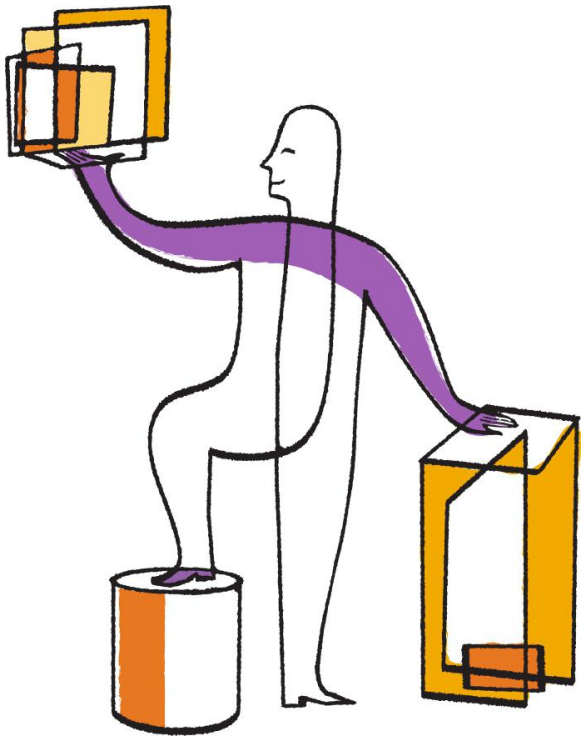
NetApp® Storage Array Management Pack for Operations Manager 2.1

User Guide



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Overview of the Management Pack for Service Center Operations Manager 2.1

The NetApp Storage Array Management Pack helps customers monitor their storage health status from within the System Center Operations Manager (SCOM) environment. The integration of the management pack and the SCOM enables administrators to extend SCOM 2007 R2 and SCOM 2012 SP1 monitoring capabilities to include detailed storage array conditions and resolution steps for troubleshooting.

The NetApp Storage Array Management Pack uses a PowerShell cmdlet library to access the storage array native interface to provide flexibility and low overhead on the agent-managed computer. The NetApp Storage Array Management Pack provides critical alerts including storage array summary, details, and applicable recovery procedures. Administrators can now troubleshoot NetApp storage arrays from one SCOM console, which reduces the complexity of dealing with multiple proprietary applications.

A script is available for downloading and importing volume performance data into a spreadsheet or other tool for detailed analysis. Obtaining Volume Performance Data on page 22 provides detailed information about the script.

The information in this guide is based on the 2.0.0.58 version of the NetApp Storage Array Management Pack. You can obtain the NetApp Storage Array Management Pack from the System Center Operations Manager.

The NetApp Storage Array Management Pack for Operations Manager 2.1 does not support in-band NetApp storage array monitoring.

Purpose

This guide is for Operations and System Administrators who monitor and troubleshoot NetApp storage arrays. The NetApp Storage Array Management Pack is to be used only for monitoring and configuring performance thresholds for NetApp storage arrays. You cannot use the NetApp Storage Array Management Pack to perform storage management functions. For recovery procedures that require storage management functions that are listed in the alert knowledge base articles within the SCOM console, refer to the NetApp Storage Manager documentation.

New in This Release

The following features are new in this release of the NetApp Storage Array Management Pack:

- Ability to alter the following volume performance metrics for performance alerts You can set each metric on a per volume basis, and you can override volume performance alerts on a per volume basis:
    - Read latency and write latency
    - Read throughput and write throughput
    - Read IOPs and write IOPs
- Critical Alert (Recovery Guru) based knowledge content consisting of the following:
    - Critical alert summary information
    - Critical alert detail information
    - Critical alert recovery procedure information
- Object Override capabilities for the following:
    - Monitor Interval
    - Alert Timeout
    - Alert Trace
- Integration Package (agent-managed computer)
    - NetApp Storage Array Discovery Application
    - PowerShell Cmdlet Storage Library

- Windows Event Log Integration
- Cookdown

Abbreviations, Acronyms, and Definitions

The following table shows the abbreviations and acronyms used in this document and their definitions

Table 1 Abbreviations, Acronyms, and Definitions

Abbreviations and Acronyms	Definitions
RMS	Root management server
SCOM	System Center Operations Manager

The NetApp Storage Array Management Pack currently supports up to 50 NetApp storage arrays for each agent-managed computer.

Software Configurations

The NetApp Storage Array Management Pack supports the following software configurations:

Table 2 Software Configurations

Root Management Servers	Agent-Managed Computers	Power Shell	.NET Framework
Windows Server 2003 Sp2 x86, x64	Windows Server2003 Sp2 x86, x64	3.0	NET 3.5 SP
Windows Server 2008 Sp2 x86, x64	Windows Server 2003 Sp2 x86, x64	3.0	NET 3.5 SP
Windows Server 2008 R2	Windows Server 2008 R2	3.0	NET 3.5 SP
SCOM 2012 Sp1			
SCOM 2007 R2			

Configuring Agent-Managed Computers

Before you import the NetApp Storage Array Management Pack for Operations Manager 2.1, perform the following tasks to configure the agent-managed computers.

Enabling Proxy Server Capabilities

Enable agent-managed computers that monitor NetApp storage to act as proxy servers and discover managed objects on other computers in the RMS SCOM Server console.

If you do not enable agent-managed computers that monitor NetApp storage arrays to act as a proxy and discover managed objects on other computers from the root management server the NetApp Storage Array Management Pack does not function.

1. Open the SCOM Operations Console.
2. Open the Administration view, and select Device Management >> Agent-Managed.
3. Right-click the agent-managed computer that monitors NetApp storage arrays, and select Properties.

4. Select the Security tab, and enable Allow this agent to act as a proxy and discover managed objects on other computers.
5. Click OK.
6. Perform step 1 through step 5 for each agent-managed computer that is used to monitor NetApp storage arrays.

Installing the NetApp Integration Package

You must install the NetApp Integration Pack on the agent-managed computer before you import the NetApp Storage Array Management Pack. Based on the OS of the agent-managed computer, Table 3 shows the software necessary for monitoring NetApp storage.

Table 3 Agent-Managed Computer Requirements

Operating System	Software
Windows 2012 (x64)	• Power Shell version 3.0 or greater • .NET Framework version 3.5 • NetApp Integration Pack (available x86, x64 versions)
Windows Server 2008 Sp2 (x86, x64)	• Power Shell version 3.0 or greater • .NET Framework version 3.5 • NetApp Integration Pack (available x86, x64 versions)
Windows Server 2008 R2	• Power Shell version 3.0 or greater • .NET Framework version 3.5 • NetApp Integration Pack (available x64 version)

The NetApp Integration Pack installation log file is located at the following location:

```
C:\Program Files\NetApp\SCOMIntegrationPackInstalllog.txt
```

To install the NetApp Integration Package on an agent-managed computer, perform these steps:

1. Log on to the agent-managed computer with an account that has installation privileges.
2. Locate the desired NetApp Integration Pack Installer for SCOM-WSX64-00.00.00.00 (x64 platforms).
3. Run the Installer. The installation wizard appears.
4. Follow the wizard steps to complete the installation.

Discovering NetApp Storage Arrays

Perform the following actions to start the process of discovering NetApp storage arrays for SCOM monitoring.

The NetApp Storage Array Discovery application is at the following location:

```
C:\Program Files\NetApp\SCOM Integration Pack
```

1. Select Start >> All Programs.
2. Locate the folder SCOM Integration Pack.
3. Select the icon labeled NetApp Storage Array Discovery.
4. Run the NetApp Storage Array Discovery application.
5. Either manually add storage arrays or perform an auto-discover of the storage array IP addresses to allow SCOM monitoring of the selected storage array.

    - You can perform an auto-discovery only when the storage arrays are located within the same subnet that the proxy server is located. Multiple proxy servers can be located in different subnets. There is no limit to the number of proxy servers.

- You can perform a manual discovery across subnets so long as the storage arrays are within the same domain.

6. Add the selected storage array IP addresses to the Windows pane labeled Selected Storage Arrays.

   A confirmation dialog box appears followed by an option to proceed or cancel the NetApp storage array discovery process.

7. Click OK.

Removing NetApp Storage Arrays

To remove a NetApp storage array from SCOM monitoring, perform these steps. The NetApp Storage Array Discovery application is at the following location:

```
C:\Program Files\NetApp\SCOM Integration Pack
```

1. Select Start >> All Programs, and locate the folder labeled SCOM Integration Pack.
2. Select the NetApp Storage Array Discovery icon.
3. Run the NetApp Storage Array Discovery application.
4. Locate and select the storage array to be removed from SCOM monitoring in the Selected Storage Arrays pane.
5. Click Remove Selected.

   A confirmation dialog box appears followed by an option to continue or cancel the storage array removal process.

6. Click OK.

Downloading NetApp E-Series Storage Array Management Files

To monitor NetApp storage arrays, download the following NetApp Storage Array Management Pack for Operations Manager 2.1 and monitoring software.

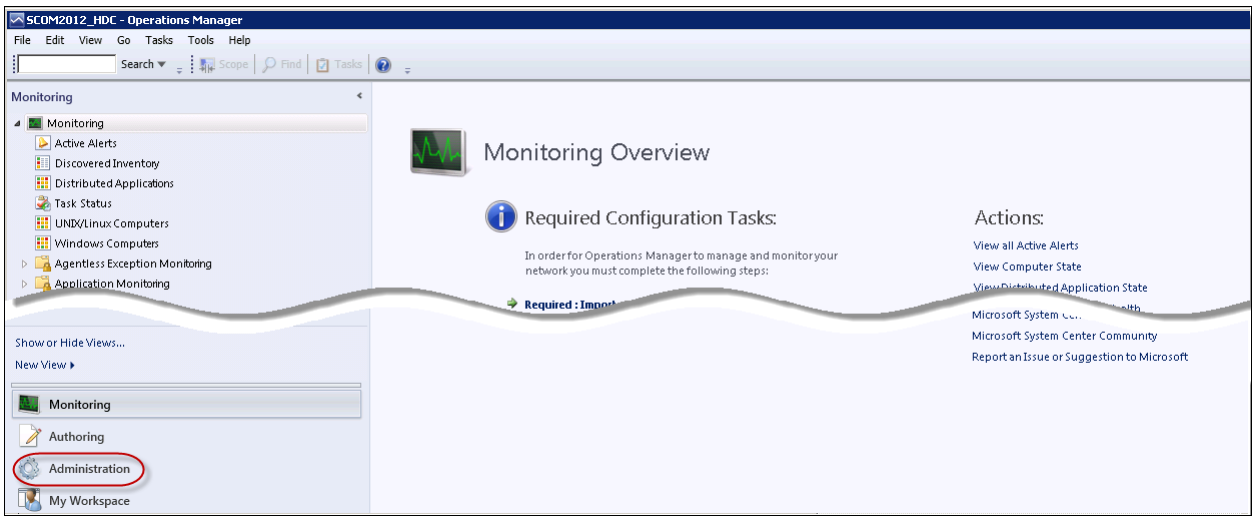
```
NetAppESeries.IntervalOverides.xml
NetAppESeries.mp
NetAppESeries.PerformanceOverrides.xml
NetAppESeries.TimeoutOverrides.xml
NetAppESeries.TraceOverrides.xml
SCOM-Integration-Pack-WSX64-<xx.xx.xxxx.xx>.exe
```

Logging on to the Operations Manager Console

1. On the Root Management Server, select Start >> All Programs >> Operations Console.

   The Microsoft System Center 2012 Operations Manager console appears.

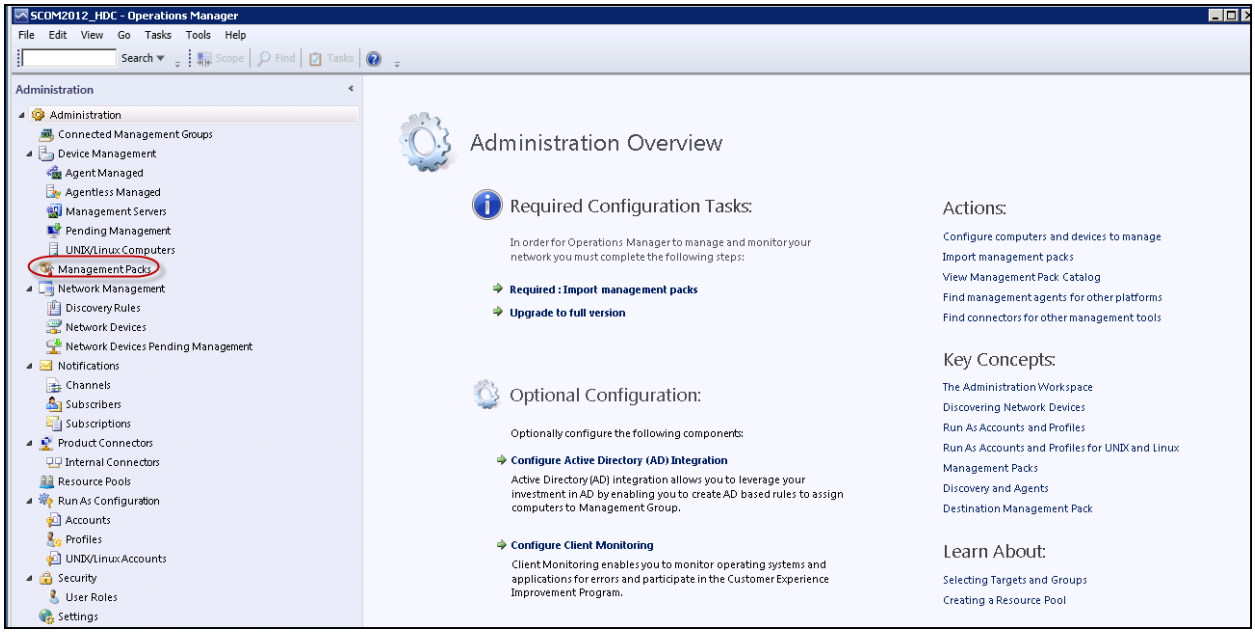
Figure 1 Microsoft System Center 2012 Operations Manager Console



2. In the lower left corner of the Operations Manager window, click Administration.

   The Administration Overview window opens.

Figure 2 Administration Overview Window



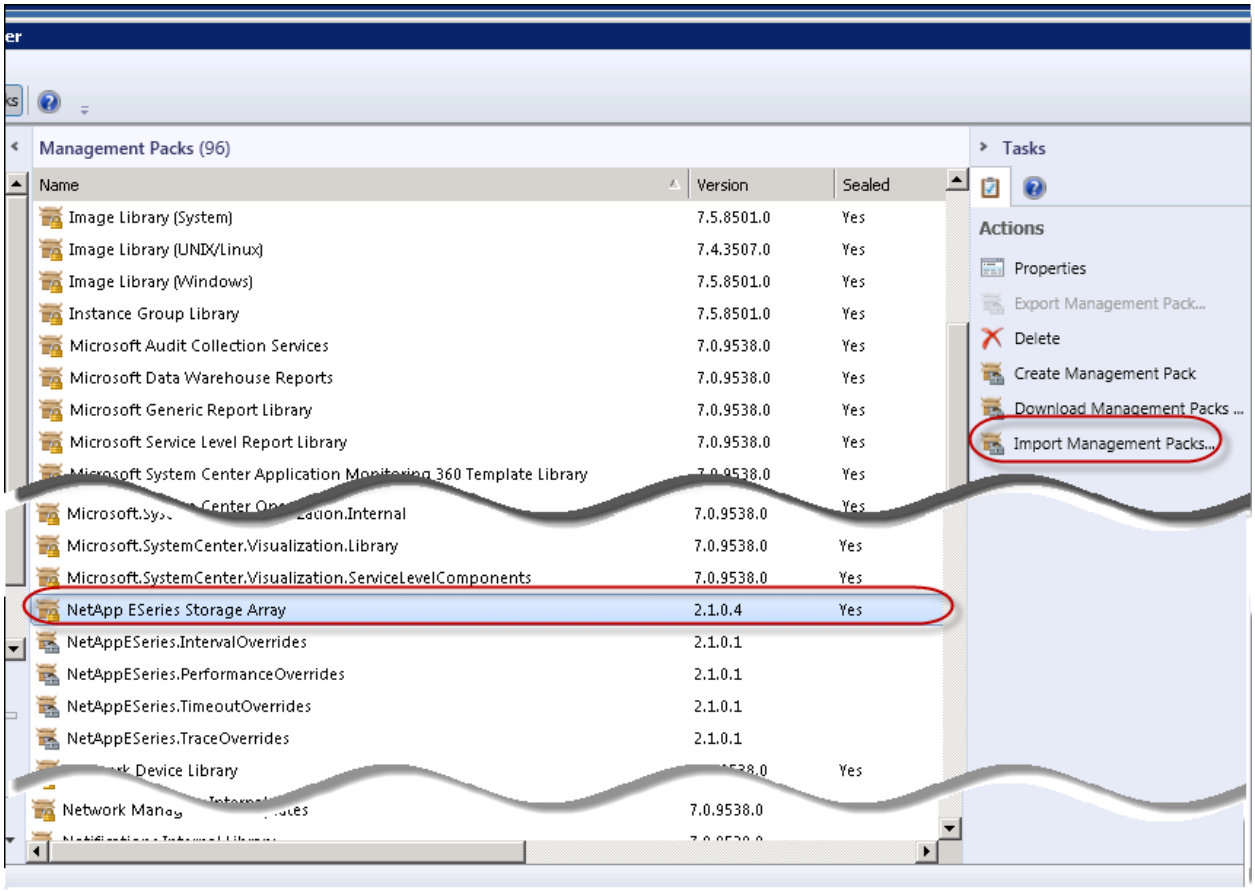
Importing the NetApp E-Series Management Pack

To import the NetApp E-Series Storage Array management pack, perform these steps:

1. In the Administration pane, click Management Packs.

   The Management Packs list appears in the middle pane.

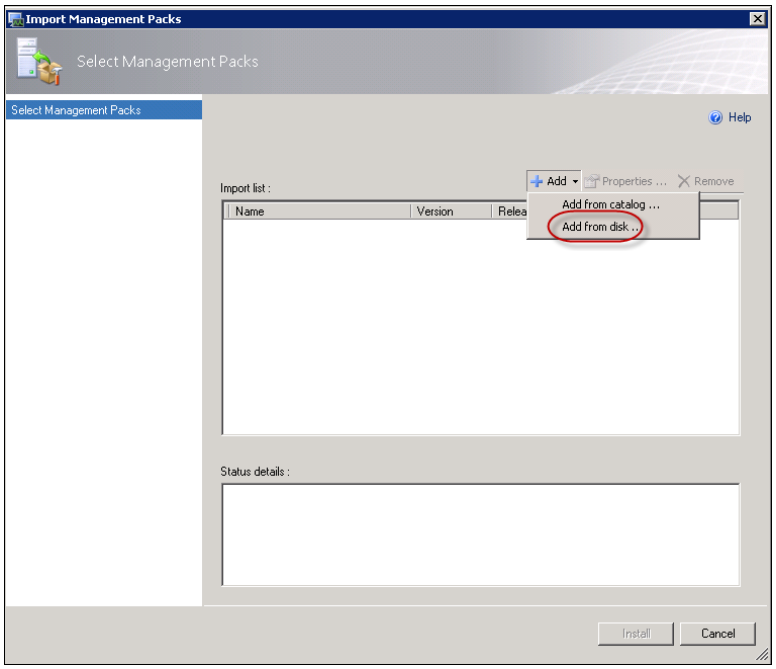
Figure 3 Management Packs



2. In the Management Packs list, find and select NetApp ESeries Storage Array.
3. In the Actions pane, click Import Management Packs.

   The Select Management Packs dialog box appears.

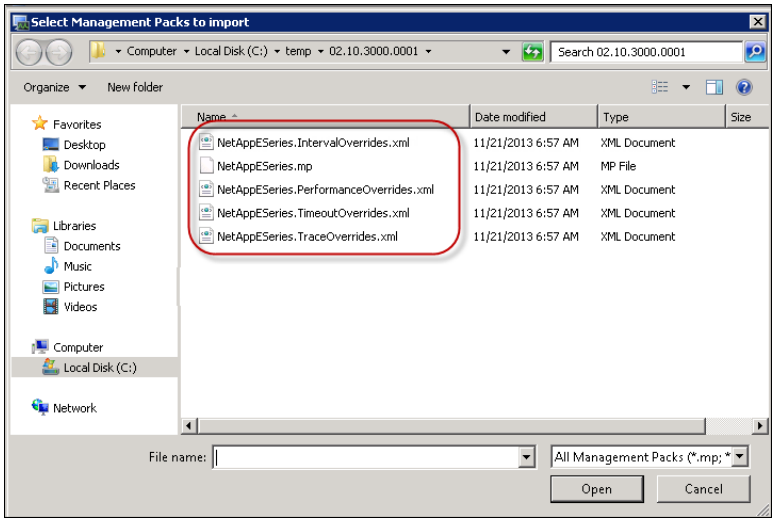
Figure 4 Import Management Packs - Select Management Packs Dialog Box



4. Select Add >> Add from disk.

   The Select Management Packs to Import window opens.

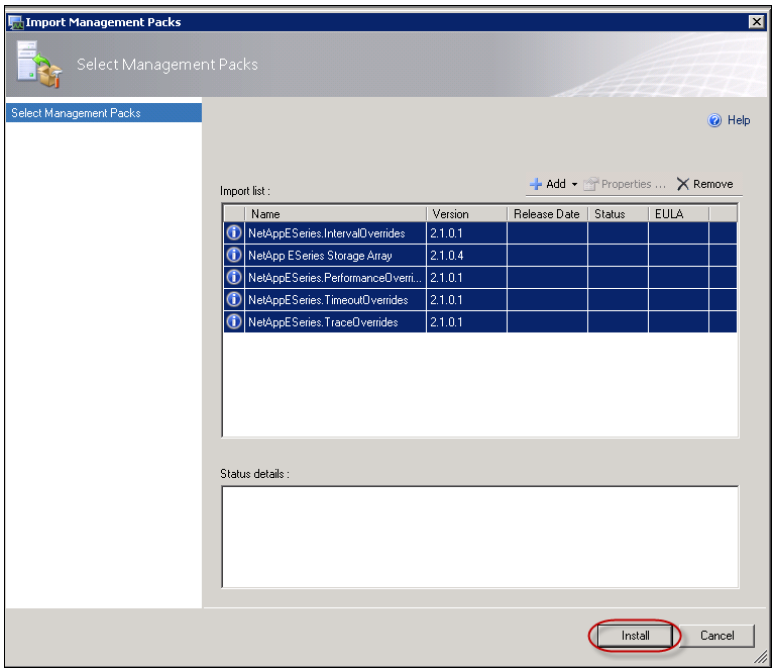
Figure 5 Select Management Packs to Import Window



5. Select the NetApp ESeries Storage Array management pack and associated .xml files to install.
6. Click Open.

   The Import Management Packs - Select Management Packs dialog box appears.

Figure 6 Import Management Packs - Select Management Packs Dialog Box



7. Select the files to install.
8. Click Install.

   The NetApp ESeries Storage Array management pack and associated .xml files install.

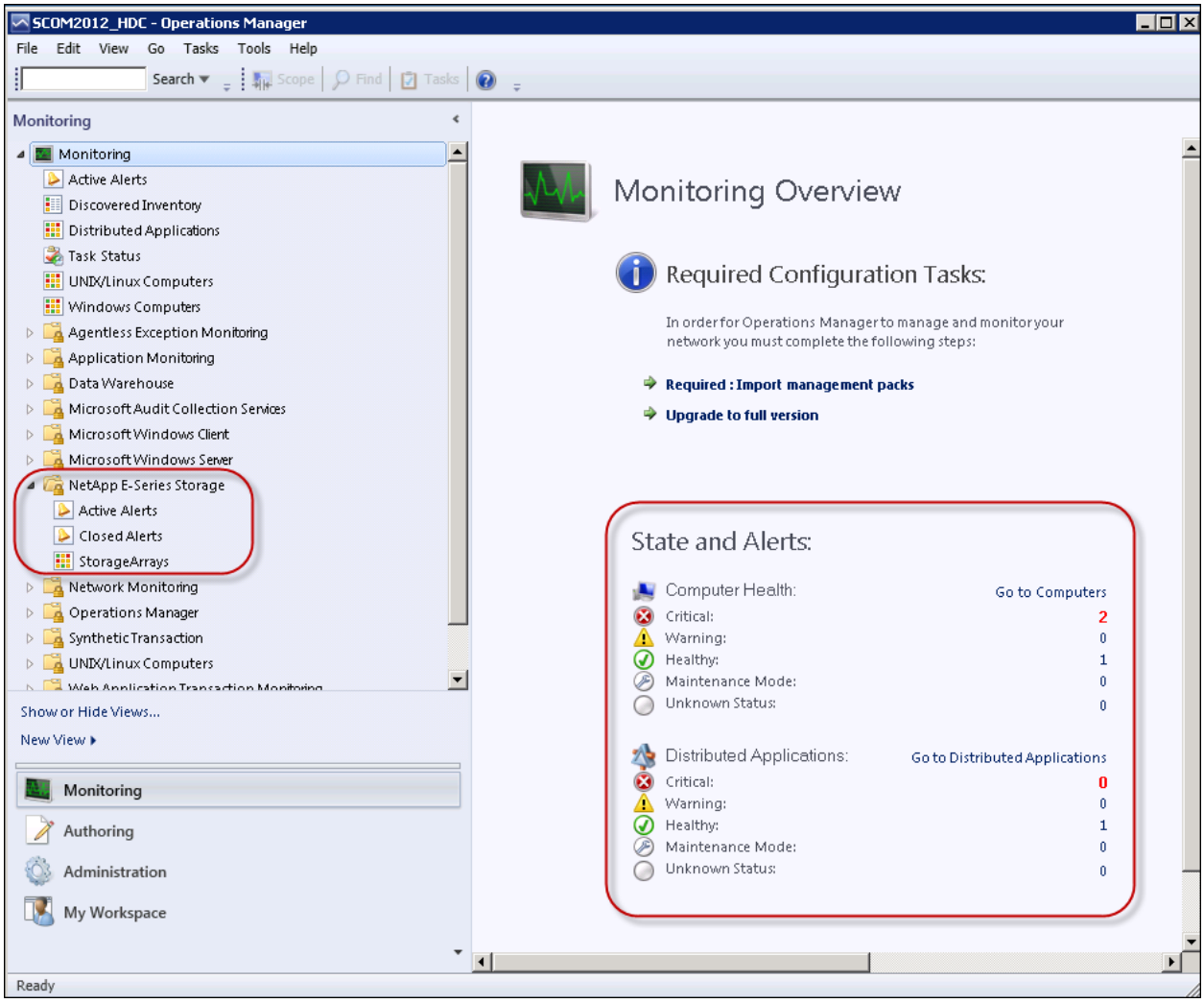
NetApp E-Series Storage Arrays

The Monitoring pane in the Microsoft System Center 2012 Operations Manager console shows the expanded NetApp E-Series Storage folder with three monitoring views:

- Active Alerts
- Closed Alerts
- Storage Arrays

The State and Alerts table shows the icons and descriptions for the health of computers and distributed applications.

Figure 7 SCOM Operations Manager Console



Active Alerts

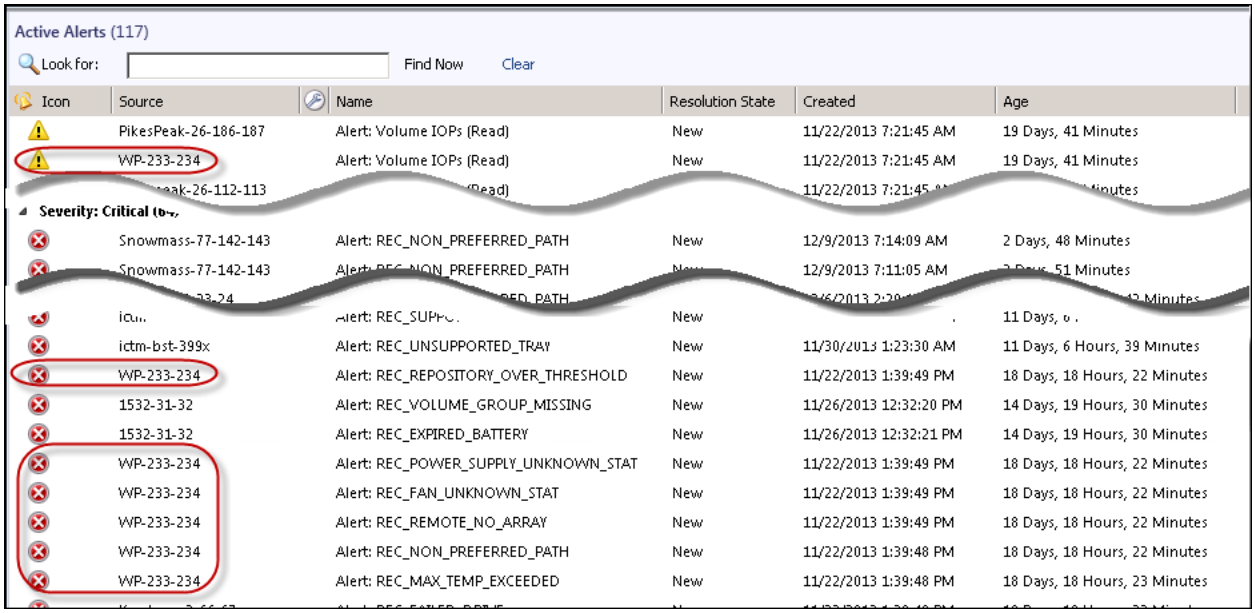
The Active Alerts pane shows the active alerts and summary information about them. Alert severity levels are separate. Alerts are grouped according to the severity of the alert. A storage array can have multiple alerts both within the same severity level and across multiple severity levels. Because the table can be sorted according to multiple criteria, the alerts might be grouped separately even within the same severity level. Within severity levels, you can sort active alerts by the following criteria:

- Source
- Maintenance Mode
- Name

- Resolution State
- Created
- Age

To view the alerts that SCOM is actively monitoring for NetApp E-Series storage arrays, click Active Alerts in the NetApp E-Series Storage folder.

Figure 8 Active Alerts



Closed Alerts

The Closed Alerts pane shows the alerts that were manually closed and removed from active alert state. The Closed Alerts pane displays alerts the same way that the Active Alerts pane displays alerts. You can sort closed alerts the same you sort active alerts.

To view the closed alerts that SCOM is not monitoring for NetApp E-Series storage arrays, click Closed Alerts in the NetApp E-Series Storage folder.

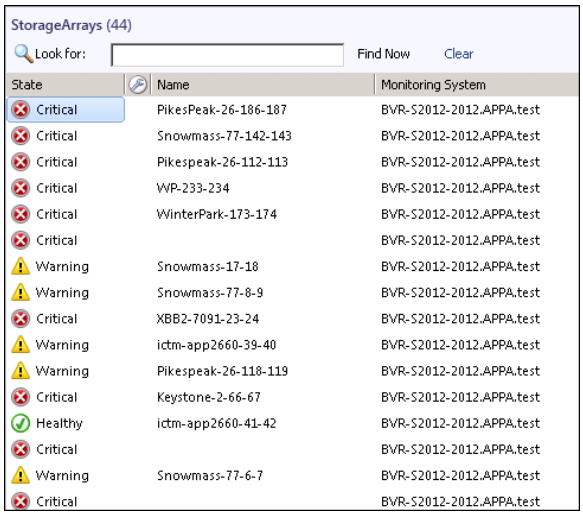
Storage Arrays

The Storage Arrays pane shows all storage arrays the SCOM is monitoring for health and performance. The State column shows both the storage array health and the storage array alert status. You can sort the storage arrays by the following criteria:

- State
- Maintenance Mode
- Name
- Monitoring System

To view the NetApp E-Series storage arrays that SCOM is actively monitoring for health and performance, click Storage Arrays in the NetApp E-Series Storage folder.

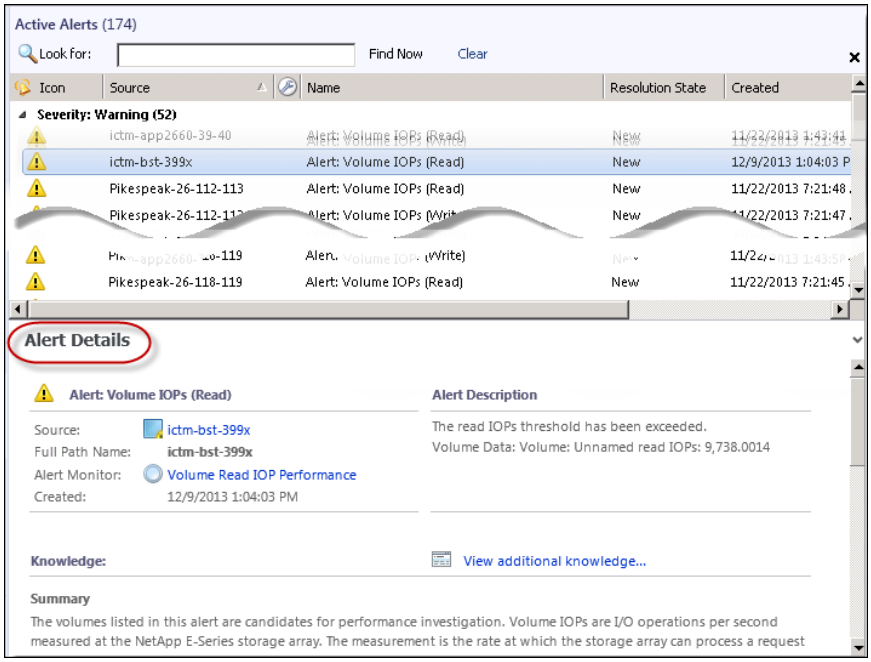
Figure 9 Storage Arrays Monitored for Health and Performance



Viewing Alert Details

The SCOM Operations Manager shows alert details for both active and closed alerts. To view alert details, select an alert. The Alert Details pane displays the alert details.

Figure 10 Alert Details



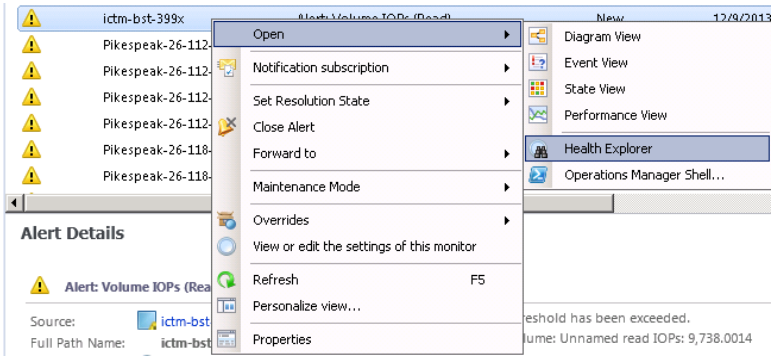
Health Explorer

The Health Explorer shows the health of a storage array and its member volumes. You can open the Health Explorer from either the Active Alerts pane, the Closed Alerts pane, or the StorageArrays pane. To open the Health Explorer, perform the following steps:

1. Right-click the alert or storage array for which to open the Health Explorer.

   A pop-up menu appears.

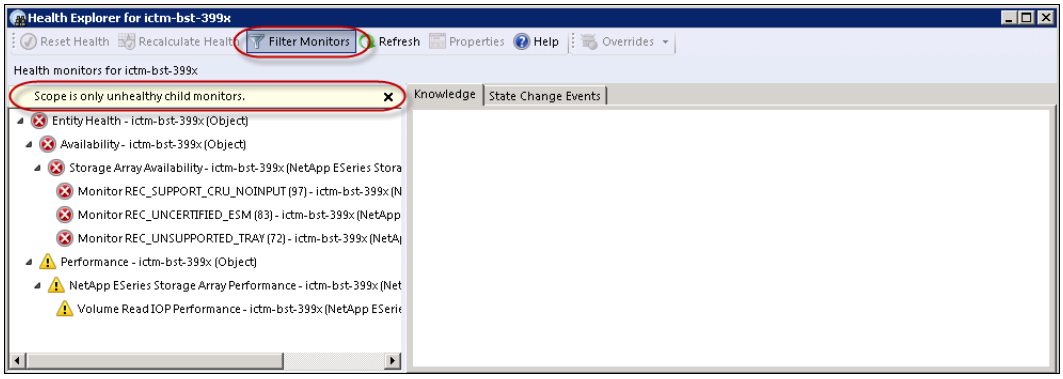
Figure 11 Open >> Health Explorer



2. Select Open >> Health Explorer.

   The Health Explorer window opens.

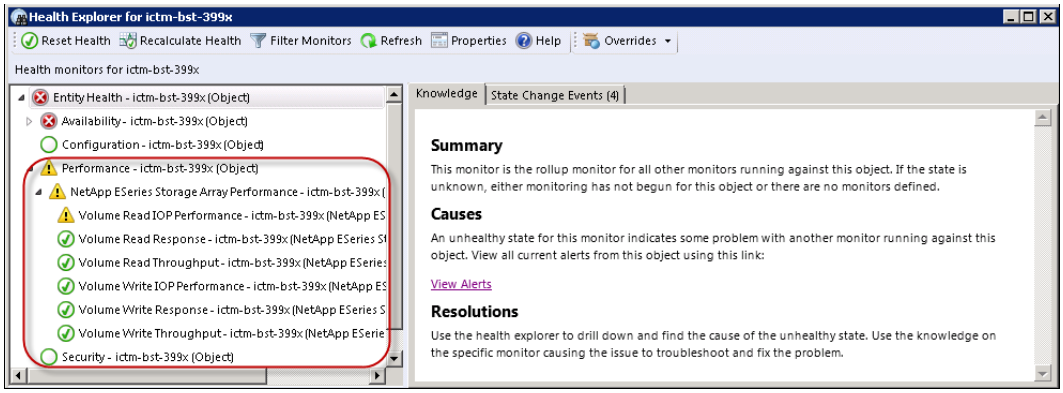
Figure 12 Health Explorer



- The initial view shows only unhealthy child monitors below the storage array as an object entity. You can filter the monitors to expand the entity to show both healthy and unhealthy child monitors.

  NOTE SCOM 2007 does not have the Filter Monitors feature.

Figure 13 Health Explorer With Healthy and Unhealthy Performance Monitors



- To view all child monitors, click Filter Monitors. The Health monitors pane for the storage array shows both health and unhealthy child monitors and both critical alerts and performance warning alerts.
- To return to only unhealthy child monitors, click Filter Monitors on the top-line menu bar.

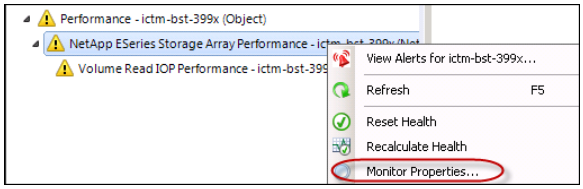
Configuring Performance Properties

You can configure performance properties for a single volume or for a storage array. To configure performance properties, perform these steps:

1. In the Health Monitor, right-click the volume or storage array for which to configure the performance properties.

   A pop-up menu appears.

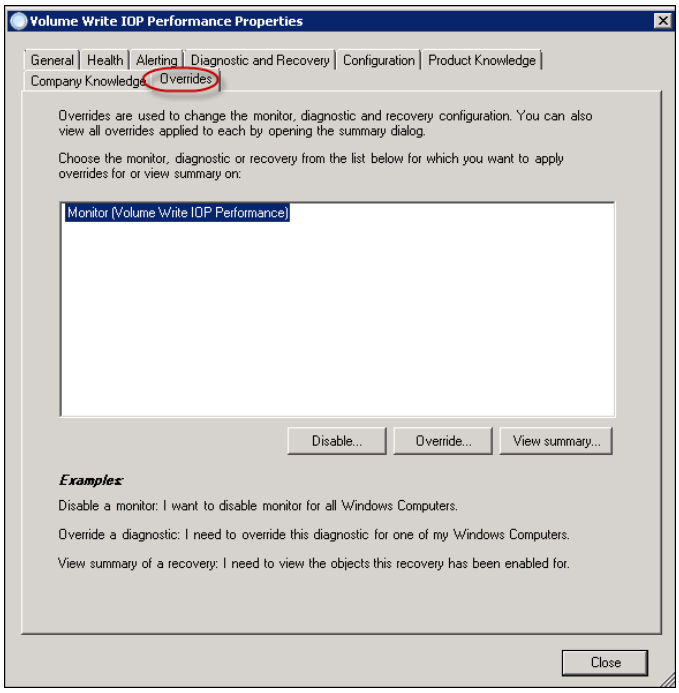
Figure 14 Performance Properties Pop-up Menu



- When you select a storage array, the NetApp ESeries Storage Array Performance Properties dialog box appears.
- When you select a volume, the Volume Performance Properties dialog box appears.

2. Click the Overrides tab.

Figure 15 Volume Performance Properties Dialog Box – Overrides



Changing Override Values

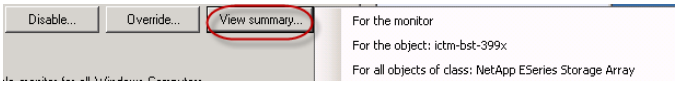
You can view and change performance override values for the following volume and storage array entities:

- For a monitor
- For an object
- For all objects of a class.

Viewing Override Summaries

To view performance overrides summaries, click View Summary in the Volume Performance Properties dialog box. A pop-up menu appears.

Figure 16 View Summary Pop-up Menu



- To view the summary for the monitor, click For the Monitor. The Overrides Summary dialog box for overrides that affect this monitor appears. See Figure 17 on page 14.
- To view the summary for the object, click For the Object. The Overrides Summary dialog box for overrides that affect this object appears. See Figure 18 on page 15.
- To view the summary for all objects of the class, click For the Object. The Overrides Summary dialog box for overrides that affect this class appears. See Figure 19 on page 15.

Changing Override Values

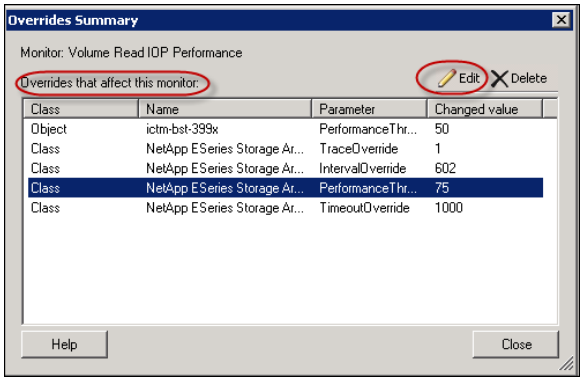
You can change performance override values for the following volume or storage array entities:

- For a monitor
- For an object
- For all objects of a class.

Overrides for a Monitor

The Overrides Summary dialog box shows the performance overrides that affect the selected monitor. When the Overrides Summary dialog box shows performance overrides for multiple classes or objects, you can edit them all at one time.

Figure 17 Overrides Summary Dialog Box – Overrides That Affect This Monitor

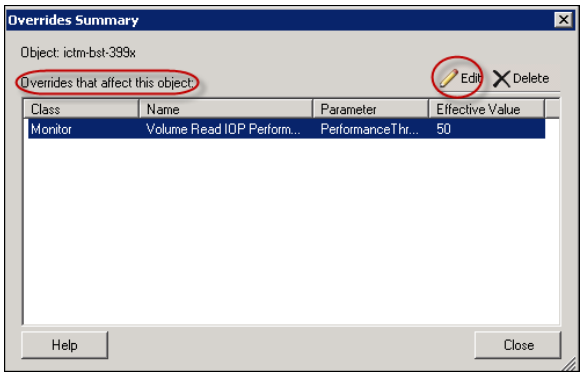


- Overriding the performance monitor for an object changes the performance override value for only the object.
- Overriding the performance monitor for a class changes the performance override value for all objects in the class.
- To edit performance overrides for the monitor, select the class or object in the Class column of the Overrides that affect this monitor table.

Overrides for an Object

The Overrides Summary dialog box shows the performance overrides that affect the selected object. When the Overrides Summary dialog box shows performance overrides for multiple classes or objects, you can edit them all at one time.

Figure 18 Overrides Summary Dialog Box – Overrides That Affect This Object

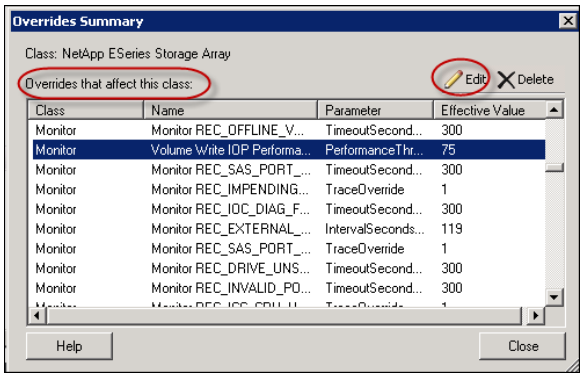


- Overriding the performance monitor for an object changes the performance override value for only that object. The performance override values for all other objects in the class do not change.
- To edit performance overrides for the object, select the monitor in the Class column of the Overrides that affect this object table.

Overrides for all Objects of the Class

The Overrides Summary dialog box shows the performance overrides that affect all objects within the selected class. When the Overrides Summary dialog box shows performance overrides for multiple classes or objects, you can edit them all at one time.

Figure 19 Overrides Summary Dialog Box – Overrides That Affect This Class



- Overriding the performance monitor for a class changes the performance override value for all objects in the class.
- To edit performance overrides for the object, select the monitor in the Class column of the Overrides that affect this monitor table.

Editing Override Properties

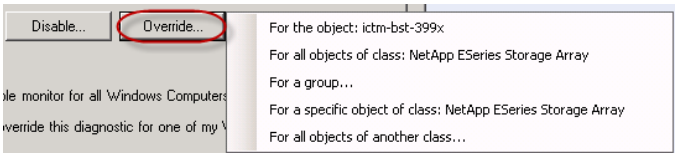
You can edit performance override properties for the following volume or storage array entities:

- For an object
- For all objects of a class
- For a group
- For specific object of a class

- For all objects of another class

To override volume or storage array performance properties, click Override in the Volume Performance Properties dialog box. A pop-up menu appears.

Figure 20 Override Pop-up Menu



Overrides for the Object

Overriding the performance monitor for an object changes the performance override value for only the object. To edit performance override properties for an object, click For the object.

- The Override Properties dialog box appears, as shown in Figure 23 on page 19.
- Performance Properties Overrides on page 19 describes how to change performance override properties.

Overrides for All Objects of Class

Overriding the performance monitor for an object changes the performance override value for only the object. To edit performance override properties for all objects of a class, click For all objects of class.

- The Override Properties dialog box appears, as shown in Figure 23 on page 19.
- Performance Properties Overrides on page 19 describes how to change performance override properties.

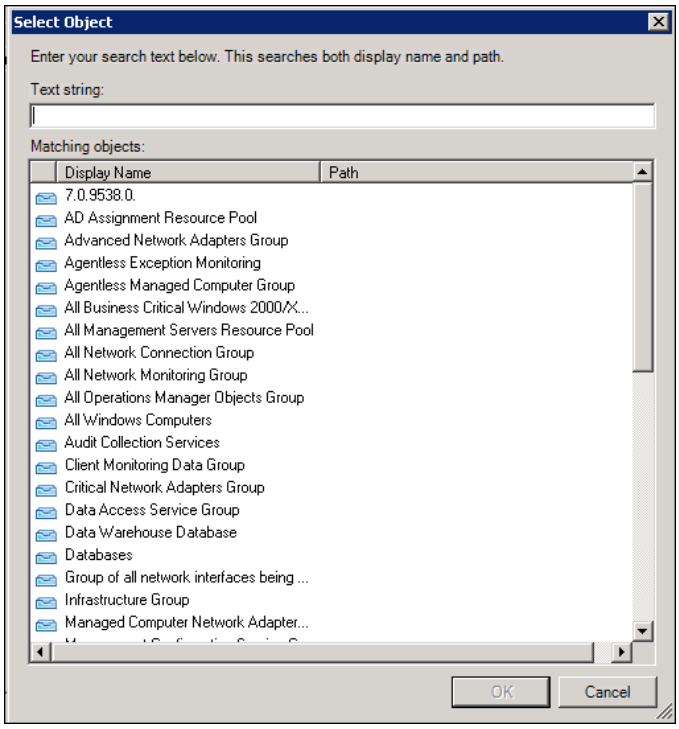
Overrides for a Group

Overriding the performance monitor for a group changes the performance override value for all classes and objects that are members of the group. To edit performance override properties for a group, perform these steps:

1. Click For a group.

   The Select Object dialog box appears.

Figure 21 Select Object Dialog Box



2. In the Display Name column, select the matching object.
3. Click OK.

   - The Override Properties dialog box appears, as shown in Figure 23 on page 19.
   - Performance Properties Overrides on page 19 describes how to change performance override properties.

For a Specific Object of Class

Overriding the performance monitor for a specific object of a class changes the performance override value for only that object. The performance override values for all other objects in the class remain the same. To edit performance override properties for a specific object of a class, perform these steps:

1. Click For a specific object of class.

   The Select Object dialog box appears, as shown in Figure 21 on page 17.

2. In the Display Name column of the Select Object dialog box, select the matching object.
3. Click OK.

   - The Override Properties dialog box appears, as shown in Figure 23 on page 19.
   - Performance Properties Overrides on page 19 describes how to change performance override properties.

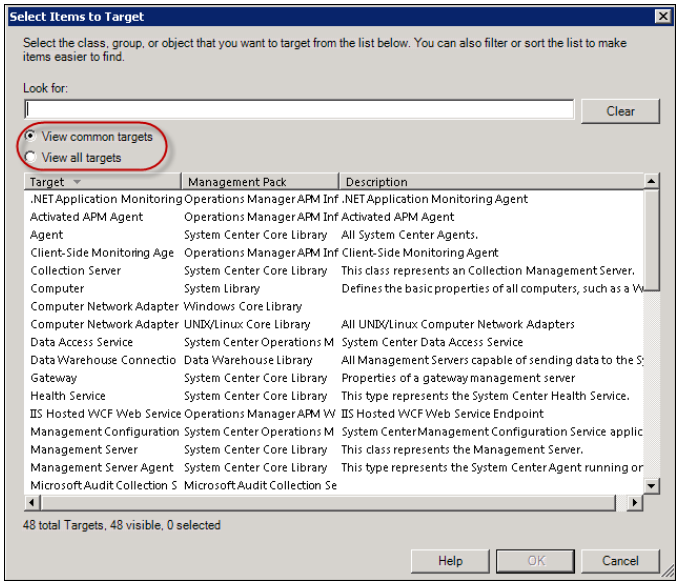
For All Objects of Another Class

Overriding the performance monitor for all objects of another class changes the performance override value for all objects in that class. To override the performance monitor properties of all objects of another class, perform these steps:

1. Click For all objects of another class.

   The Select Items to Target dialog box appears.

Figure 22 Select Items to Target Dialog Box



2. Select either View common targets or View all targets.
3. In the Target column, select the target class.
4. Click OK.

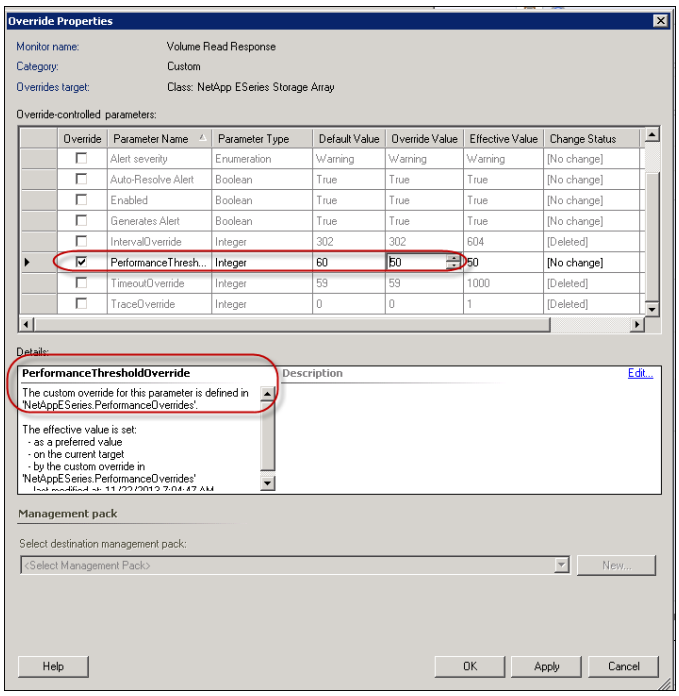
   - The Override Properties dialog box appears.
   - Performance Properties Overrides on page 19 describes how to change performance override properties

Performance Properties Overrides

Use the Override Properties dialog box to configure performance property overrides for all entities.

- Monitor
- Object
- All objects of a class
- Group
- Specific object of a class
- All objects of another class

Figure 23 Override Properties Dialog Box



- The Override column identifies performance property overrides that apply to the monitor, object, or class.
- The Details section of the Override Properties dialog box identifies the custom overrides defined in the NetAppESeries.PerformanceOverrides management pack.
- The Default Value column shows the value assigned to the performance parameter in the default management pack.
- The Override Value column shows the override value assigned to the performance parameter in the NetAppESeries.PerformanceOverrides management pack.

Configuring Performance Property Overrides

You can add, change, and delete performance property overrides.

Adding a Performance Property Override

1. In the Override column, select the new performance override.
2. Change the performance override values.

    - To change the default performance value, type the new performance value in the Default Value column.
    - To change the performance override value, select the new performance value from the drop-down list in the Override Value column.

3. Save the new performance override.

   - To save the new performance override and continue configuring performance monitor overrides, click Apply.
   - To save the new performance override and close the Override Properties dialog box, click OK.

     The Overrides Summary dialog box appears.

Removing a Performance Property Override

1. In the Override column, uncheck the performance override to remove.
2. Save the changed performance overrides.

   - To save the changes and continue configuring performance monitor overrides, click Apply.
   - To save the changes and close the Override Properties dialog box, click OK.

     The Overrides Summary dialog box appears.

Changing a Performance Property Override

1. In the Override column, select the performance override to change.
2. Change the performance override values.

   - To change the default performance value, type the new value in the Default Value column.
   - To change the performance override value, select the new performance value from the drop-down list in the Override Value column.

     The Overrides Summary dialog box appears.

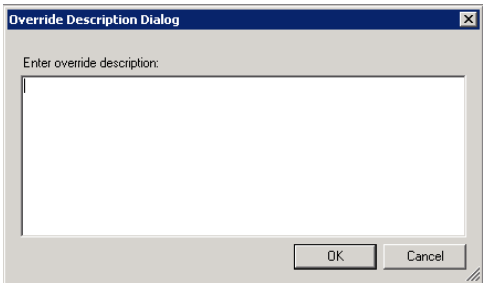
Editing Performance Override Descriptions

The Details section contains the read-only, default description of the monitor override parameter. To add, change, or delete a customized description, perform these steps:

1. In top right corner of the Details text box, click Edit.

   The Override Description Dialog dialog box appears.

Figure 24 Override Description Dialog – Enter Override Description Dialog Box



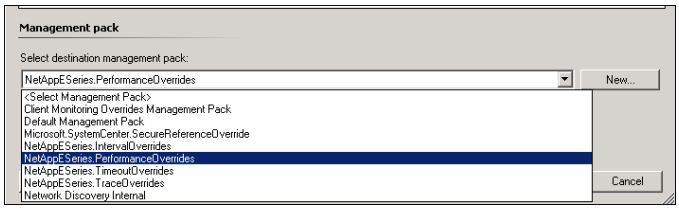
2. In the Enter override description text box, either type a new description, edit the current description, or delete the current description.
3. Click OK.

Selecting the Management Pack

When you change a performance override value, the Select destination management pack drop-down list is active. To select the management pack, perform these steps:

1. In the Select destination management pack drop-down list, click NetAppESeries.PerformanceOverrides.

Figure 25 Select Destination Management Pack



The Select destination management pack drop-down list closes.

2. Save the performance override properties.

- To save the changes and continue configuring performance monitor overrides, click Apply.
- To save the changes and close the Override Properties Dialog dialog box, click OK.

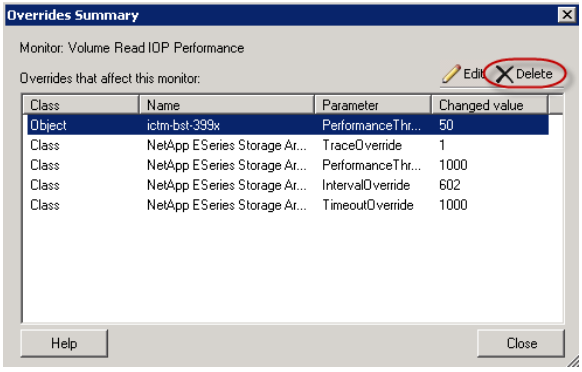
Deleting Monitor Overrides

To delete a monitor override, perform these steps:

CAUTION When you delete a performance override, the performance override is deleted immediately. No confirmation message appears.

1. In the Overrides Summary dialog box, select the performance override to delete.

Figure 26 Overrides Summary Dialog Box – Delete



2. Click Delete.
3. Click Close to return to the Overrides Properties dialog box.

Obtaining Volume Performance Data

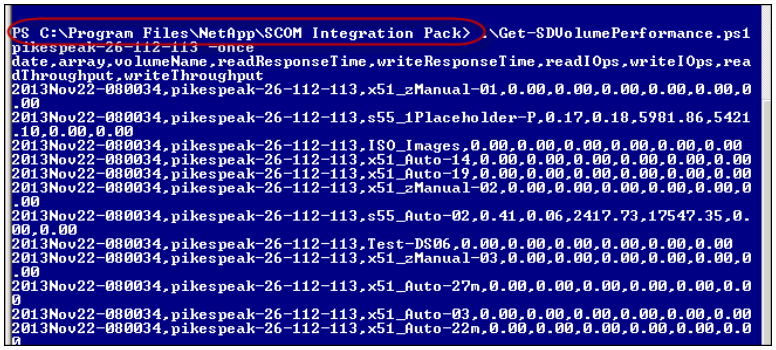
The NetApp Storage Array Integration Pack contains a script for obtaining the performance data of storage arrays and volumes that the SCOM integration pack is monitoring.

Performance Monitor Data Output

You can import the data into a spreadsheet as a tool to organize the data, sort it, chart it, and analyze it for debugging purposes when a performance alert is triggered.

NOTE You must run the script from the proxy server:

Figure 27 Example Data Performance Script



You can obtain performance data on only one storage array at a time. The script returns the following performance data:

- Response time (latency) - The amount of time expressed in milliseconds that the array takes to perform an I/O operation
- Input/output operations per second
- Throughput expressed as MB per second.

Performance statistics are returned from the NetApp E-Series web service cache. The cache is refreshed with new analyzed data every 300 seconds. By default, the script returns the performance data for all volumes on a storage array. By default, the script returns performance data only when requested. However, you can edit the script in the following ways:

- Continuously poll a storage array and return the data as terminal window output. The script returns performance data for the specified volume and then sleeps before returning performance data again.
- Change the data collection interval.
- Specify individual volumes on a storage array for which to return performance data.

The `wsconfig.xml` is located in the webserver directory of the installation path of the NetApp SCOM Integration Pack at the following location:

```
C:\Program Files\NetApp\SCOM Integration Pack
```

You can run a script to download the performance data for a single volume as a comma-delimited spreadsheet. The spreadsheet provides a tool for you to use to analyze volume performance data. You can run the script to query the web server and output the data to the terminal two modes.

- The default mode is a one-time query.
- The script can run in continuous mode. To interrupt the continuous output, press Ctrl+C.

The script returns the following volume performance data:

- Read response time
- Writer response time
- Read IOps
- Write IOps
- Read throughput
- Write throughput

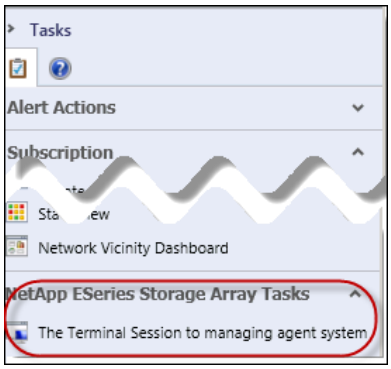
For you to run the script, the SCOM integration pack must be monitoring the storage array. By default, the script returns the data for all volumes on the storage array, but you can filter the list of volumes on which to run the script.

Running the Performance Data Script

You must run the script from the NetApp Storage Array Shell PowerShell. To run the script, perform these steps:

1. In the SCOM Operations Manager window, select a volume or storage array on which to run the script.
2. In the right pane of the SCOM Operations Manager window, click The Terminal Session to managing agent system.

Figure 28 Tasks – NetApp ESeries Storage Array Tasks – The Terminal Session to Managing Agent System

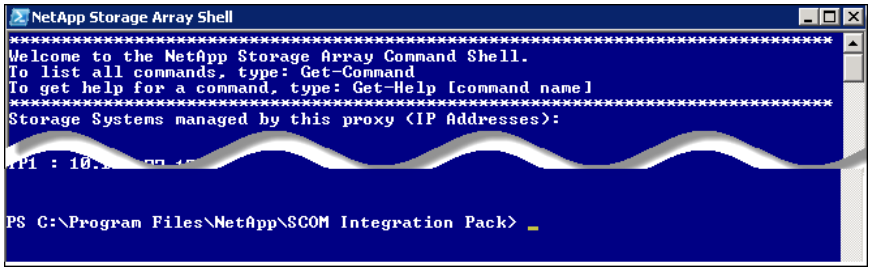


The proxy server opens.

3. On the proxy server desktop, select Start >> NetApp StorageArray Console.

   The NetApp Storage Array Shell terminal window opens and shows all storage arrays managed by the proxy server.

Figure 29 NetApp Storage Array Shell



4. At the command prompt, type one of the following commands:

   - For a one-time return of volume performance data—

     `.\Get-SDVolumePerformance.ps1 <array name> -once`

     EXAMPLE—

```
.\Get-SDVolumePerformance.ps1 ictm-bst-399x -once
```

- For a continuous return of volume performance data—

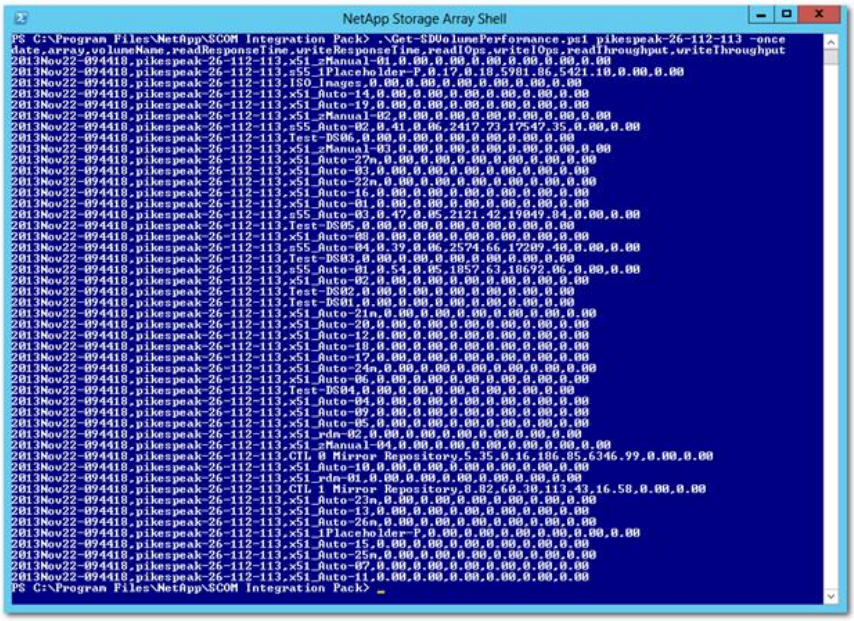
  ```
  .\Get-SDVolumePerformance.ps1 <array name> -continuous
  ```

  EXAMPLE—

  ```
  .\Get-SDVolumePerformance.ps1 ictm-bst-399x -continuous
  ```

  - The terminal window returns the volume performance data.
  - To end a continuous return of volume performance data, type Ctrl+C.

Figure 30 Volume Performance Data for a Storage Array



Downloading the Performance Data

You can download the performance data to your local workstation and then import it as a comma-delimited file into a spreadsheet or other application.

NOTE For the imported file to correctly format the data, the file must be comma-delimited.

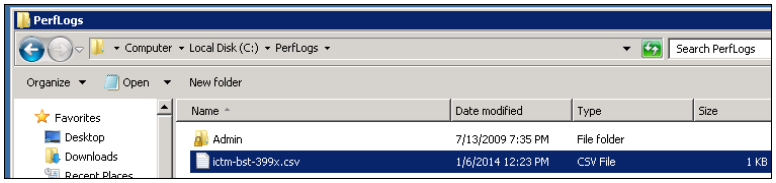
1. To download the performance data, type the following command at the command prompt:

```
.\Get-SDVolumePerformance.ps1 < array name> -once | out-file <location> < array name>.csv
```

EXAMPLE—

```
.\Get-SDVolumePerformance.ps1 ictm-bst-399x -once | out-file C:\PefLogs\ictm-bst-399x.csv
```

Figure 31 Downloaded File



2. Import the file as a comma-delimited file into a spreadsheet of other application.

- Import the data From Text.
- Make sure the file type is Delimited.
- Make sure the delimiter is Comma
- Make sure YMD is selected in the Column data format.

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