computers running the Windows Server 2016 Core operating system. |
| Windows Server 2016 Full Computer | All instances of computers running the Windows Server 2016 Full operating system. |
| Windows Server 2016 Operating System | All instances of the Windows Server 2016 operating system. |
| Windows Server 2016 Core Operating System | All instances of the Windows Server 2016 Core operating system. |
| Windows Server 2016 Full Operating System | All instances of the Windows Server 2016 Full operating system. |
| Windows Server 2016 Computer Group | A group containing all computers that are running a Windows Server 2016 Full Server version of the Windows operating system |
| Windows Server 2016 Core Computer Group | A group containing all computers that are running a Windows Server 2016 Core Server version of the Windows operating system |
| Windows Server 2016 Full Computer Group | A group containing all computers that are running a Windows Server 2016 Full Server version of the Windows operating system |
| Windows Server 2016 Disk Partition | All instances of a disk partition on a Windows Server 2016 operating system |
| Windows Server 2016 Logical Disk | All instances of a logical disk on a Windows Server 2016 operating system |
| Windows Server 2016 Network Adapter | All instances of a network adapter on a Windows Server 2016 operating system |
| Windows Server 2016 Physical Disk | All instances of a physical disk on a Windows Server 2016 operating system. |
| Windows Server 2016 Processor | All instances of a processor on Windows Server 2016 operating system. |

### How Health Rolls Up

The following diagrams explains how health rolls up within Windows Server 2016 Operating System Management Pack. Health model of this Management Pack is complicated so it’s broken down for logical parts.

Windows Server

Windows Server

2016

Computer

Windows Server

2016 Core

Computer

Windows Server

2016 Full

Computer

Virtual Server

Windows Server

2016

Computer Group

Windows Server

2016 Core

Computer Group

Windows Server

2016 Full

Computer Group

Windows Server

Computer Group

*Diagram 1. Windows Server OS Management Pack Health Rollup 1 of 3*

Windows Server

2016

Disk Partition

Windows Server

2016

Logical Disk

Windows Server

2016

Network Adapter

Windows Server

2016

Physical Disk

Windows Server

2016

Processor

Windows Server

2016

Operating

System

Windows Server

2016 Core

Operating

System

Windows Server

2016 Full

Operating

System

Windows Server

Windows Server

2016

Computer

Windows Server

2016 Core

Computer

Windows Server

2016 Full

Computer

*Diagram 2. Windows Server OS Management Pack Health Rollup 2 of 3*

Windows Server

2016

Disk Partition

Windows Server

2016

Logical Disk

Windows Server

2016

Network Adapter

Windows Server

2016

Physical Disk

Windows Server

2016

Processor

Cluster Shared

Volume

Cluster Disk

Virtual Server

Windows Server

2016

Operating

System

Windows Server

2016 Core

Operating

System

Windows Server

2016 Full

Operating

System

Windows Server

2016

Computer Group

Windows Server

2016 Core

Computer Group

Windows Server

2016 Full

Computer Group

Windows Server

Computer Group



*Diagram 3. Windows Server OS Management Pack Health Rollup 3 of 3*

## Key Monitoring Scenarios

The System Center Management Pack for Windows Server 2016 Operating System is designed to provide monitoring information for computers running Windows Server 2016 (Full and Core). The following section describes some of the most common monitoring scenarios.

Availability

|  |  |
| --- | --- |
| Operating system and services | The following required services are checked for status (for example, running, not running, or paused):****** Logical Disk Manager ****** Server ****** Workstation ****** Remote Procedure ****** DHCP Client ****** Computer Browser ****** DNS Client ****** Event Log ****** Messenger ****** Plug and Play ****** TCP/IP NetBIOS Helper  In addition, services and drivers are checked for unstable or unpredictable states, incorrect configuration, failure to start, or unexpected termination. |
| Storage | Logical hard drives are checked for availability, sufficient free space, and integrity of the NTFS partition. |
| Network | Network adapters are checked for connection health, name and IP address conflicts. |

Performance

|  |  |
| --- | --- |
| Processor | System processor(s) performance is checked system-wide using the following performance indicators:****** CPU Utilization****** Percent Interrupt Time****** DPC TimeProcessors can optionally be monitored on a per processor basis using the following criteria performance indicators:****** CPU Utilization****** Percent Interrupt Time****** Percent DPC TimePerformance data is collected for the following processor performance indicators:****** System Processor Queue Length****** System Context Switches Per Second****** Total Percent Interrupt Time****** Total DPC Time****** Total CPU Utilization |
| Memory | Memory consisting of physical memory and virtual memory (also known as page files) is monitored using the following performance indicators:****** Available memory (in MB)****** Pages per second****** Page file percent usagePerformance data is collected for the following memory criteria:****** Percent Committed Bytes In Use****** Available MB****** Pages per second****** Memory Pool Non Paged Bytes (disabled by default)****** Memory Pool Paged Bytes (disabled by default)****** Page File Percent Usage |
| Logical disk | ****** Logical disks are monitored, and performance data is collected for average disk seconds per read, disk seconds per write, and disk seconds per transfer.****** The “Logical Disk Fragmentation Level” monitor runs a periodic fragmentation check for all logical disks on a given computer running Windows Server 2016 during non-business hours. Use overrides to enable automatic defragmentation or to modify the configuration of non-business hours.  |
| Physical disk | Physical disks are monitored, and performance data is collected for average disk seconds per read, disk seconds per write, and disk seconds per transfer. |
| Network adapter | Network adapters are monitored for the number of bytes received per second, the number of bytes sent per second, and the total bytes per second. In addition, the health state of the network adapter is evaluated and is set to Healthy if connected and Critical if disconnected. |

## Troubleshooting

The following issues have been identified in the System Center Management Pack for Windows Server Operating System.

Disk Partitions Which Correspond to Mounted Disks Are Not Monitored

Issue: Disk partition discovery is not enabled by default, but when enabled, disk partitions that correspond to mounted disks cannot be monitored properly and will show up as “Not Monitored” in the Operations Console. Management is still provided by way of other means in this management pack, but the disk partition perspective will not work in these instances.

Workaround: There is no workaround currently available.

SUBST Drive Mappings Are Not Supported by Logical Disk Monitoring

Issue: There is a command-line tool (SUBST.exe) that can be used to associate a path (such as c:\windows\system32) with a drive letter (such as D:\). Because these mappings are exposed in WMI, logical disk monitoring discovers them and attempts to monitor them as such, but will subsequently generate errors.

Workaround: There is no workaround currently available, and this configuration is not supported.

Known Issue: Cluster Disks Managed by Third-Party Software are Not Monitored

Issue: If the Cluster disks are managed by third party software, and they change the resource type to anything other than “Physical Disk”, these disks will be discovered but we do not provide monitoring for these.

Workaround: There is no workaround currently available. In future, we will be removing discovery for these too.

## Appendix: Windows Server 2016 Rules, and Monitors Disabled by Default

The following table lists the rules and monitors for Windows Server 2016 that are disabled by default.

|  |  |  |
| --- | --- | --- |
| Rule/monitor | Why disabled | When to enable |
| Discover Windows CPUs | This discovery is disabled based on customer feedback. A majority of our customers do not monitor Windows CPUs by default. | Enable this discovery rule when CPUs need to be discovered and monitored. |
| Discover Windows Disk Partitions | This discovery is disabled based on customer feedback. A majority of our customers do not monitor Windows disk partitions by default. | Enable this discovery rule when Windows disk partitions need to be discovered and monitored. |
| Discover Network Adapters (Both Enabled and Disabled) | There are two different discoveries for network adapters; Discover Network Adapters (Enabled) and Discover Network Adapters (Both Enabled and Disabled). Since they both discover enabled network adapters, both should not be enabled at the same time.  | Enable this discovery rule when disabled network adapters need to be discovered. |
| Discover Windows Physical Disks | This discovery is disabled based on customer feedback. A majority of our customers do not monitor Windows physical disks by default. | Enable this discovery rule when Windows physical disks need to be discovered and monitored. |
| Populate All Windows Server 2016 Core Computer Group | This group population rule is disabled based on customer feedback. A majority of our customers do not differentiate between Windows Server 2016 Core and Full computers and therefore do not need to populate these groups. | Enable this Group Population Rule if you need a group of only the Windows Server 2016 Core computers. |
| Populate All Windows Server 2016 Full Computer Group | This Group Population Rule is disabled based on customer feedback. A majority of our customers do not differentiate between Windows Server 2016 Core and Full computers and therefore do not need to populate these groups. | Enable this group population rule if you need a group of only the Windows Server 2016 Full computers. |
| Windows Server 2016 Logical Disk | This monitor is disabled based on customer feedback. A majority of our customers do not monitor average disk seconds per write performance information on logical disks by default. | Enable this monitor if average disk seconds per write performance monitoring is required. |
| Windows Server 2016 Network Adapter Connection Health | This monitor is disabled based on customer feedback. A majority of our customers do not monitor network adapter connection health by default. | Enable this monitor if network adapter connection health monitoring is required. |
| Windows Server 2016 Percent Bandwidth Used Read | This monitor is disabled based on customer feedback. A majority of our customers do not monitor percent bandwidth used read performance information on network adapters by default. | Enable this monitor if percent bandwidth used read performance monitoring is required. |
| Windows Server 2016 Percent Bandwidth Used Write | This monitor is disabled based on customer feedback. A majority of our customers do not monitor percent bandwidth used write performance information on network adapters by default. | Enable this monitor if percent bandwidth used write performance monitoring is required. |
| Windows Server 2016 Percentage of Committed Memory in Use | This monitor is disabled based on customer feedback. A majority of our customers do not monitor percentage of committed memory in use performance information by default. | Enable this monitor if percentage of committed memory in use performance monitoring is required. |
| Windows Server 2016 Total DPC Time Percentage | This monitor is disabled based on customer feedback. A majority of our customers do not monitor total DPC time percentage performance information by default. | Enable this monitor if total DPC time percentage performance monitoring is required. |
| Windows Server 2016 Total Percentage Interrupt Time | This monitor is disabled based on customer feedback. A majority of our customers do not monitor total percentage interrupt time performance information by default. | Enable this monitor if total percentage interrupt time performance monitoring is required. |
| Windows Server 2016 Average Physical Disk Seconds Per Read | This monitor is disabled based on customer feedback. A majority of our customers do not monitor average physical disk seconds per read performance information on physical disks by default. | Enable this monitor if average physical disk seconds per read performance monitoring is required. |
| Windows Server 2016 Physical Disk Percent Idle Time | This monitor is disabled based on customer feedback. A majority of our customers do not monitor physical disk percent idle time performance information on physical disks by default. | Enable this monitor if physical disk percent idle time performance monitoring is required. |
| Windows Server 2016 CPU DPC Time Percentage | This monitor is disabled based on customer feedback. A majority of our customers do not monitor CPU DPC time percentage performance information on CPUs by default. | Enable this monitor if CPU DPC time percentage performance monitoring is required. |
| Windows Server 2016 CPU Percentage Interrupt Time | This monitor is disabled based on customer feedback. A majority of our customers do not monitor CPU percentage interrupt time performance information on CPUs by default. | Enable this monitor if CPU percentage interrupt time performance monitoring is required. |
| Collection rule for the Average Disk Queue Length Windows Server 2016 | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the average disk queue length performance information by default. | Enable this collection rule if average disk queue length performance collection is required. |
| Collection rule for Disk Bytes Per Second Windows Server 2016 | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the disk bytes per second performance information by default. | Enable this collection rule if disk bytes per second performance collection is required. |
| Collection rule for Disk Reads Per Second Windows Server 2016 | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the disk reads per second performance information by default. | Enable this collection rule if disk reads per second performance collection is required. |
| Collection rule for Disk Writes Per Second Windows Server 2016 | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the disk writes per second performance information by default. | Enable this collection rule if disk writes per second performance collection is required. |
| Disk Read Bytes Per Second Windows Server 2016 | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the disk read bytes per second performance information on logical disks by default. | Enable this collection rule if disk read bytes per second performance collection is required. |
| Logical Disk Write Bytes Per Windows Server 2016 | This collection rule is disabled based on customer feedback. A majority of our customers do not collect disk write bytes per second performance information on logical disks by default. | Enable this collection rule if disk writes per second performance collection is required. |
| Average Logical Disk Read Queue Length Windows Server 2016 | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the average logical disk read queue length performance information on logical disks by default. | Enable this collection rule if average logical disk read queue length performance collection is required. |
| Average Disk Write Queue Length Windows Server 2016 | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the average disk write queue length performance information on logical disks by default. | Enable this collection rule if average disk write queue length performance collection is required. |
| Logical Disk Split I/O Per Second Windows Server 2016 | This collection rule is disabled based on customer feedback. A majority of our customers do not collect split I/O per second performance information on logical disks by default. | Enable this collection rule if split I/O per second performance collection is required. |
| Output Queue Length Windows Server 2016 | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the output queue length performance information on network adapters by default. | Enable this collection rule if output queue length performance collection is required. |
| Percent Bandwidth Used Read Windows Server 2016 | This collection rule and monitor is disabled based on customer feedback. A majority of our customers do not collect the percent bandwidth used read performance information on network adapters by default. | Enable this collection rule or monitor if percent bandwidth used read performance collection or monitoring is required. |
| Percent Bandwidth Used Write Windows Server 2016 | This collection rule and monitor is disabled based on customer feedback. A majority of our customers do not collect the percent bandwidth used write performance information on network adapters by default. | Enable this collection rule or monitor if percent bandwidth used write performance collection or monitoring is required. |
| Network Adapter Bytes Received per Second Windows Server 2016 | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the network adapter bytes received per second performance information on network adapters by default. | Enable this collection rule if network adapter bytes received per second performance collection is required. |
| Network Adapter Bytes Sent per Second Windows Server 2016 | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the network adapter bytes sent per second performance information on network adapters by default. | Enable this collection rule if network adapter bytes sent per second performance collection is required. |
| Memory Page Reads per Second Windows Server 2016 | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the memory page reads per second performance information by default. | Enable this collection rule if memory page reads per second performance collection is required. |
| Memory Page Writes per Second Windows Server 2016 | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the memory page writes per second performance information by default. | Enable this collection rule if memory page writes per second performance collection is required. |
| Memory % Committed Bytes in Use Windows Server 2016 | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the memory % committed bytes in use performance information by default. | Enable this collection rule if memory % committed bytes in use performance collection is required. |
| Page File Percentage Use Windows Server 2016 | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the page file percentage use performance information by default. | Enable this collection rule if page file percentage use performance collection is required. |
| A Service or Driver Failed to Start | This alert rule is disabled based on customer feedback. A majority of our customers do not alert on a generic failure such as “A Service or Driver Failed to Start” by default. | Enable this alert rule if a generic failure such as “A Service or Driver Failed to Start” monitoring is required. |
| A Service Terminated Unexpectedly | This alert rule is disabled based on customer feedback. A majority of our customers do not alert on a generic failure such as “A Service Terminated Unexpectedly” by default. | Enable this alert rule if a generic failure such as “A Service Terminated Unexpectedly” monitoring is required. |
| A Share Configuration is Invalid | This alert rule is disabled based on customer feedback. A majority of our customers do not alert on a generic failure such as “A Share Configuration is Invalid” by default. | Enable this alert rule if a generic failure such as “A Share Configuration is Invalid” monitoring is required. |
| A Software Update Installation Failed | This alert rule is disabled based on customer feedback. A majority of our customers do not alert on a generic failure such as “A Software Update Installation Failed” by default. | Enable this alert rule if a generic failure such as “A Software Update Installation Failed” monitoring is required. |
| System Context Switches per Second Windows Server 2016 | This collection rule is disabled based on customer feedback. A majority of our customers do not collect system context switches per second performance information by default. | Enable this collection rule if system context switches per second performance collection is required. |
| Total Processor % DPC Time Windows Server 2016 | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the total processor % DPC time performance information by default. | Enable this collection rule if total processor % DPC time performance collection is required. |
| Total Processor % Interrupt Time Windows Server 2016 | This collection rule is disabled based on customer feedback. A majority of our customers do not collect total processor % interrupt time performance information by default. | Enable this collection rule if total processor % interrupt time performance collection is required. |
| Cache Bytes | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the cache bytes performance information by default. | Enable this collection rule if cache bytes performance collection is required. |
| Committed Bytes | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the committed bytes performance information by default. | Enable this collection rule if committed bytes performance collection is required. |
| Pages Output Per Second | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the pages output per second performance information by default. | Enable this collection rule if pages output per second performance collection is required. |
| Pages Input Per Second | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the pages input per second performance information by default. | Enable this collection rule if pages input per second performance collection is required. |
| Commit Limit | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the commit limit performance information by default. | Enable this collection rule if commit limit performance collection is required. |
| Pool Paged Resident Bytes | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the pool paged resident bytes performance information by default. | Enable this collection rule if pool paged resident bytes performance collection is required. |
| System Cache Resident Bytes | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the system cache resident bytes performance information by default. | Enable this collection rule if system cache resident bytes performance collection is required. |
| Cache Data Map Hits Percent | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the cache data map hits percent performance information by default. | Enable this collection rule if cache data map hits percent performance collection is required. |
| Physical Disk Average Disk Queue Length Windows Server 2016 | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the physical disk average disk queue length performance information by default. | Enable this collection rule if physical disk average disk queue length performance collection is required. |
| Physical Disk Average Disk Seconds per Read Windows Server 2016 | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the physical disk average disk seconds per read performance information by default. | Enable this collection rule if physical disk average disk seconds per read performance collection is required. |
| Physical Disk Average Disk Seconds per Write Windows Server 2016 | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the physical disk average disk seconds per write performance information by default. | Enable this collection rule if physical disk average disk seconds per write performance collection is required. |
| Physical Disk Bytes per Second Windows Server 2016 | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the physical disk bytes per second performance information by default. | Enable this collection rule if physical disk bytes per second performance collection is required. |
| Physical Disk Reads per Second Windows Server 2016 | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the physical disk reads per second performance information by default. | Enable this collection rule if physical disk reads per second performance collection is required. |
| Physical Disk Writes per Second Windows Server 2016 | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the physical disk writes per second performance information by default. | Enable this collection rule if physical disk writes per second performance collection is required. |
| % Physical Disk Idle Time Windows Server 2016 | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the % physical disk idle time performance information by default. | Enable this collection rule if % physical disk idle time performance collection is required. |
| Disk Read Bytes Per Second Windows Server 2016 (Physical Disk) | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the disk read bytes per second performance information by default. | Enable this collection rule if disk read bytes per second performance collection is required. |
| Physical Disk Write Bytes Per Second Windows Server 2016 | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the physical disk write bytes per second performance information by default. | Enable this collection rule if physical disk write bytes per second performance collection is required. |
| Average Physical Disk Read Queue Length Windows Server 2016 | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the average physical disk read queue length performance information by default. | Enable this collection rule if average physical disk read queue length performance collection is required. |
| Average Disk Write Queue Length Windows Server 2016 (Physical Disk) | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the average disk write queue length performance information by default. | Enable this collection rule if average disk write queue length performance collection is required. |
| Physical Disk Split I/O Per Second Windows Server 2016 | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the physical disk split I/O per second performance information by default. | Enable this collection rule if physical disk split I/O per second performance collection is required. |
| Processor % DPC Time Windows Server 2016 | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the processor % DPC time performance information by default. | Enable this collection rule if processor % DPC time performance collection is required. |
| Processor % Interrupt Time Windows Server 2016 | This collection rule is disabled based on customer feedback. A majority of our customers do not collect the processor % interrupt time performance information by default. | Enable this collection rule if processor % interrupt time performance collection is required. |
| Cluster Shared Volume - NTFS State Monitor | This monitor is disabled because the state of the NTFS partition is not typically needed (Dirty State notification). | Enable this monitor if the state of the NTFS file system is required. |
| Cluster Shared Volume - State Monitor | This monitor is disabled because, when enabled, it may cause false negatives during backups of the Cluster Shared Volumes. | Enable this monitor if availability of the Cluster Shared Volume is necessary (not based on CSV space). |
| Windows Server Windows Server 2016 Operating System BPA Monitor | This monitor is disabled based on customer feedback. Customers do not want BPA data to be collected on all systems by default. | Enable this monitor if BPA information is necessary. |