
Storage Management Best Practices Using VisualSRM

Abstract

The implementation of best practices and strategies has never been easier with EMC's VisualSRM, a solution that provides ways for administrators and users to manage their storage infrastructure.

Published 11/20/2004

Copyright © 2003, 2004 EMC Corporation. All rights reserved.

EMC believes the information in this publication is accurate as of its publication date. The information is subject to change without notice.

THE INFORMATION IN THIS PUBLICATION IS PROVIDED “AS IS.” EMC CORPORATION MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WITH RESPECT TO THE INFORMATION IN THIS PUBLICATION, AND SPECIFICALLY DISCLAIMS IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Use, copying, and distribution of any EMC software described in this publication requires an applicable software license.

EMC², EMC, Symmetrix, Celerra, CLARiiON, CLARAlert, Documentum, HighRoad, Legato, Navisphere, PowerPath, ResourcePak, SnapView/IP, SRDF, TimeFinder, VisualSAN, and where information lives are registered trademarks and EMC Automated Networked Storage, EMC ControlCenter, EMC Developers Program, EMC OnCourse, EMC Proven, EMC Snap, Access Logix, AutoAdvice, Automated Resource Manager, AutoSwap, AVALONidm, C-Clip, Celerra Replicator, Centera, CentraStar, CLARevent, Connectrix, CopyCross, CopyPoint, DatabaseXtender, Direct Matrix, Direct Matrix Architecture, EDM, E-Lab, Engenuity, FarPoint, FLARE, GeoSpan, InfoMover, MirrorView, NetWin, OnAlert, OpenScale, Powerlink, PowerVolume, RepliCare, SafeLine, SAN Architect, SAN Copy, SAN Manager, SDMS, SnapSure, SnapView, StorageScope, SupportMate, SymmAPI, SymmEnabler, Symmetrix DMX, Universal Data Tone, and VisualSRM are trademarks of EMC Corporation. All other trademarks used herein are the property of their respective owners.

Part Number H1255

Table of Contents

Overview	4
What are Storage Management Best Practices?.....	4
Benefits of Storage Management Best Practices	4
Lower Total Cost of Ownership	4
Ease of Use	4
Reduce or Eliminate Server Outages Due to Out-of-Control Disk Space Consumption	4
Automate Management Processes	5
Improve Capacity Planning and Chargeback Capabilities	5
Using VisualSRM to Monitor Disk Space	6
Identifying Potential Out-of-Space Problems.....	6
User Interface	6
Threshold Policies	7
Managing Chargeback According to Business Needs	10
File Groups and Chargeback Reporting	10
File Groups	10
Chargeback Summary Report.....	11
Improving Service Levels through Availability and Automation	12
Using Intelligent Actions to Improve Storage Management.....	12
Identifying Stale or Dormant Files and Folders	12
Using VisualSRM for Cleanup	16
Finding and Removing Core Files	16
Using Intelligent Action to Find MP3 Files.....	18
Quota Management Using Threshold Policies	19
Creating a Threshold Policy.....	20
Conclusion	21

Overview

EMC® VisualSRM™ is software that has been specifically architected to provide centralized storage resource management for mid-tier storage environments. VisualSRM gives administrators a powerful solution to efficiently manage their storage resources with file-level reporting, and takes action through Intelligent Actions (IA) that frees the administrator to do more important things.

What Are Storage Management Best Practices?

Today, many businesses face an ever-increasing challenge of managing their storage resources. How is storage being utilized? How much free space is available and where is it? All of these processes, using tools unique to each operating system and storage array, can be extremely complex and labor-intensive. Organizations of every size have issues with data and storage management practices. Many businesses worry about loss of critical data caused by failures. This has forced storage administrators to analyze and reevaluate how their data is being protected.

Best practices are process-oriented steps that are well planned and prioritized to facilitate a certain activity that helps ensure the delivery of a Quality of Service (QoS) level. EMC's VisualSRM enables companies to move from passive storage management processes to automated storage management. It empowers users to understand the usage patterns and configure and proactively control their storage resources according to business requirements.

Benefits of Storage Management Best Practices

VisualSRM, in conjunction with this set of best practices, enables administrators to quickly and easily enhance the value of existing storage resources. The following sections describe the benefits of using VisualSRM best practices.

Lower Total Cost of Ownership

By making better use of existing storage capacity and reducing the need to buy additional storage to meet demand, VisualSRM increases the value of existing equipment, lowering total cost of ownership. In addition, the automation of previously time-consuming manual processes lowers the overall cost of management, further benefiting total cost of ownership.

Ease of Use

VisualSRM provides a single console with an intuitive graphical user interface for managing storage resources across operating systems and storage types—internal, direct attached, network-attached storage (NAS), or storage area network (SAN). Its intuitive GUI enables administrators to understand visually how resources are being used and better manage those resources. Combined with the best practices discussed in this document, administrators can begin reaping the benefits of automated storage resource management soon after installation is complete.

Reduce or Eliminate Server Outages Due to Out-of-Control Disk Space Consumption

By setting and automatically enforcing storage thresholds (at volume, partition, share, directory, or sub-directory levels) administrators can take actions to delete, compress, or archive files to free up space.

Historical views of storage usage trends allow administrators to find underutilized storage that can be used by automatically migrating directories and files from storage that will be overutilized if no action is taken.

The VisualSRM alerting mechanism prevents out-of-disk-space conditions and improves availability by actively monitoring thresholds and events, and taking action ranging from alerting administrators to performing file deletes, compressions, migrations, and more.

Automate Management Processes

Policy-based Intelligent Actions help automate management processes across platforms, saving time while providing predictable and repeatable results. Administrators can set thresholds on criteria and events such as capacity levels, age of files, or time since a file has been accessed, and set policies that define the actions to take when an event occurs. This automation saves time while ensuring a storage environment that functions smoothly and predictably.

Improve Capacity Planning and Chargeback Capabilities

VisualSRM provides built-in and customizable reports that can be run interactively or as scheduled jobs. The reports show detail and summary-level information, including trending analysis for capacity planning and chargeback calculations.

Using VisualSRM to Monitor Disk Space

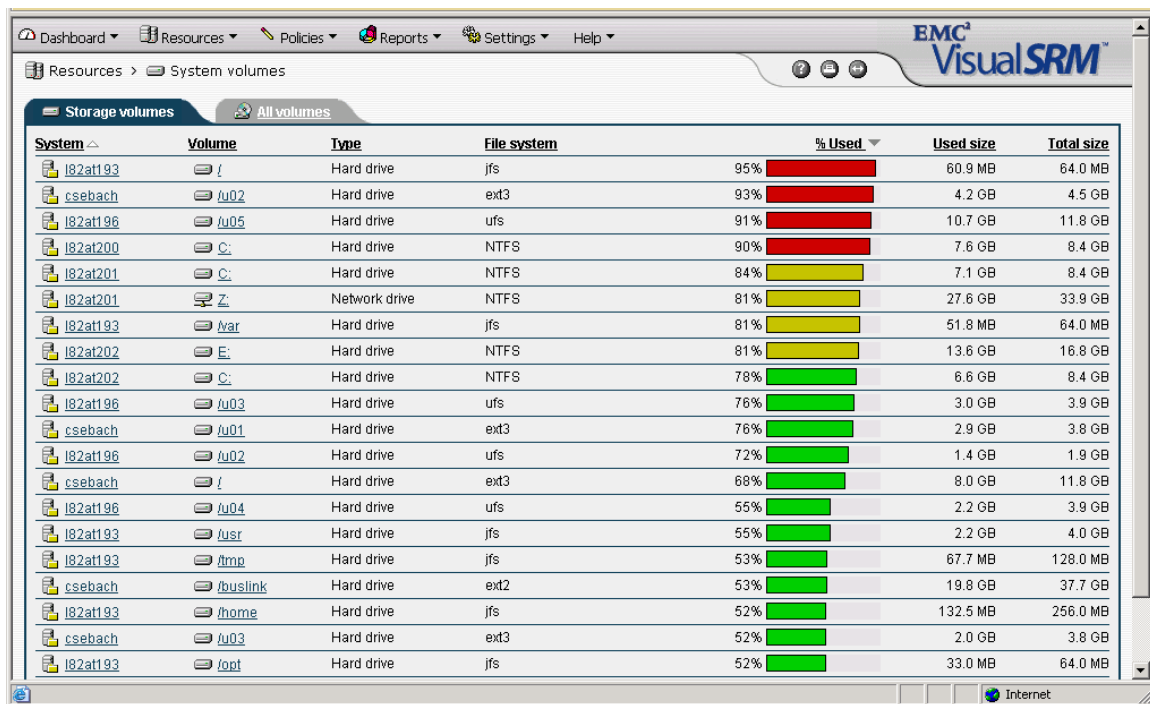
VisualSRM can be used to help Monitor Disk space problems. In the following examples, we will look at ways to identify potential out-of-space problems by utilizing the User Interface and Threshold policies.

Identifying Potential Out-of-Space Problems

A common problem that system administrators face is users running out of space on their volumes. If this occurs, not only does it cause problems with the users, it can cost the company money due to data loss. All of these items can be done by creating scripts to collect information, but that requires time by the system administrators to collect, collate, and display the findings. VisualSRM can help identify potential out-of-space problems in three ways: the user interface, threshold policies, and disk space reporting.

User Interface

One way to locate devices that are almost full is to use the VisualSRM user interface. The System Volumes window gives a quick glance at the highest utilized file systems. The System Volumes window displays the system, the volume (file system), the type of file system, the percentage used, the size used, and the total size. This display gives a quick glance at the top devices that might need attention. For example, system csebach has a device, /u02, which is currently at 93 percent. Earlier, this drive had been at a much lower amount. Figure 1 shows an example of the System Volumes window.



System	Volume	Type	File system	% Used	Used size	Total size
I82at193	/	Hard drive	jfs	95%	60.9 MB	64.0 MB
csebach	/u02	Hard drive	ext3	93%	4.2 GB	4.5 GB
I82at196	/u05	Hard drive	ufs	91%	10.7 GB	11.8 GB
I82at200	C:	Hard drive	NTFS	90%	7.6 GB	8.4 GB
I82at201	C:	Hard drive	NTFS	84%	7.1 GB	8.4 GB
I82at201	Z:	Network drive	NTFS	81%	27.6 GB	33.9 GB
I82at193	/var	Hard drive	jfs	81%	51.8 MB	64.0 MB
I82at202	E:	Hard drive	NTFS	81%	13.6 GB	16.8 GB
I82at202	C:	Hard drive	NTFS	78%	6.6 GB	8.4 GB
I82at196	/u03	Hard drive	ufs	76%	3.0 GB	3.9 GB
csebach	/u01	Hard drive	ext3	76%	2.9 GB	3.8 GB
I82at196	/u02	Hard drive	ufs	72%	1.4 GB	1.9 GB
csebach	/	Hard drive	ext3	68%	8.0 GB	11.8 GB
I82at196	/u04	Hard drive	ufs	55%	2.2 GB	3.9 GB
I82at193	/usr	Hard drive	jfs	55%	2.2 GB	4.0 GB
I82at193	/tmp	Hard drive	jfs	53%	67.7 MB	128.0 MB
csebach	/buslink	Hard drive	ext2	53%	19.8 GB	37.7 GB
I82at193	/home	Hard drive	jfs	52%	132.5 MB	256.0 MB
csebach	/u03	Hard drive	ext3	52%	2.0 GB	3.8 GB
I82at193	/opt	Hard drive	jfs	52%	33.0 MB	64.0 MB

Figure 1. System Volumes Window

After clicking the /u02 link, we see the subpaths of the path and its size. There is also an ability to see the files in the paths. An examination of the files that have been created reveals that an Oracle database had been created in the path, thus leaving the space at 93 percent.

Threshold Policies

The user interface provides a quick way to see devices that are near capacity, but must be viewed constantly to be used to best effect. By using threshold policies, we will set up policies that monitor file systems, and send a warning e-mail notification to administrators.

For this example, an e-mail will be sent when the resource—or volume in this example—exceeds 70 percent, 80 percent, and 90 percent. At 70 percent, the resource owner will receive a warning e-mail. At 80 percent, both the user and the administrator group will receive an e-mail notification. At 90 percent, the user, the administrator group, and the user's manager will receive an e-mail notification. By using a proactive process, the risk of the end user running out of disk space is minimized, thus saving the company money.

Creating a Threshold Policy

It is easy to create and maintain a Threshold policy. To create a new Threshold policy, follow these steps:

1. Select **Policies, Thresholds** from the VisualSRM menu bar.
2. Click **New**.

The **New Threshold Policy** dialog box opens (**Error! Reference source not found.**).

3. Enter the policy name, the threshold type (in this example, we will be using a volume threshold), the threshold percent, and the actions necessary once the threshold has been reached. In this example, we want to alert the owner when the threshold has been breached.
4. Click **OK** to create the new threshold policy.

Figure 2. New Threshold Policy

Adding Monitored Objects

Once the policy has been created, you will need to add objects that will be monitored by the policy. Click **Add** to add monitored objects. In this example, we will be adding /u0x volumes. We first click on **csebach**, and then select the /u0x devices. **Error! Reference source not found.** shows the **Add Objects** dialog box.

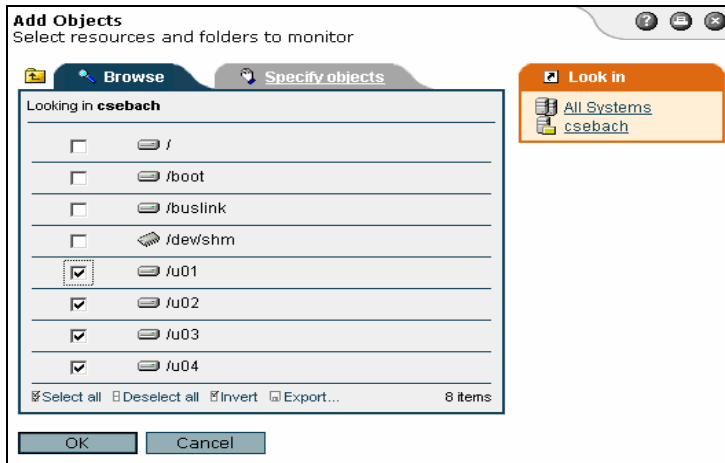


Figure 3. Add Objects Dialog Box

Adding Owners

Now that the file systems have been added, we need to add the owners who will be responsible for this file system. Click the appropriate line in the Owners' column, and the Owner's dialog box will load. Select the appropriate user and click **OK**. Figure 4 shows the Add Owner dialog box.

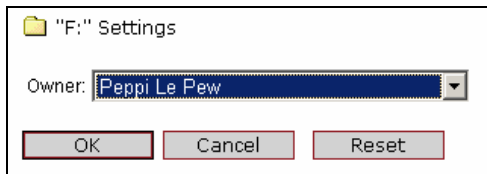


Figure 4. Add Owner Dialog Box

Setting Warning Levels

It is often not enough to be alerted if a threshold is breached. Often, many people want to be alerted if a threshold is close to being breach. Visual SRM gives you the opportunity to set warning levels. To do this, click "New..." under the Warning Levels tab while in the Threshold Policy.

The New Threshold Policy dialogue box will open, and you have the choice of deciding if you wish to set a warning at a set utilization, such as 100 MB, or to set the warning at a percentage. For this example, we will set to send a warning at 70 percent. Also, there are dialogue boxes that allow you to send the message to the owner, or to a group of people. For this example, we will send the message to only the owner. Further, there is the ability to send a message to the owner's manager. This feature will not be used in this example. Finally, you have the option of running a task list. A task list is a series of related policies, run in sequence, that are triggered when certain events, defined by the policies in the list, occur. Each policy in the task list has to run successfully before the next one in the series is run. This feature will not be used for this example. Once all the features are selected, click **OK** to create the warning levels. Figure 5 illustrates the New Threshold Policy dialog box.

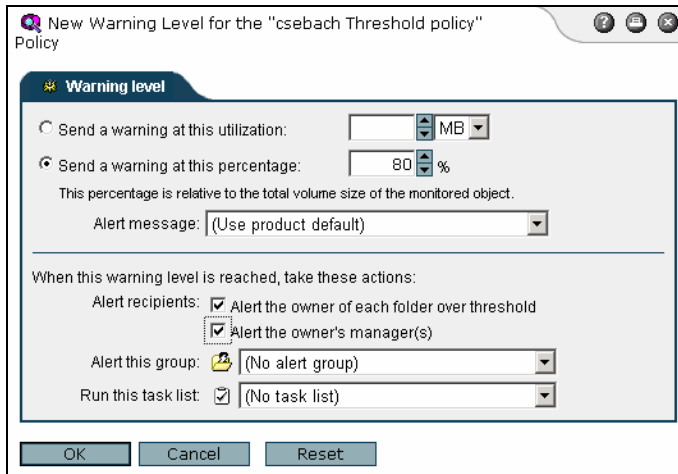


Figure 5. New Warning Level Dialog Box

With the warning levels in place, our volume owners will receive warnings at 70, 80, and 90 percent of capacity. Also, at 90 percent, the administrator group will receive an e-mail to help prevent the file systems from exceeding capacity. All of this was done without having to write time-consuming scripts, testing them on each type of machine, and having the administrators worry about having to update the scripts each time a user leaves or a status changes.

Built-in Reports

Another way to find full volumes is by using VisualSRM built in reports. VisualSRM has several reports that help track and show disk space consumption. Several reports that are available that can give information on space consumption are as follow:

- Paths Trendview — Directory paths growth and trending levels
- Space Usage by Path — Storage consumption by path
- Systems Trendview — System disk consumption trending levels
- Volumes Trendview — Disk volume (file system) trending levels

It is a best practice to run these reports on a daily or weekly basis and become aware of potential space problems and correct them before they cost your company time, effort, and money.

Managing Chargeback According to Business Needs

Because of the cost of maintaining and operating computer centers, many businesses today are starting to charge back the cost of storage. Often, these costs are divided up by department or geographical cost centers. VisualSRM makes this type of chargeback easy to implement and use.

File Groups and Chargeback Reporting

File groups are used to organize paths and files across resources into logical groupings. For example, you might want to identify all folders that belong to a specific department, and then create a file group that reflects that information. These must be created before the Chargeback Summary Report can be run.

File Groups

File groups are created to logically represent how you want your resources to be divided. For example, if you want to have logical groupings by department, you would create file groups for the Finance, Accounting, Engineering, and Management groups. Within the Finance file group, the objects (or resources) would include all the systems, file systems, and/or directories that the Finance group uses. Because the chargeback report needs a chargeback amount, you will need to provide a chargeback amount for the space consumed by the Finance department. This amount is usually set by company policy. Once this information is available, it is quite easy to create the file group.

Creating a New File Group

To view file groups, select **Resources, File Groups** from the VisualSRM menu bar. To create a new file group, click **New in the File Groups window**. The **New File Group** dialog box appears. In the dialog box, you can enter the name of the group and the chargeback value that will be associated with this group.

In Figure 6, the administrator creates a group called “Finance” and enters a value of \$2.00 per megabyte of storage.

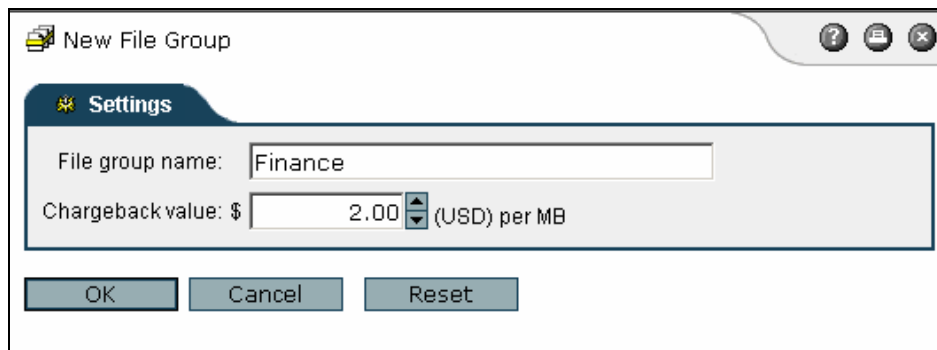


Figure 6. New File Group

Adding Objects

Once the file group is created, you can add the objects that belong to the group. To do so, click **Add**. The **Add Objects** dialog box appears, and you can browse the objects you want to enter into the group. For this example, we will choose all the file systems that are used by the Finance department.

Hint: You can select a specific directory by clicking on the host link and following the directory links to the directories needed.

Once the file groups are created and objects assigned to them, you can run the Chargeback Summary report.

Chargeback Summary Report

The Chargeback Summary report provides a chargeback group summary for the file groups that have been created. All groups are included in the report. The report includes the file group, path, system name, chargeback value (entered in the file group), size of path, and the chargeback amount. The report is subtotaled and totaled for all the systems. Figure 7 shows an example of the chargeback report.

File Group: Finance		ChargeBack Value	Size below this Path (MB)	Path Value
Path	System			
CA	E2at130	\$2.00	3,583	\$7,166.00
DA	E2at130	\$2.00	3,650	\$7,300.00
FA	E2at130	\$2.00	25	\$50.00
GA	E2at130	\$2.00	75	\$150.00
CA	E2at175	\$2.00	5,893	\$11,786.00
EA	E2at175	\$2.00	10,775	\$21,550.00
FA	E2at175	\$2.00	1,873	\$3,746.00
GA	E2at175	\$2.00	18,652	\$37,304.00
File Group Totals			44,526	\$89,052.00
Total ChargeBack Value			145,390	\$239,021.00

Figure 7. Chargeback Summary Report

Improving Service Levels through Availability and Automation

Service levels can be improved by increasing space availability, and by using the automation techniques. VisualSRM can do this by using Intelligent Actions to improve storage management, specifically by identifying stale or dormant files and folders, and cleaning up unused log files that take up space on storage subsystems.

Using Intelligent Actions to Improve Storage Management

VisualSRM gives you the ability to improve your storage management by offering ways to identify stale or dormant files, and by giving several ways for the system administrator to do house cleaning. The following sections describe using Intelligent Action policies in more detail.

Identifying Stale or Dormant Files and Folders

People leaving the company, old projects, and users changing jobs are all examples of how files can get stale and become dormant. Scripts can be written to find files that have not been touched in a period of time; however, they can be difficult to write and must be maintained. Furthermore, trying to maintain custom scripts on multiple systems being managed can be quite challenging and time consuming. VisualSRM has built-in features, called Intelligent Action Policies, which will enable active storage management, allowing the user to stage, compress, copy, delete, or move any objects you manage with VisualSRM. For example, an Intelligent Action can be used to find dormant files. To do so, the Intelligent Action policy would be used to find files and folders that have not been accessed in a specific period of time. In our example, we will look at a technique to find compressed files (tar, gunzip, etc.) that have not been accessed for 6 months (180 days) and then move them to a staging area. After they have been in the staging area for two weeks, the files would then be compressed.

Creating an Intelligent Action Policy

To create an Intelligent Action (IA) policy, which will enable us to compress stale files, follow these steps:

1. Select **Policies**, and **Intelligent** Actions from the VisualSRM menu bar.
The **Intelligent Action** window opens.
2. Click **New** in the **Intelligent Action** window.
The **New Intelligent Action Policy** dialog box appears.
3. Enter the policy name, the action you want to take, whether you want to execute the policy with or without conformation, and how much history you wish to keep on this IA. Additionally, you can also leave a link to the files that have been staged.

For our example, we will enter **Stale Compressed file staging** as the policy name, select that we want the files to be staged for two weeks, and we require confirmation and want to alert the Administrators group that this IA is ready to be run. We also want to maintain 8 weeks of history on this IA. Figure 8 shows the New Intelligent Action Policy dialog box.

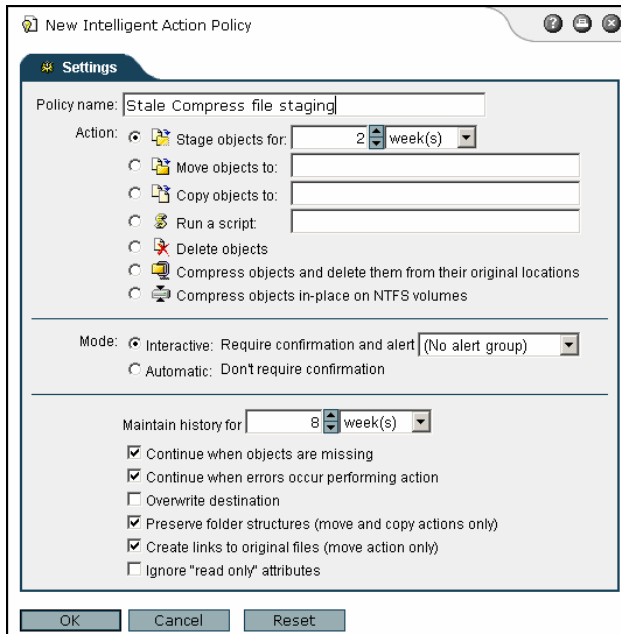


Figure 8. New Intelligent Action Policy Dialog Box

Adding Filters to the IA

Once you click **OK**, the dialog box will close and the **Stale Compressed file staging** page opens. In order for this IA to work correctly, you must add filters. A filter is the criteria that you set to trigger intelligent actions policies. For our example, we will need to add three filters: one for the resources, one for the file type, and one for the file-last-accessed date.

Resource Filter

To add the resource filter, click **New** under the **File Filters** section of the newly created IA. The **New Filter** dialog box appears. A resource in this example is the name of the machine in which you want to look for the specific type of files. For our example, we will select a machine named **csebach**. Figure 9 shows the **New Filter** dialog box.

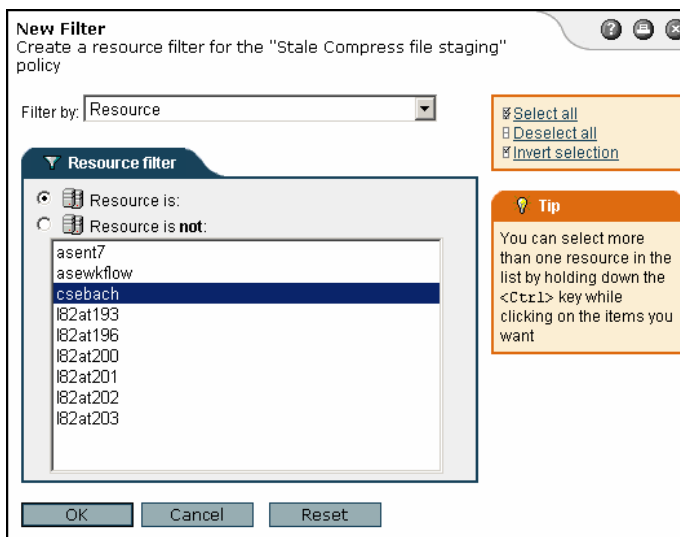


Figure 9. New Filter Dialog Box

File-Type Filter

Next, we need to create a file-type filter. This filter will allow us to choose the file types that we are looking for on the system. For our example, we will be looking for compressed file types. These file types are files that end in .gz, .taz, .tgz, .Z, and .zip. To create this file filter, follow these steps:

1. Click **New** under the **File Filters** section of the newly created IA.
The **New Filter** dialog box appears.
2. From the **Filter by** pull-down menu, select **File type**.
3. In the **File type** pull-down menus, select **includes**, and then select **compressed files**.
4. Click **OK** when you have finished.

Figure 10 shows the file-type filter.

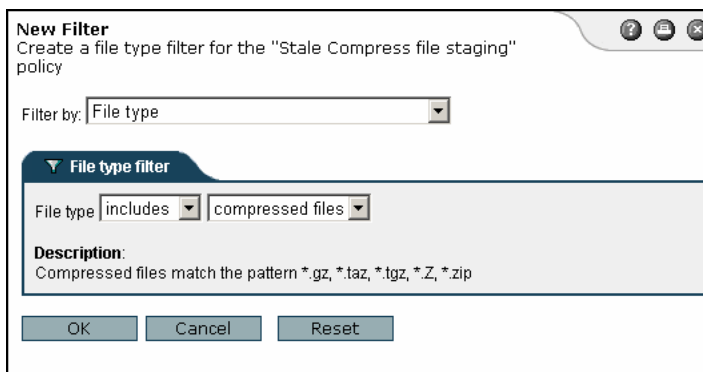


Figure 10. File-Type Filter

File Last-Accessed-Date Filter

The final filter that needs to be created is the file last-accessed-date filter. To create this filter, follow these steps:

1. Click **New** under the **File Filters** section of the newly created IA.
The **New Filter** dialog box appears.
2. From the Filter by pull-down menu, select **File last accessed date**.
3. Select the appropriate options to specify that the file last-accessed date is not within the last 180 days.
See Figure 11.
4. Click **OK** to create the filter.

New Filter
Create a file last accessed date filter for the "Stale Compress file staging" policy

Filter by:

File last accessed date filter

File last accessed date is

File last accessed date is


File last accessed date is

Figure 11. File Last-Accessed-Date Filter

Testing the File Filter

You should test file filters before actually running the IA. There are two steps to doing this: validation and preview. Validation is accomplished by clicking **Validate** under **File Filters** section of the IA. If the validation is successful, you will get a message that states The filter expression is syntactically correct. The **Preview** button lets you see the results of the file filter. Figure 12 shows a sample preview.

Hint: To ensure the correct results, you should always do a preview before actually running an Intelligent Action.



Use the following procedure to set a schedule for the selected resource. First, from the drop-down lists in the time fields of the IA, select the times that you want the selected policy to run, and then select the boxes next to the days and weeks. To enable the policy to run on the schedule that you set, ensure that **Enable this policy** is selected.

Results

The IA for this example resulted in several compressed files that were found and removed from the systems. Because VisualSRM handled all the work, there was neither a need to write scripts for the various offerings of UNIX operating systems nor a need to deploy, set up, and debug the scripts.

Using VisualSRM for Cleanup

Cleanup is one of the many functions that today's busy System Administrator must do on a regular basis. Core files, log files, and other types of system files need to be cleaned up in order to provide room for future growth on the file systems by deleting or archiving older files that are no longer needed onto other media. VisualSRM's Intelligent Actions give the System Administrator the ability to have these functions run automatically. Intelligent actions are policies that you build in order to take corrective actions automatically when certain conditions are met or certain events occur. They can be triggered based upon a schedule, as part of a task list, or run from the Console as necessary. As an example, a way to find and remove core files will be demonstrated.

Finding and Removing Core Files

Core files are often left behind when an application fails, or when a user aborts an application. Through the use of Intelligent Actions, these files can be found and removed on a scheduled basis. The following steps will help you to set up an Intelligent Action to remove core files from a UNIX server.

Creating an Intelligent Action Policy

To create an Intelligent Action policy to find and remove Core files, follow these steps:

1. Select **Policies**, and **Intelligent Actions** from the VisualSRM menu bar.
The **Intelligent Action** windows opens.
2. Click **New** in the **Intelligent Action** window.
The **New Intelligent Action Policy** dialog box appears.
3. Enter the name of the policy, the action that you want VisualSRM to take when it finds the file(s), whether confirmation is required, and how long to maintain the history of the action taken.

Figure 13 shows the **New Intelligent Action Policy** dialog box.

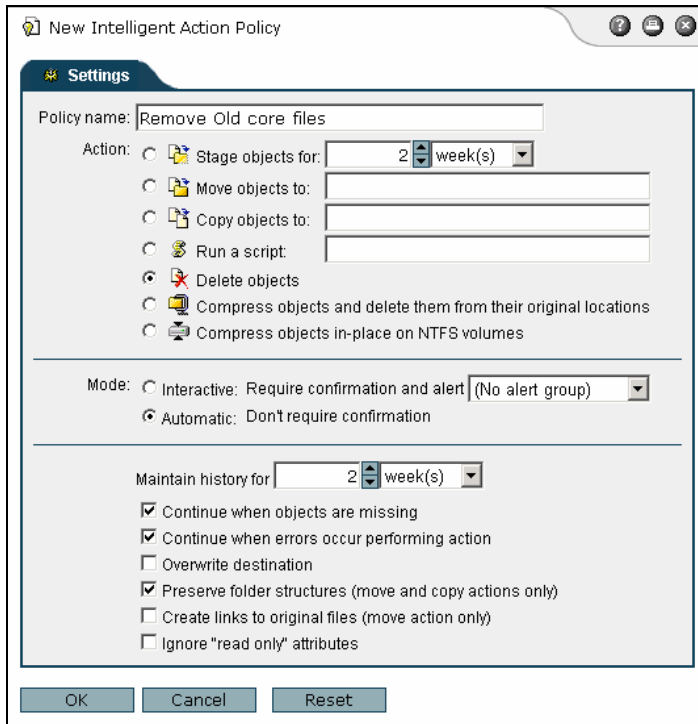


Figure 13. New Intelligent Action Policy Dialog Box

After you click **OK**, the policy will be saved and the user interface will allow you to enter more information on the new policy.

Creating a File Filter

A file filter is the criteria that you set to trigger IA policies. You can include or exclude paths to objects across managed resources, down to the file level. In this example, we want to create a filter to find all the core files on our UNIX systems. It will take two filters to make this policy work correctly. To create the first, click **New** to open the **New Filter** dialog box. The first filter we will create is one to find the correct resource. Select **Resource** from the pull-down menu, and then select the resources that you want this policy to use. After clicking **OK**, the file filter will be created and displayed.

A second filter will need to be created, this time selecting a filename that matches the core. Figure 14 shows the completed New Filter dialog boxes for both examples.

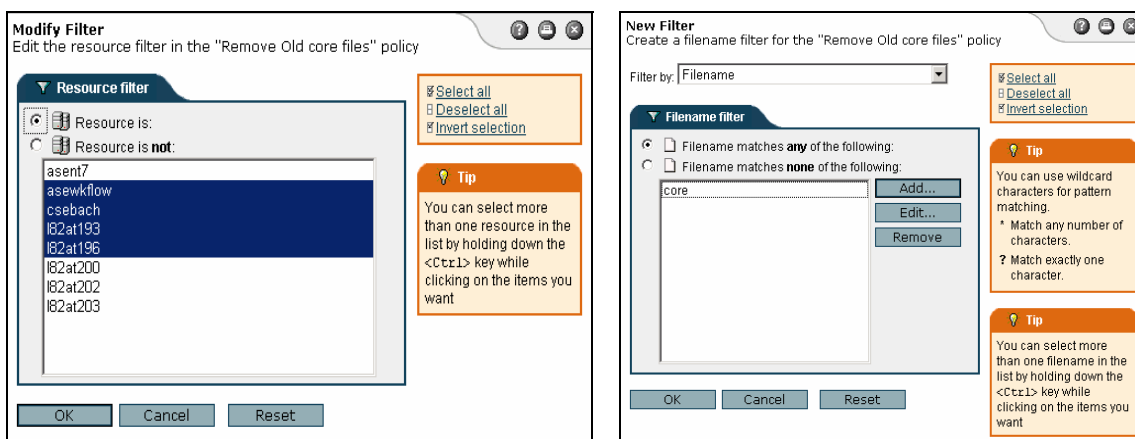


Figure 14. Filter Dialog Boxes

The **File Filters** section, under the Intelligent Action, lists the filters for the selected policy. The filters run in the order that they are shown. To change the order, click the up or down arrow in the **Order** field until the filter is in the position that you want. The policy will execute in the order that you select. Figure 15 shows the completed file filter.

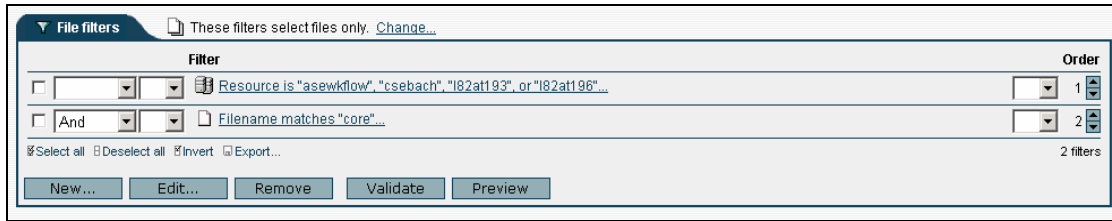


Figure 15. File Filters

Testing the File Filter

You should test file filters before actually running the IA. There are two steps to doing this: validation and preview. Validation is accomplished by clicking **Validate** under **File Filters section of the Intelligent Action**. If the validation is successful, you will get a message that states The filter expression is syntactically correct. The **Preview** button lets you see the results of the file filter.

Hint: To ensure the correct results, you should always do a preview before actually running an Intelligent Action.

Next, you would schedule the IA policy to run.

Results

The IA for this example resulted in several core files that were found and removed from the systems. Once again, since VisualSRM handled all the work, there was neither a need to write scripts for the various types of UNIX operating systems nor a need to deploy, set up, and debug the scripts.

Using Intelligent Action to Find MP3 Files

One of the trends in computing is the downloading of music and sound files. These files can take up a lot of storage space, and in many cases are nonbusiness files. In this example, our administrator has had problems with users downloading MP3 music files and leaving them on the servers. By using VisualSRM's powerful Intelligent Actions, these files can be located and removed automatically.

Creating an Intelligent Action

In order to find and remove the MP3 files, the administrator must create a new IA using the following steps:

1. Select **Policies**, and **Intelligent Actions** from the VisualSRM menu bar.

The **Intelligent Action** windows opens.

2. Click **New** in the **Intelligent Action** window.

The **New Intelligent Action Policy** dialog box appears.

3. Enter the policy name, such as **Find and Remove MP3 Files**.

Intelligent Actions have several ways to handle files that are found:

- Staged Found objects can be placed in a "holding" area.
- Moved Objects can be moved to a different location.
- Copied Objects can be copied to a different location.
- Run a script An independent script can be used by VisualSRM.

- Deleted Objects can be deleted.
- Compressed The objects can be compressed (zip or tar.Z) or utilize the in-place Windows compression.

Because of company policy, the files will be simply deleted. If desired, the administrator can have the policy require confirmation and alert a user, or simply have the files removed. A history of what files have been deleted can also be maintained for as long as desired.

4. Click **OK** to save the policy.

Creating a File Filter

Several settings must be completed in order for the policy to be effective. First, file filters must be created. File filters are the criteria that you set to trigger Intelligent Actions policies. You can either include or exclude paths to objects across managed resources down to the file level. Follow these steps to define the rules by which you filter IA policies:

1. Click **New** under the **File Filters** section of the newly created IA.
The **New Filter** dialog box appears.
2. From the **Filter by** pull-down menu, select **Resource**.
A list of your managed resources appears in the **Resource filter** field.
3. Select **resources** from the list, or click **Select all** or **Deselect all**. Click **Invert** to toggle your last selection. To include or exclude a resource in the IA, select the appropriate option.

For our example, we will choose a host that has had problems with MP3 and other audio files being left on it. Also, we will add a second file type filter for all audio files. These will be joined with an “And” statement (Figure 16).

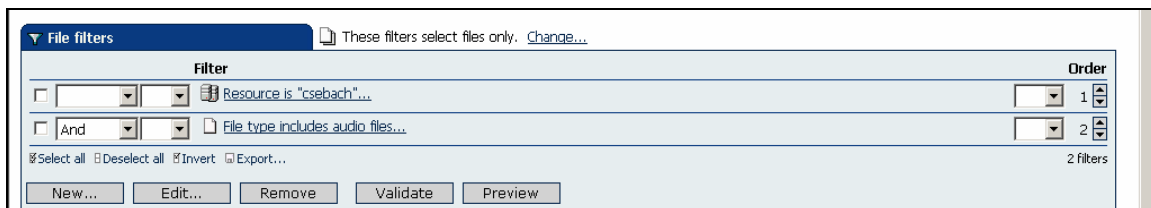


Figure 16. File Filters

To determine if the filter expression that you have specified is correct, click **Validate**. The results appear in the **Filter summary** tab. Preview an intelligent actions policy before you run it, and then schedule the IA to run.

Quota Management Using Threshold Policies

VisualSRM can help with user quota management by using threshold policies. Threshold policies are policies that allow you to establish limits for resources or objects on resources at the disk, directory, and file-group levels. You can include or exclude filters for each threshold policy, including subdirectories and objects within groups. Threshold policies can be defined to trigger other policies (database scans, event alerts, file scans, Intelligent Actions, mailbox scans, and task lists) and they can initiate notifications at multiple levels to users or user groups. Threshold policies can be set to define thresholds for percentage limits and/or amount of space consumed set in KB, MB, GB, or TB at the disk, directory, or file-group level.

Creating a Threshold Policy

Quota management can be performed through VisualSRM by setting threshold policies. In this example, our administrator wants to keep users from having more than 4 GB of storage in their home directories. However, our administrator doesn't want to have to check on a daily or weekly basis to see if users are keeping their space down. Our administrator decides to use VisualSRM to do this:

1. Create a new Threshold policy entitled Quota Management.
2. Select a file system threshold. In this example, the administrator selects a 4 GB file threshold including subdirectories.
3. Click **OK** to create the Threshold policy.
4. Add managed objects by browsing the objects for the server
5. Select the file systems for the users.
6. Add the users responsible for the file systems.

Figure 17 shows the monitored objects with owner.

Resource	Monitored object	Owner	Size	% of threshold	Status
csebach	/home/ghogg	Gordon Hogg...	9.1 KB	0%	Under threshold
csebach	/home/jhorgan	Julia Horgan...	9.1 KB	0%	Under threshold
csebach	/home/pbeeson	Patrick Beeson...	9.3 KB	0%	Under threshold
csebach	/home/swalsh	Steve Walsh...	50.7 MB	1%	Under threshold

Figure 17. Example of Monitored Objects with Owners

The administrator will also need to add some warning levels to let the users know their file systems are getting full. In order to do this, the administrator selects **New** under the Warning Levels panel. In this case, our administrator creates two warning levels: one for 80 percent, and one for 90 percent.

When a user hits 80 percent of the 4 GB total, the Quota Management policy will send an e-mail to the owner. When it hits 90 percent, it will send another warning to the owner of the file and to the Administrators group. This policy will be run every 15 minutes.

Conclusion

In today's business environment there is a need to have uninterrupted data accessibility. The implementation of best practices and strategies has never been easier with EMC's VisualSRM, a solution that provides ways for administrators and users to manage their storage infrastructure. VisualSRM provides storage management capabilities such as reporting, monitoring, scheduling, and automation so that storage management best practices can be implemented.