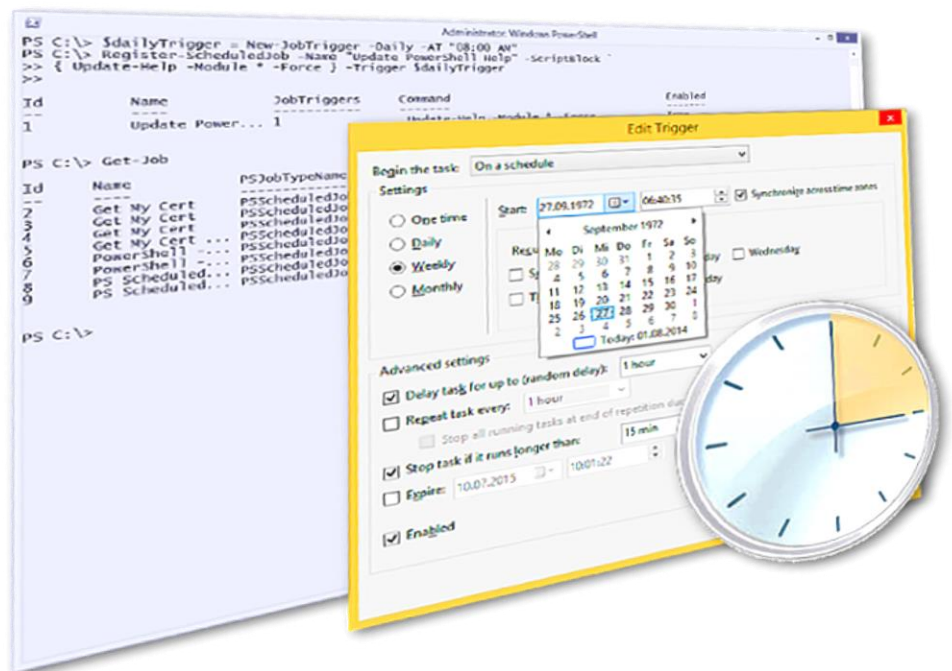# Windows Scheduled Task and PowerShell Scheduled Job Management Pack Guide for Operations Manager 2012

Published*: July 2014*

Version 1.2.0.500

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All management packs should be thoroughly tested before being introduced into a production Operations Manager environment. The author of this management pack accepts no responsibility or liability for negative impact as a result of use of this management pack in your Operations Manager environment.

Contents

Revision History

Release Date	Changes
February, 2008	Original release of this guide
May, 2008	Version 1.0.1.40
July, 2008	Version 1.0.1.45
August, 2008	Version 1.0.1.46
September, 2008	Version 1.0.1.61
December, 2008	Version 1.0.1.75
January, 2009	Version 1.1.0.10 (Windows 2008 support added)
February, 2009	Version 1.1.0.12 (Task return code override implemented as RegEx)
April, 2009	Version 1.1.1.0 - Localization support for Server 2008 (all languages) - Localization support for Server 2003 (Dutch, English, French, German, Italian, Portuguese and Spanish) - Server 2003: Class for tasks with a repetitive schedule added (daily, weekly or monthly)
June, 2014	Version 1.2.0.500 - Windows 2012 / 2012 R2 support - PowerShell Scheduled Job Support - Timing adjustments - RegEx discovery filter on task name and path exposed as override - Only task and PS job result monitors are active by default. All other monitors and rule are disabled by default. - Discoveries as now disabled. Quick Start OR MPs added. - Windows 2003 support stopped. MP may still be used "as is"

Scheduled Task and PowerShell Scheduled Job Management Pack

The Windows Scheduled Task and PowerShell Scheduled Job management pack monitors tasks and PowerShell scheduled jobs on Windows Server 2008, 2008 R2, 2012 and 2012 R2. Support for Windows Server 2003 is limited.

The management pack provides discovery, availability, performance and configuration monitors plus tasks. The following aspects of scheduled tasks and jobs are covered:

- task return code respectively PowerShell job exception monitor

- long running task/job monitor (disabled by default)

- task/job execution was skipped monitor

- task/job is without a trigger monitor

- task/job schedule has expired monitor

- task/job execution time collection rule

The management pack requires at least Operations Manager 2012 RTM.

Remark on backward compatibility

Windows Server 2003

Starting with version 1.2 (June 2014), further development and support for Windows 2003 has been stopped. Actually it has been so since 2009). The provided `Custom.Windows.TaskScheduler.Windows2003.Monitoring.mp` management pack may still be used "as is" to monitor scheduled tasks on Windows Server 2003.

Automatically managing Scheduled Tasks on Windows Server 2003 is not a trivial task. The operating system offers little to no support for WMI or VBScript when it comes to managing scheduled tasks. Using WMI, only tasks created by the at.exe command can be configured but not tasks created by the much more powerful GUI wizard. The only tool that reliably allows managing all Scheduled Tasks is '`schtasks.exe`'. This management pack makes use of this command line tool and parses its output.

Operations Manager 2007

Version 1.2 does no longer support SCOM 2007. The latest management pack version 1.1 is still available for download. However; it does not support Windows 2012 and PowerShell scheduled jobs.

Supported Configurations

The PKI Certificate Validation Management Pack for Operations Manager 2012 supports the following agent configurations:

Agent Operating System	Remarks
Windows Server 2012 (including R2)	Task Scheduler Logging must be enabled.
Windows Server 2008 R2	Task Scheduler Logging must be enabled. PowerShell scheduled jobs are only supported when PowerShell >= 3.0 is installed
Windows Server 2008	Task Scheduler Logging must be enabled. PowerShell >= 2.0 must be installed. PowerShell scheduled jobs are only supported when PowerShell >= 3.0 is installed
Windows Server 2003	System locale must be: • Dutch • English • French • German • Italian • Portuguese • Spanish PowerShell is not required as the legacy 2003 MP is using VBScript.

Getting Started

Before importing the Management Pack

The management pack consists of three files. Use the **Import Management Pack** function from the Administration pane of the Operations Console to import the management pack. Make sure you have all the management pack, the WMS management pack depends on, imported as well. The import wizard will let you know if some are missing.

The following table lists the management pack files

Management Pack File	Version	Remarks
Custom.Windows.TaskScheduler.Library.mpb	1.2.0.500	
Custom.Windows.TaskScheduler.Windows2008.Monitoring.mp	1.2.0.500	Windows Server 2008, 2008 R2, 2012 and 2012 R2
Custom.Windows.TaskScheduler.Windows2003.Monitoring.mp	1.2.0.10	legacy / "as is"

The MP file `Custom.Windows.TaskScheduler.Windows2008.Monitoring.mp` is providing support for Windows Server 2012 as well, despite its name.

Just import the management pack files you require. The '`Custom.Windows.TaskScheduler.Library.mpb`' is required in all cases as the other MPs depend on it.

Upgrade notes

The current MP will upgrade older versions (>= 1.1.1.0). Should the import wizard fail you may follow these steps:

1. Try deleting the `'Custom Windows Scheduled Task Monitoring'` MP. If you receive a 'Dependent Management Packs' notification, take a note of their names.

2. Export the dependent MPs to a temporary location

3. Delete the dependent MPs

4. Delete the old `'Custom Windows Scheduled Task Monitoring'` MP

5. Import the current MPs

6. Review and optionally reimport the dependent MPs from their temporary location to preserve overrides.

Note: Since version 1.2.0.0 all discoveries, advanced monitors plus the performance collection rule are disabled by default. If you were depending on those on a previous version and wish to keep them active, you must enable the workflows using overrides. Please see the monitor and rules section later in this document for details.

Customizing the management pack

The Windows Scheduled Task management pack is sealed. Changes to it are not possible. Using overrides almost all aspects of it can be customized. When doing so it is recommended that you store your overrides for the Windows Scheduled Task management pack in a specifically for this purpose created one. The '`Default Management Pack`' should not be used.

Doing so simplifies exporting, reporting on or altering your changes. Furthermore the '`Default Management Pack`' will not be made dependant on the Windows Scheduled Task management pack. Removing the Windows Scheduled Task management pack will be possible.

Enabling Task Scheduler Logging

To enable Task Scheduler Logging on Windows 2008 and later, open the "Task Scheduler" administrative tool (taskschd.msc) and select "Enable All Tasks History" from the action pane. This will enable logging events to the TaskScheduler event log (Applications and Services Logs\Microsoft\Windows\TaskScheduler\Operational).
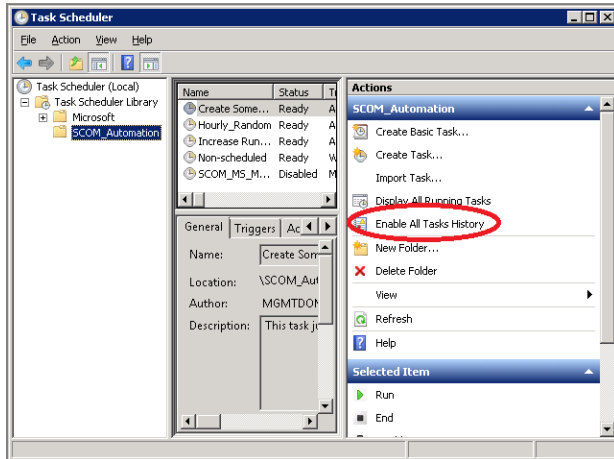
Elements of the Windows Scheduled Task management pack

## Class Model

The following diagram shows the type model of the Windows Scheduled Task management pack. Inheritance is shown vertically while Hosting and Health Roll up are drawn near horizontally. Blue object types are part of the management pack, while grey ones already exist. They are defined by the management pack's dependencies.

Windows Scheduled Task Model
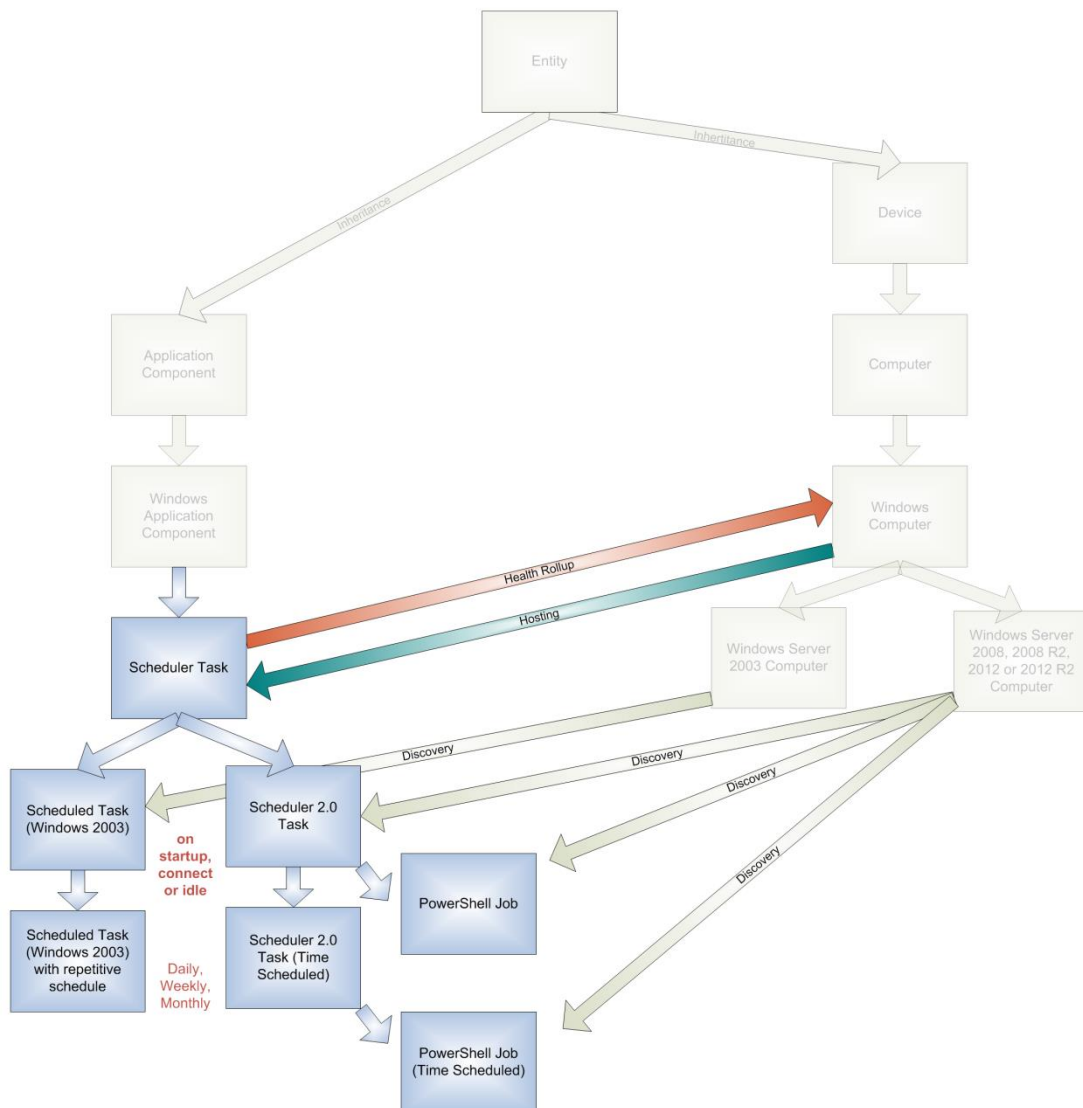
Object Discovery

All discoveries of the MP are disabled by default. You will either have to enable those using overrides or import the included "Quick Start Override" MP. It will enable the discoveries for Windows Servers.

The Windows Scheduled Task management pack discovers objects of the following type:

Object Type	Automatically	Discovery Rule	Attributes
Scheduler 2.0 Task	No	Windows Task Scheduler 2.x General Trigger Task Discovery (Windows Server 2008 through 2012 R2)	• Task Name • Task Path • Description • Task Triggers • Task Actions • Last Result • Last Run • Next Run • Status • User • Task Author
Scheduler 2.0 Task (Time Scheduled)	No	Windows Task Scheduler 2.x Schedule Triggered Task Discovery (Windows Server 2008 through 2012 R2)	
PowerShell Job	No	PowerShell Job General Trigger Job Discovery (Windows Server 2008 through 2012 R2)	
PowerShell Job (Time Scheduled)	No	PowerShell Job Schedule Triggered Job Discovery (Windows Server 2008 through 2012 R2)	
Scheduled Task (Windows 2003)	No	Windows Scheduled Task Discovery (Windows 2003)	• Task Name • Task Path • Description • Task Command • Task Schedule • Last Result • Last Run • Next Run • Status • User • State (Enabled)
Scheduled Task (Windows 2003) with repetitive schedule	No	Windows Scheduled Task Discovery (Windows 2003)	

The two classes 'Task/Job'' and 'Task/Job (time scheduled)' are nearly identical. All tasks will be members of the first one. But only tasks having a time schedule trigger configured (daily, weekly, monthly), will also be members of the second class.

This is because the "schedule expired" monitor does only make sense for tasks which run on a schedule rather than being triggered by system events.

On Windows 2008 and later, only *"non Microsoft Windows"* tasks are being discovered; specifically tasks not located inside the "Microsoft\Windows" folder of the Task Scheduler. The exception being Windows Backup tasks (path \Microsoft\Windows\Backup) and PowerShell scheduled jobs (path \Microsoft\Windows\PowerShell). If discovery of all tasks is required, configure the *DiscoverWindowsTasks* override of the appropriate discovery.

Furthermore it is possible to filter tasks and PS jobs based on the name and/or path. To do so, configure following four override(s) on the appropriate discovery. They are being evaluated as a logical AND condition:

Override Parameter Name	Default Value
Task Name Include Filter (RegEx)	.*
Task Path Include Filter (RegEx)	.*
Task Name Exclude Filter (RegEx)	^$
Task Path Exclude Filter (RegEx)	^$

The legacy Windows 2003 MP discoveries do not support filtering.

Monitors

The management pack defines five monitors that keep track of the discovered Scheduled Tasks and generate alerts if required. A recovery task is included to support troubleshooting an erroneous state.
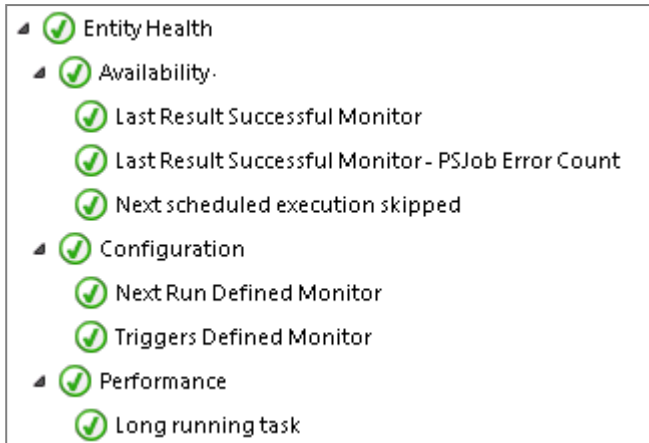
Simplified Health Explorer screen shot (Windows 2008 R2 with PowerShell job support):

When not stated otherwise, all monitors and rules apply for both traditional scheduled tasks and PowerShell scheduled jobs.

Last Result Successful Monitor – Enabled by default

After every execution, the 'Last Result' property of a Scheduled Task will show the exit code of the application it ran. Likewise an error code is returned if the task could not be started.

Use the override '`Expected Return Code (RegEx)`' if anything else than 0 (or 1 for tasks with a popup action) is expected to be the normal last result code of a given Scheduled Task. Format the Regular Expression accordingly: e.g. `^(0|127|255)$`

A disabled Scheduled Task will be shown in state '`Success`', regardless of its last result code.

Severity	Alert Name	Possible Overrides	Diagnostic and Recovery Tasks	Implementation Details
Warning	Scheduled Task failed to complete successfully	• Standard • DesiredReturnCode	Run Scheduled Task	Evaluate '`Last Result`' approx. 2 minutes after a task has ended.

On Windows Server 2008 – 2012 R2, the following return codes are ignored as they are transitive states:

- '267009': currently running
- '267014': was terminated by user
- '267045': queued
- '-2147216609': instance of this task already running -> being taken care of by the separate monitor

Popup actions will normally terminate with a return code of '1'. Hence '1' will not trigger an alert if a task is configured with a popup action.

Note that *PowerShell scheduled jobs* will always finish with return code 0 unless a fundamental issue with the PSScheduledJob module is encountered. Hence the "Last Result Successful" monitor is of limited use for PowerShell scheduled jobs. Instead the following monitor is looking at exceptions thrown by the PowerShell script.

Last Result Successful Monitor - PSJob Error Count – Enabled by default

After every execution of a PowerShell scheduled job, the number of excpetions (errors) thrown by the PowerShell script is evaluated.

Use the override '`max. Error Count`' if you know that a PowerShell job will return a certain number of error objects in its normal operation cycle but need alert if more exceptions occurred.

A disabled PowerShell Scheduled Job will be shown in state '`Success`', regardless of its last result code.

Severity	Alert Name	Possible Overrides	Diagnostic and Recovery Tasks	Implementation Details
Warning	PS Scheduled Job failed to complete successfully	• Standard • max. Error Count	Run Scheduled Task	Evaluate '`PS Error Count`' approx. 2 minutes after a task has ended.

This monitor does not apply to traditional (non PowerShell job) scheduled tasks. Hence it is disabled for scheduled tasks via an internal override.

The monitor's alert description and context will contain additional information about the number and nature of the PowerShell exceptions that occurred on Windows 2012 and later. However; due to limitations of SCOM agent's PowerShell workflows, it will not be able to extract the error description when running on Windows 2008 R2. Only the number of exceptions will be available.

Long Running Task Monitor – Disabled by default

This monitor alerts if a scheduled task is taking longer to complete than expected. ***It is not enabled by default***. ***Use overrides to enable the monitor and set the threshold (in minutes).***

Severity	Alert Name	Possible Overrides	Diagnostic and Recovery Tasks	Implementation Details
Warning	Scheduled Task is running too long	• Standard • Threshold	none	Check how long a task is running for every 15 minutes (schedule)

It is not normally required to override this monitor to run more often than every 15 minutes. It checks both the total run time (of already finished tasks) and the current time (for tasks still running). If this must be done, keep in mind that the monitoring script is running every time, which might cause additional load on the agent computer.

Next Run Defined Monitor – Disabled by default

If the 'Next Run' property of a Scheduled Task is 'Never', this monitor will report a 'Warning' condition.

A disabled Scheduled Task will be shown in state '`Success`', regardless of its next run property.

This monitor is targeted at tasks with a repetitive schedule trigger (e.g. 'daily', 'weekly' or 'monthly'). ***This monitor is not enabled by default.***

Severity	Alert Name	Possible Overrides	Diagnostic and Recovery Tasks	Implementation Details
Warning	Scheduled Task's schedule expired	• Standard	none	Evaluate '`Next Run`' approx. 2 minutes after a task has ended or its configuration was changed.

Next Scheduled Execution Skipped Monitor – Disabled by default

If a scheduled task is taking too long to complete, it might still be running at its next scheduled run time.

- On Windows 2008 – 2012 R2 it logs a warning event.
- On Windows 2003 the task scheduler quietly skips that execution.

The monitor alerts if a scheduled execution was skipped because the task was already (still) running.

It is targeted at tasks or jobs with a repetitive schedule (e.g. 'daily', 'weekly' or 'monthly'). *It is not enabled by default.*

Severity	Alert Name	Possible Overrides	Diagnostic and Recovery Tasks	Implementation Details
Warning	Scheduled Task ran past next scheduled execution	• Standard	none	Windows >= 2008: Trigger on EventID 322. Reset approx. 2 minutes after a task has ended without another 322 event. Windows 2003: Check if a task ran past its initial 'Next Run' time every minute

Note that only tasks running for at least two minutes can reliably be detected by this monitor. The monitor will reset once a complete job run was observed and no 322 event was written.

Triggers Defined Monitor – Disabled by default

A scheduled task or PS job might have several triggers defined (Windows 2008 an later). This monitor alerts if no triggers are configured or none are active. *This monitor is not enabled by default.*

Severity	Alert Name	Possible Overrides	Diagnostic and Recovery Tasks	Implementation Details
Warning	Scheduled Task has no active triggers	• Standard	none	Check if triggers are present approx. 2 minutes after the configuration of a task was changed.

## Current Status Monitor (Windows 2003 only - legacy)

The status of a scheduled task would normally be empty or 'Running'. Anything other (e.g. 'Could not start') is considered a warning condition.

A disabled Scheduled Task will be shown in state '`Success`', regardless of its current status.

Severity	Alert Name	Possible Overrides	Diagnostic and Recovery Tasks	Implementation Details
Warning	Scheduled Task has an invalid status	• Standard		Check the discovered '`Status`' property every 10 minutes

Note that the status 'Running' will not be reflected on the Scheduled Task's property in the Operations Manager console. This is to keep the load on the Operations Manager DB as low as possible.

Scheduled Tasks History Enabled Monitor
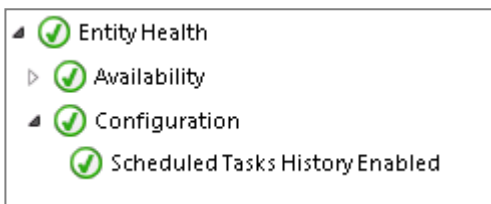
On Windows 2008 and later, most task and job workflows in this management pack rely on event triggers from the *Microsoft-Windows-TaskScheduler/Operational* event log. This monitor is targeted at the Windows Operating System and will alert if logging to this event log has been disabled.

Severity	Alert Name	Possible Overrides	Diagnostic and Recovery Tasks	Implementation Details
Warning	Task Scheduler: All Tasks History is disabled	• Standard	none	Checks hourly if the task history logging is enabled (registry poll).

To enable task history logging, select "Enable All Tasks History" from Task Scheduler administrative tool (taskschd.msc), execute the agent task "Enable All Tasks History" or run the predefined recovery on this monitor.

Rules

Scheduled Task Job Duration Collection Rule – Disabled by default

A rule is collecting the time it took for a task to finish. This data is available both through the Operations Manager Monitoring view and is written to the Operations Manager Data Warehouse. This rule is not generating any alerts. If you need to know if a task ran too long, configure the 'Long Running Task Monitor'.

The collection rule is not enabled by default.

Rule Name	Possible Overrides	Data collected
Collect scheduled task job duration	• Standard	Windows Scheduled Tasks / Job Duration (min)

If tasks are run more often than every 5 minutes, this rule will collect the longest execution time observed during the last 5 minutes.

Internal rules

The following event rules are used for internal purposes of the management pack. They are writing consolidated events following task scheduler actions to the "Operations Manager" event log. Those are then used as triggers for the main discovery and monitoring workflows.

This approach allows running workflows on demand (e.g. after a task has ended) AND additionally on a schedule. The advantage being that monitors are being refreshed to a valid health state even after an agent has been restarted or come out of maintenance mode.

- Task Scheduler Action Observer Rule
- Task Scheduler Configuration Change Observer Rule
- Task Scheduler Evaluation Trigger Rule

Please do not disable those rules or the management pack will no longer execute most workflows.

Tasks

Tasks are targeted at Scheduled Task object types. Whenever a Scheduled Task object is selected within the Operations Manager GUI, the tasks can be executed against that specific object.

One task is defined as recovery. It is available in the context of an alert, the Health Explorer or the knowledge of a monitor.

Name	Parameters	Implementation Details
End Scheduled Task	None	schtasks.exe /end command
List All Scheduled Tasks	None	schtasks.exe /end command
Run Scheduled Task	None	schtasks.exe /query command
Enable Scheduled Task	None	schtasks.exe /modify /enable
Disable Scheduled Task	None	schtasks.exe /modify /disable
Enable All Tasks History	None	enables event log via registry key on Windows 2008 and later

Due to the fact that Windows 2003 uses two different APIs to manage scheduled tasks (at and schtasks), not all of the above tasks will work against scheduled tasks created using 'at'.
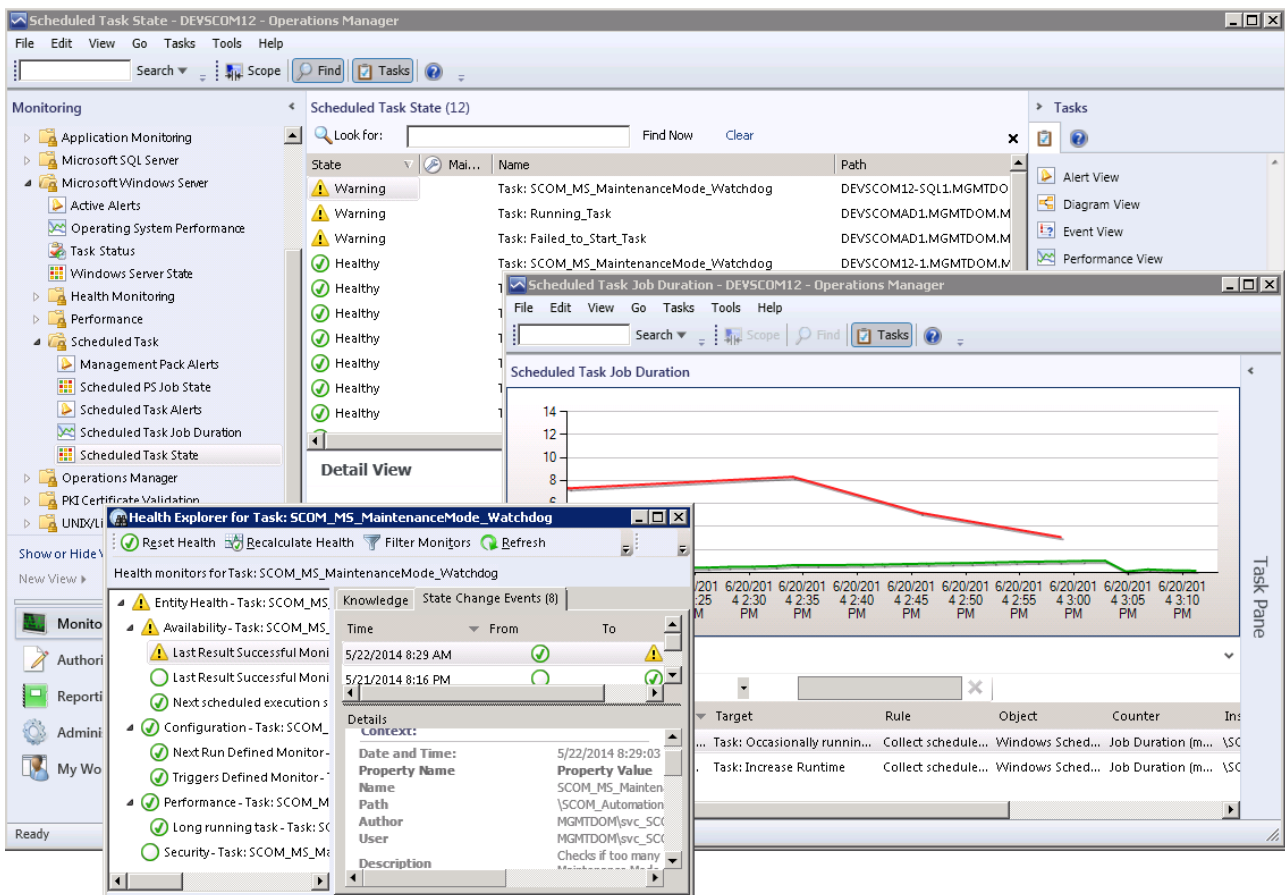
Using the Management Pack

After importing the management pack, Operations Manager, no instances of Windows Scheduled Tasks will be discovered automatically. After either enabling the disocveries via overrides or importing the included quick start override MPs, task result monitoring is going to work automatically.

Other monitors and the task duration collection rule will have to be enabled via overrides.

Console Views

Discovered scheduled tasks and their state can be seen at the following console view folder: Microsoft Windows Server / Scheduled Task.

Consider using '`My Workspace`' or adding views to a custom management pack to get customized views.

Using the '`Distributed Application Designer`' you can integrate the Scheduled Task objects into your custom diagram view. The diagram on page 10 will help choosing the correct object type for your distributed application.

Configuring Overrides

Overrides are particularly useful to change the behaviour of the management pack's monitors. The following table contains scenarios and lists which monitors would have to be overridden.

Overrides can be configured for individual servers, groups or all objects of a type.

Note that it is recommended to use a specifically created management pack for your overrides instead of saving them into 'Default Management Pack'.

Scenario	Overrides to configure
Change desired 'Last Result' code of a Scheduled Task	Change the default of the monitor 'Scheduled Task Last Result Monitor' from 0 to what is expected. Use a Regular Expression: e.g. $(0\|1\|36)$
Activate advanced monitoring	Enable all or individual of the following monitors: Long running task Next scheduled execution skipped Next Run Defined Monitor Triggers Defined Monitor and/or enable the performance collection rule Collect scheduled task job duration
Configure Long Running Task monitoring	Enable all or individual of the following monitors: 'Long running task' Configure the threshold (in minutes) 'Long running task' at 'Windows Scheduled Task' from 60 (minutes) to what is needed.
Enable discovery and monitoring of Windows Server internal tasks (Windows 2008 and later)	The management pack does not normally discover Windows Server 2008 internal tasks (tasks found in \Microsoft\Windows). If you need to discover and monitor them as well: Set the 'DiscoverWindowsTasks' parameter the task and job discoveries to 'True'. Assure all four discoveries are configured identically.
Include or exclude specific tasks or PS jobs (Windows 2008 and later only)	Set the overrides 'Task Name Filter (RegEx)' and/or 'Task Path Filter (RegEx)' on the task and job discoveries. Tasks not matching the regular expression will be undiscovered on the next discovery interval.

Appendix

Event Reference

The following table lists events that may be logged by the MP's scripts to the Operations Manager event log. Their source is "Health Service Script".

EventID	Severity	Description
9620 (debug)	Information	Calling parameters and PowerShell host environment of the `Custom.TaskScheduler2.Task.GetTaskAndJobsProperties.ps1` script.
9621 (debug)	Information	Script was run on an unsupported Windows OS.
9623 (debug)	Information	Running on Windows 2008 or 2008 R2 (6.0 or 6.1) in PowerShell 2.0. No PS Job Error description display strings.
9624	Warning	Unable to load "Schedule.Service" COM object (temporarily). Script ends without returning property bag data.
9625 (debug)	Information	Details on every task object retrieved and returned to SCOM.
1004	Information	Event used to trigger MP workflows. Written every 4 hours by the internal rule "Task Scheduler Evaluation Trigger Rule"
1005	Information	Event used to trigger MP workflows. Written 2 minutes after task(s) have ended. Generated by the internal rule "Task Scheduler Action Observer Rule"
1006	Information	Event used to trigger MP workflows. Written 2 minutes after task configuration changes have been observed. By internal rule "Task Scheduler Configuration Change Observer Rule"
8001 (legacy)	Information	Windows 2003 task discovery details.
8094 (legacy)	Information	Windows 2003 locale is not supported.

Script Reference

The following table lists the scripts run by the management pack.

Script	Purpose	Discoveries and Monitors	Frequency
Custom.TaskScheduler2.Task.GetTaskAndJobsProperties.ps1	Gets scheduled tasks and PowerShell job properties. Calculates runtimes based on windows events in the TaskScheduler log.	Task and PS job discoveries, rules and monitors. Cookdown is applied to minimize the number times the script is started.	Discovery: every 4 hours Monitors / Rules: after event triggers
SystemCenterCentral.Custom.TaskScheduler2.Task.WorkflowTriggerEvent.ps1	Creates events in the Operations Manager event log. Those are used to trigger above script.		After task operations / additionally every 4 hours.
Custom.Windows.ScheduledTask.ServiceDiscovery.vbs	*Legacy* Windows 2003 discovery and monitoring script		
Custom.Windows.ScheduledTask.RunTime.PropertyBagHelper.vbs	*Legacy* Windows 2003 task duration check	Windows 2003 task duration monitor and rule	
Custom.Microsoft.Windows.ScheduledTask.OSLanguage.vbs	*Legacy* Windows 2003 OS language discovery		

Feedback

For comments on this guide or the Management Pack, the authors of the Management Pack can be contacted by leaving a comment on the original publishing source or by email to *raburri[_at_]bluewin[.]ch*