

SANscreen **VM Insight 5.1** **User Guide**

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Part number 215-04640_A0

April 2009

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Preface

The *SANscreen VM Insight User Guide* describes SANscreen VM Insight functionality and usage, providing you with a thorough understanding of the features and procedures required to manage virtual storage services.

SANscreen VM Insight spans both virtual machine and physical host deployments. Specifically, this product:

- Provides visibility for a virtual data center: Hosts, virtual machines, datastores and paths.
- Activates and configures host virtualization rules (policy-based validation).
- Provides SAN-related performance visibility for virtual machines.
- Provides SAN-related performance analyzing capabilities for physical hosts.
- Provides real-time monitoring.
- Identifies resource bottlenecks.
- Identifies inefficient resource allocations and underutilization of physical devices.
- Identifies what may become problematic configurations.

NetApp Products

The following products comprise the NetApp SANscreen suite of solutions:

Product Name	Description
Service Insight	Offers visibility into your SAN environment, including host-to-storage access paths, storage availability and change management.
Service Assurance	Enables real-time monitoring of storage services and risk-free migrations.
Capacity Manager	Capacity Manager manages the end-to-end resource order and allocation process to allow companies to accelerate application provisioning, manage resource reservations and forecast based on past trends and future demand, enabling educated capacity management decisions.
VM Insight	Enables virtual machine to array path visibility for organizations deploying VMware ESX technology combined with VMware Virtual Center.
Application Insight	Uses SAN traffic data to reclaim underutilized resources, manage tiers, identify multipath risks and troubleshoot ongoing performance bottlenecks. Discovers, collects and maintains performance information measured by critical array metrics throughout the SAN.
Enterprise Reporting for Capacity Manager	Provides a centralized reports portal to support viewing critical information from the data warehouse in capacity-related reports such as chargeback, consumption analysis, capacity planning, purchasing, storage tier analysis, storage service catalogs, trending and historical usage.

Enterprise Reporting for Service Insight	Provides a centralized reports portal to support viewing critical information from the data warehouse to facilitate operational, strategic and tactical storage-related decisions.
Data Warehouse	Provides a central repository for all inventory information, giving IT the ability to consolidate multisite environments, provide global visibility of distributed infrastructures and allow access to critical analysis and reporting.

Documentation Set

The following table lists the full documentation set for NetApp's SANscreen products. These user guides and manuals are available for download from the SANscreen Client Help menu and from the NOW site (URL):

<http://now.netapp.com/NOW/knowledge/docs/docs.cgi>

User Guide	Description of Content
SANscreen Installation and Administration User Guide	Overview of the suite's architecture with instructions to get the system up and running, discover the SAN and perform administrative tasks.
SANscreen Service Insight User Guide	Information about the tools and features available to help you gain visibility into your SAN environment, including FC and iSCSI inventory.
SANscreen Service Assurance User Guide	Overview of how to use Service Assurance to analyze and validate your storage network environment and to automate operational monitoring, as well as procedures to make safe changes without disrupting availability. Includes FC and iSCSI paths, policies and violation information.
SANscreen VM Insight	Overview of virtualization in SANscreen, including the VC Plug-in feature.
SANscreen Application Insight User Guide	Overview of how to use Application Insight to reclaim underutilized resources, manage tiers, identify multipath risks and troubleshoot on-going performance bottlenecks. Information about how Application Insight discovers, collects and maintains performance information measured by critical array metrics throughout the SAN.
SANscreen Capacity Manager User Guide	Overview of how to use Capacity Manager to enable educated capacity management decisions by managing the end-to-end resource order and allocation process.

Enterprise Reporting for Capacity Manager User Guide	Presentation of the centralized reports portal that supports viewing critical capacity-related information from the data warehouse.
Enterprise Reporting for Service Insight User Guide	Presentation of the centralized reports portal that supports viewing critical inventory information from the data warehouse.
Enterprise Reporting Data Model Reference Manual	A description of the metadata model upon which SANscreen reports are based.
SANscreen Data Sources User Guide	Describes the configuration parameters and some installation procedures for data sources used by SANscreen. Provides recommended methods of discovering a SAN environment for a SANscreen deployment.
Data Warehouse User Guide	Overview of Data Warehouse structure.
SANscreen Connect API User Guide	Overview of how to use the API interface to enable integration with other applications, such as reporting and monitoring systems.

Chapter 1 SANscreen VM Insight

1.1 Overview

SANscreen VM Insight provides essential visibility into the configuration of the virtualized server and displays data that allow the SAN administrator to analyze and investigate—and solve—performance problems on virtual machines installed in the SAN.

The SAN administrator has to be able to determine what capacity is being used by the virtual machines that have been created and needs tools to manage them.

To accomplish this, VM Insight enables all changes in the virtual data center to be recorded in SANscreen, showing:

- How resources are being used to increase utilization.
- What hosts are best suited for which virtual machines.
- The path of a virtual machine to the SAN storage device.
- The volumes that belong to the datastore for every virtual machine.

In addition, VM Insight serves to help provision applications for high availability through the use of multiple hosts and load balancing, thereby avoiding performance degradation and downtime.

VM Insight acts as a bridge between the SAN and virtual world, offering proactive management of the virtual environment now operating in your SAN.

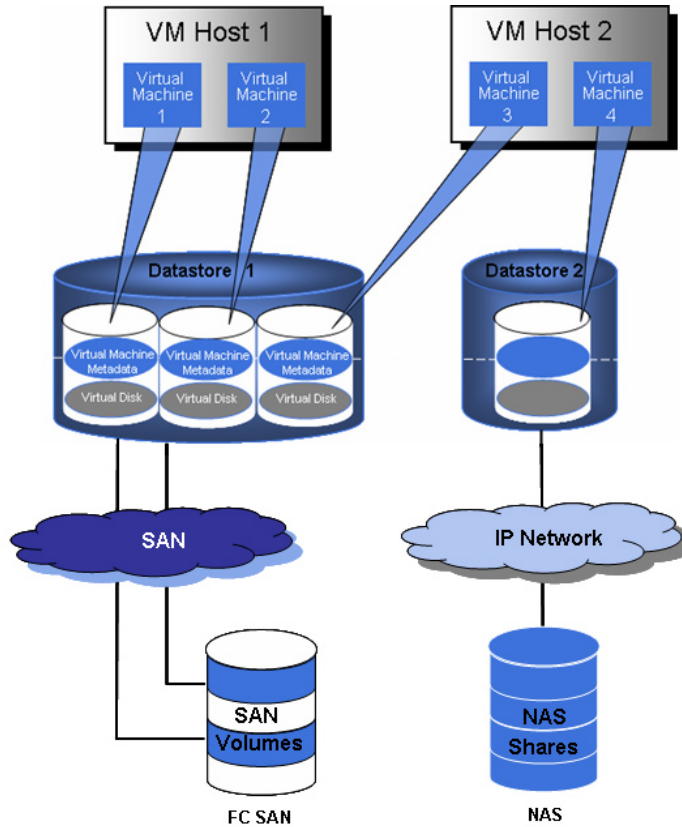


Figure 1: Virtualized Storage

1.2 Installing VM Insight

The instructions for installing a new license are provided in the *SANscreen Administration and Installation User Guide*. Please refer to that book for all installation procedures.

1.3 Prerequisites

The following environment is necessary to provide optimum use of SANscreen VM Insight:

- Virtual Center:
Version 2.0 and higher
- Virtual Infrastructure Client (Management Server GUI):
Version 2.0 and higher
- ESX Server:
Version 3.0 and higher

1.4 Steps Before SANscreen

1. Name a new virtual machine using the VMware wizard.
2. Choose a host.
3. Choose a datastore that will contain a virtual machine based on free capacity, storage performance and response time.
4. Choose an OS.
5. Choose the CPUs (virtual processing).
6. Allocate the virtual machine memory. This can be altered later, along with other elements.
7. Set up and configure network cards.
8. Allocate these in a hard drive.
9. The process is complete and the virtual machine is ready. Select Finish to end the wizard.

NOTE: Once a virtual machine has been created, the guest OS does not know it is running on a virtual machine, since the virtual machine functions like a physical setup.

1.5 In This User Guide

Subsequent chapters describe how SANscreen VM Insight manages the data it has collected from a Virtual Center.

The last chapter gives multiple examples of how VM Insight can be used to optimize the virtualization of your SAN.

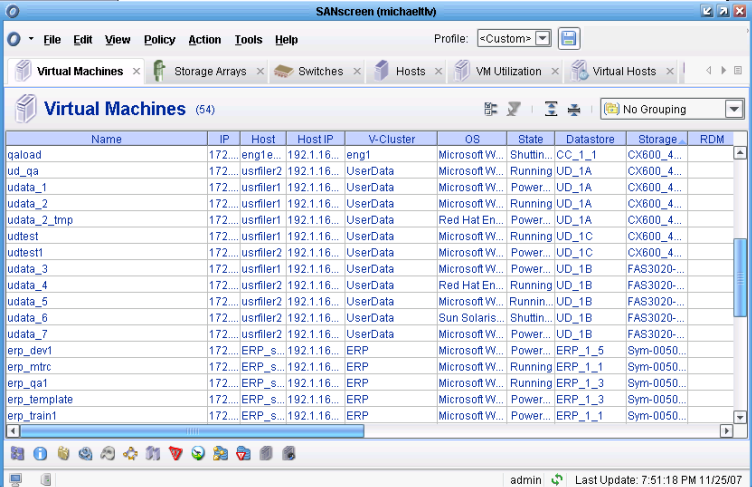
Chapter 2 Virtual Machines

2.1 Virtual Machines (VM)

The Virtual Machine view provides information on virtual machine and their storage settings. Each row represents a relationship between a virtual machine and a volume on the SAN or a NAS share. Each row represents either:

- A virtual machine which is available to the virtualization host (the ESX server) and a datastore containing a portion of the virtual machine.
- A virtual machine which is available to the virtualization host (the ESX server) and a SAN device to which it is mapped.

The next two views show all the virtual machines available to the host (ESX server) that VM Insight has detected, their allocated capacity, and all the datastores accessible by the host. There are 16 columns of information providing extensive and expanded detail:



Name	IP	Host	HostIP	V-Cluster	OS	State	Datastore	Storage	RDM
gaload	172...	eng1e...	192.1.16...	eng1	Microsoft W...	Shuttin...	CC_1_1	CX600_4...	
ud_ga	172...	usrfler2	192.1.16...	UserData	Microsoft W...	Running	UD_1A	CX600_4...	
udata_1	172...	usrfler1	192.1.16...	UserData	Microsoft W...	Power...	UD_1A	CX600_4...	
udata_2	172...	usrfler1	192.1.16...	UserData	Microsoft W...	Running	UD_1A	CX600_4...	
udata_2_tmp	172...	usrfler1	192.1.16...	UserData	Red Hat En...	Power...	UD_1A	CX600_4...	
udtest1	172...	usrfler1	192.1.16...	UserData	Microsoft W...	Running	UD_1C	CX600_4...	
udtest1	172...	usrfler2	192.1.16...	UserData	Microsoft W...	Power...	UD_1C	CX600_4...	
udata_3	172...	usrfler1	192.1.16...	UserData	Microsoft W...	Power...	UD_1B	FAS3020...	
udata_4	172...	usrfler2	192.1.16...	UserData	Red Hat En...	Running	UD_1B	FAS3020...	
udata_5	172...	usrfler2	192.1.16...	UserData	Microsoft W...	Runnin...	UD_1B	FAS3020...	
udata_6	172...	usrfler2	192.1.16...	UserData	Sun Solaris...	Shutlin...	UD_1B	FAS3020...	
udata_7	172...	usrfler2	192.1.16...	UserData	Microsoft W...	Power...	UD_1B	FAS3020...	
erp_dev1	172...	ERP_s...	192.1.16...	ERP	Microsoft W...	Power...	ERP_1_5	Sym-0050...	
erp_mtrc	172...	ERP_s...	192.1.16...	ERP	Microsoft W...	Running	ERP_1_1	Sym-0050...	
erp_ga1	172...	ERP_s...	192.1.16...	ERP	Microsoft W...	Running	ERP_1_3	Sym-0050...	
erp_template	172...	ERP_s...	192.1.16...	ERP	Microsoft W...	Power...	ERP_1_3	Sym-0050...	
erp_train1	172...	ERP_s...	192.1.16...	ERP	Microsoft W...	Power...	ERP_1_1	Sym-0050...	

Figure 2: Virtual Machine Main Table-1

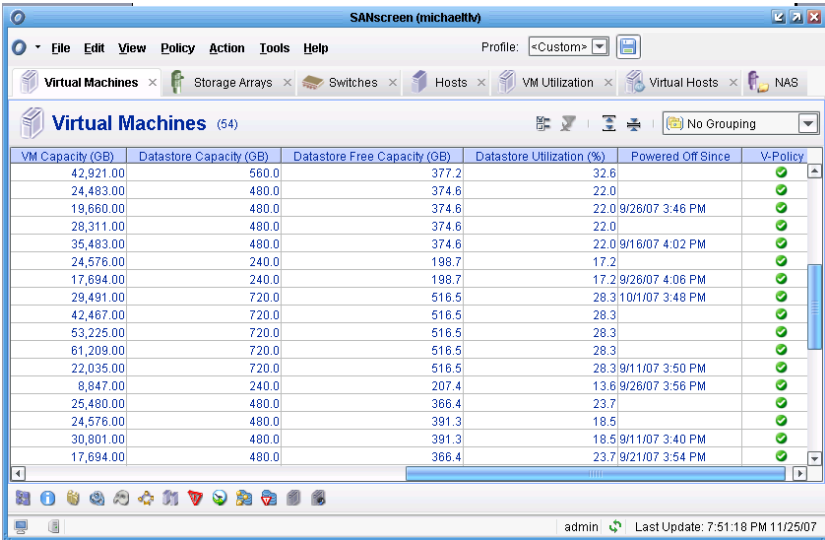
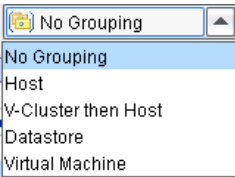


Figure 3: Virtual Machine Main Table-2

Selecting one of the available grouping options lets you specify and compress the data you want to see or analyze:



The following information displays general values for all virtual machines:

Field	Description
<i>blank</i>	Applicable with any presentation order () other than No Grouping. Column that organizes the data according to the selected grouping format (for example, vendor). The number in parentheses indicates the number of virtual machine rows reported in each (grouped) row.
Name	Name of the virtual machine.
IP	Virtual machine IP Address.

Field	Description
Host	Name of the host owning the virtual machine.
Host IP	Host IP Address.
V-Cluster	Name of a cluster of virtualization hosts sharing access to the same SAN volumes or NAS share, or blank for a standalone host.
OS	Guest operating system.
State	Shows the power state of the virtual machine combined with the state of the guest OS.
Datastore	Name of the datastore used by the virtual machine or blank for RDM.
Storage	Name of SAN or NAS storage array containing the datastore.
RDM	LUN disk name to which the RDM is mapped.
VM Capacity (GB)	Capacity allocated to the virtual machine on the datastore – this will be the sum of all virtual disks stored on the datastore which are used by the virtual machine.
Datastore Capacity	Storage capacity allocated to the datastore (provided by the SDK), blank if RDM.
Datastore Free Capacity (GB)	Datastore capacity which is not allocated to virtual machines (provided by the SDK) , blank if RDM.
Datastore Utilization %	The ratio of used capacity divided by total capacity. Shows how much capacity is not being used on the datastore.
Powered Off Since	Point in time of shutdown.
V-Policy	Shows a green check mark if the host is included in the VM Host policy or red 'X' if the host is excluded.

These values can also be found by opening the Properties  Detail Pane below the main table:

Virtual Machine (13)	
Name	Value
Name	test
IPs	172.4.25.92
Dns Name	test.bos.onaro.com
Os	Sun Solaris 10
VM State	ShuttingDown
Guest State	shuttingDown
Power State	poweredOn
Data Store	ds_bil_1
Memory (MB)	5312MB
Processors	1
Host Name	billing2
Host IP	192.1.168.9
Host Cpu Speed	1700Mhz

Figure 4: Virtual Machine Properties Detail Pane

2.2 Virtual Machine Detail Panes

There are two major Detail Panes beneath the Virtual Machine main table that can be opened to provide more detailed information about how virtual machines function:

- VM Paths 
- VM Configuration 

These Detail Panes are selected according to the view that helps analyze the case at hand.

NOTE: To understand the functionality of the standard icons that also appear, refer to the *Service Insight User Guide*.

2.2.1 VM Paths Detail Pane

The VM Paths view allows you to quickly identify the current virtual configuration and show:

- which virtual machine is running on which host
- which hosts are accessing which shared volumes
- what the active access path is
- what comprises capacity allocation and usage

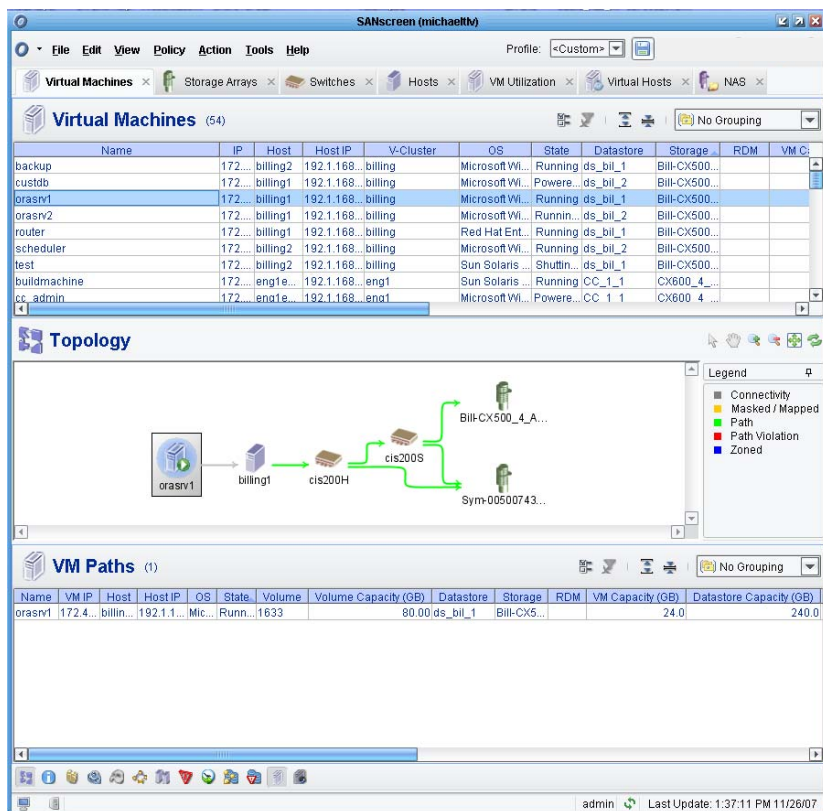
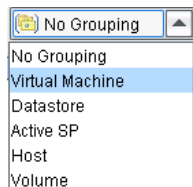


Figure 5: VM Paths Detail Pane

This view can be used to research a virtual machine to see a violation, to relocate the virtual machine or change the SAN storage—SANscreen's VM Paths displays the path that should be used.

Selecting one of the available grouping options lets you specify and compress the path data you want to see or analyze by device:



The following information displays general values for the VM Paths:

Field	Description
<i>blank</i>	Applicable with any presentation order () other than No Grouping. Column that organizes the data according to the selected grouping format (for example, vendor). The number in parentheses indicates the number of rows reported in each (grouped) row.
Name	Virtual Machine name. May be blank when the row represents a SAN volume or NAS share which is being accessed from a virtual host (ESX) but does not contain virtual machine data.
VM IP	IP address assigned to the virtual machine.
Host	Name of the Host.
Host IP	IP Address of the Host.
OS	Name of guest OS.
State	Shows the combined state of the virtual hardware of the virtual machine and of the guest OS: Running, Powered Off, Powered Off, NotRunning, Standby, Shutting Down, Unknown, Suspended.
Volume	Name of the SAN volume or NAS logical disk where the data for this path resides , may be blank if: 1. The SAN volume is accessible to the host but is not part of any datastore. 2. SANscreen is unable to identify the storage containing the virtual machine.
Volume Capacity (GB)	Size of the volume, in gigabytes.
Datastore	Name of the datastore residing on a volume.
Storage	SAN/NAS storage array name, may be blank if SANscreen I unable to identify the storage containing the virtual machine.
RDM	LUN disk name to which the RDM is mapped.
VM Capacity	Capacity allocated to the virtual machine on the

Field	Description
(GB)	datastore – this will be the sum of all virtual disks stored on the datastore which are used by the VM. This the same as the "VM Capacity" in the "Virtual Machines" view.
Datastore Capacity	Storage capacity allocated to the datastore (provided by the SDK), blank if RDM.
Datastore Free Capacity (GB)	Datastore capacity which is not allocated to virtual machines (provided by the SDK) , blank if RDM.
Datastore Utilization (%)	The ratio of used capacity divided by total capacity. Shows how much capacity is not being used.
Powered Off Since	Point in time of shutdown.
Active HBA	The name of the HBA of the active path used by the host to access the volume – applicable for SAN only.
Disk Name	LUN disk name – applicable for SAN only.
Active SP	The storage port which the active path uses (this data is retrieved from the VMware configuration).
NAS Share	Name of the NAS share (NFS export) to which the datastore is mapped.
Read Only	Indicates whether the NAS share is read only or read/write.
Policy	SAN active path selection policy, can be either "fixed" or "MRU" (Most Recently Used).

2.2.2 VM Configuration Detail Pane

The VM Configuration view allows you to look at a greater breakdown of the VM Path for a single virtual machine. Being able to see where each virtual machine is stored in a storage array is important, so that it can be moved for capacity (tiering) or migration purposes. The SAN administrator can determine which virtual machines function best in which environment.

VM Configuration allows a much greater granularity of what can be seen. The view shows a list of volumes that comprise the structure of the virtual machine and how it is being mapped to storage. A row exists for every component (a component is either a virtual disk or the virtual machine configuration—metadata) of the virtual machine (while in the VM Paths detail pane, there is one row for each volume).

Two virtual disks are stored on different datastores, one of which is using nine times the capacity of the other. The SAN administrator can use this information to see service path visibility into the actual paths that virtual machines take to access their respective data stores and balance disk access by the virtual machines.

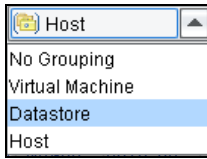
The screenshot shows the SANscreen (caric) application window. The 'Virtual Machines' tab is selected, displaying a table of virtual machines. Below this is a 'Topology' section showing a network diagram. The 'VM Configuration' section at the bottom provides a detailed view of the selected virtual machine's components.

Name	Host	V-Cluster	OS	State	Datastore
custdb (1)	custdb	billing1	Microsoft Windows XP Professional	PoweredOff	ds_bil_2
custdb	billing1	billing	Microsoft Windows XP Professional	PoweredOff	ds_bil_2
oranev (1)	oranev	billing1	Microsoft Windows 2000 Server	Running	ds_bil3
oranev	billing1	billing	Microsoft Windows 2000 Server	Running	ds_bil3
orasrv1 (1)	orasrv1	billing1	Microsoft Windows 2000 Server	Running	ds_bil_1

Host	Host IP	V-Cluster	Name	VM IP	OS	State	Powered Off Since	V-Disk	V-Disk Capacity (GB)	Datastore	Datastore Capacity (GB)	Datastore Free
billing...	192.1.1...	billing	oranev	172...	Mic...	Runn...		<VM co...		ds_bil...	24.0	
billing...	192.1.1...	billing	oranev	172...	Mic...	Runn...		[ds_bil...	12,288.0	ds_bil3		24.0

Figure 6: VM Configuration Detail Pane

NOTE: Use the Grouping drop-down menu to classify the data more quickly, in this case, using “Datastore.”



The following information displays general values for the VM Configuration:

Field	Description
<i>blank</i>	Applicable with any presentation order () other than No Grouping. Column that organizes the data according to the selected grouping format (for example, vendor). The number in parentheses indicates the number of rows reported in each (grouped) row.
Host	Name of Host
Host IP	Host IP Address.
V-Cluster	Name of a cluster of virtualization hosts sharing access to the same SAN volumes, or blank for standard physical servers.
Name	Virtual Machine name.
VM IP	IP Address of the virtual machine.
OS	Name of guest OS.
State	Shows the combined state of the virtual hardware of the virtual machine and of the guest OS: Running, Powered Off, Powered Off, NotRunning, Standby, Shutting Down, Unknown, Suspended.
Powered Off Since	Point in time of shutdown.
Virtual Disk	VMDK file name (relative to the datastore).

Field	Description
VD Capacity (GB)	Virtual disks capacity. Note that each row now represents a single virtual disk, as opposed to a row in the VM Paths detail pane that represents an aggregate of all the virtual disks and meta data of a virtual machine stored on a single datastore.
VD Free Capacity (GB)	Unused capacity of virtual disk as reported by the guest OS (not always available).
Datastore	Name of datastore residing on a volume.
Datastore Capacity	Storage capacity allocated to the datastore (provided by the SDK), blank if RDM.
Datastore Free Capacity (GB)	Datastore capacity which is not allocated to virtual machines (provided by the SDK) , blank if RDM.
Datastore Utilization %	The ratio of used capacity divided by total capacity. Shows how much capacity is not being used.
Storage	Name of SAN or NAS storage array containing the datastore.
Volumes	List of SAN volume names or a NAS logical disk (a single name, not a list) where the datastore resides, may be blank if: 1. The SAN volume is accessible to the host but is not part of any datastore. 2. SANscreen is unable to identify the storage containing the virtual machine.
NAS Share	Name of the NAS share (NFS export) to which the datastore is mapped.
Read Only	Indicates whether the NAS share is read only or read/write.

2.2.2.1 Topology

The VM Configuration topology shows icons for the virtual machines (virtual machines which exist on the host and can access the volume) of the path selected. These appear to the left of the host icon. The topology view shows the active path used to access the volume, together with any redundant paths.

The active path, in bold, begins with a specific host port and ends at a specific storage port. (Redundant paths appear as lines with dashes.)

Note: For paths that are not the active path, the topology displays the shortest path.

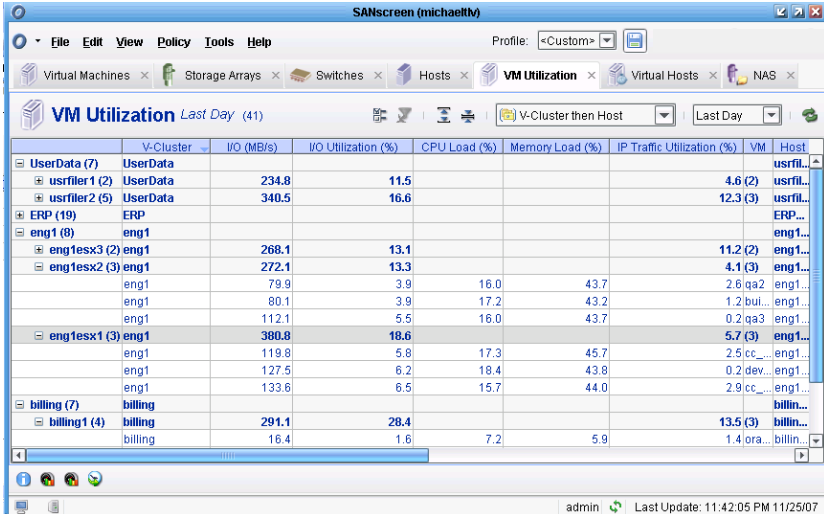
Chapter 3 VM Utilization

3.1 VM Utilization

VM Utilization lets the SAN admin identify mostly inactive virtual machines which are using high tier storage. In many instances a large datastore might hold several virtual machines and only a subset of these virtual machines actually utilize the resources (these virtual machines are either activated very little, or consume very low resources). In this case it might be beneficial to move the non-utilizing virtual machines to a lower tier (or less expensive resource on the host or storage side).

The SAN administrator chooses the accumulation interval (the period which is being displayed). Rows for virtual machines and LUNs that do not map to a volume are not displayed.

The following two screen captures show the full column set for VM Utilization:



The screenshot shows the SANscreen (michaeltm) application window with the 'VM Utilization' tab selected. The window title is 'SANscreen (michaeltm)'. The menu bar includes File, Edit, View, Policy, Tools, and Help. The toolbar shows various icons for navigation and actions. The main area displays a table titled 'VM Utilization Last Day (41)'. The table has columns for V-Cluster, I/O (MB/s), I/O Utilization (%), CPU Load (%), Memory Load (%), IP Traffic Utilization (%), VM, and Host. The table is filtered by 'V-Cluster then Host' and shows data for various virtual machines and LUNs. The status bar at the bottom indicates 'admin' and 'Last Update: 11:42:05 PM 11/25/07'.

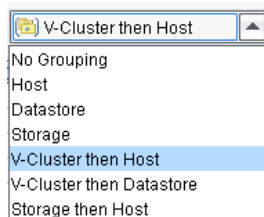
V-Cluster	I/O (MB/s)	I/O Utilization (%)	CPU Load (%)	Memory Load (%)	IP Traffic Utilization (%)	VM	Host
UserData (7)							
usrfiler1 (2)	234.8	11.5			4.6 (2)	usrfil...	
usrfiler2 (5)	340.5	16.6			12.3 (3)	usrfil...	
ERP (19)						ERP...	
eng1 (8)						eng1...	
eng1esx3 (2)	268.1	13.1			11.2 (2)	eng1...	
eng1esx2 (3)	272.1	13.3			4.1 (3)	eng1...	
eng1	79.9	3.9	16.0	43.7	2.6 qa2	eng1...	
eng1	80.1	3.9	17.2	43.2	1.2 bui...	eng1...	
eng1	112.1	5.5	16.0	43.7	0.2 qa3	eng1...	
eng1esx1 (3)	380.8	18.6			5.7 (3)	eng1...	
eng1	119.8	5.8	17.3	45.7	2.5 cc...	eng1...	
eng1	127.5	6.2	18.4	43.8	0.2 dev...	eng1...	
eng1	133.6	6.5	15.7	44.0	2.9 cc...	eng1...	
billing (7)						billin...	
billing1 (4)	291.1	28.4			13.5 (3)	billin...	
billing	16.4	1.6	7.2	5.9	1.4 ora...	billin...	

Figure 7: VM Utilization Main Table-1

Host	Host Model	Datastore	Volume	Storage	Storage Model	Raid	Disk Commands	Disk Writes	Disk Reads	Disk Balance
srfl...				CX600...	CX600, FAS30...	RAID5	0	0	0	0
srfl...		(2)		CX600...	CX600	RAID5	0	0	0	0
srfl...		(2)		CX600...	CX600, FAS30...	RAID5	0	0	0	0
RP...				Sym-00...	Symmetrix D...	[Dat...	0	0	0	0
ng1...				CX600...	CX600, USP	RAID...	0	0	0	0
ng1...		CC_1_1	1426	CX600...	CX600	RAID5	0	0	0	0
ng1...		(3)		CX600...	CX600, USP	RAID...	0	0	0	0
ng1...		CC_1_4	222	USP600...	USP	RAID...				
ng1...		CC_1_1	1426	CX600...	CX600	RAID5				
ng1...		CC_1_3	1422	CX600...	CX600	RAID5				
ng1...		(2)		CX600...	CX600, USP	RAID...	0	0	0	0
ng1...		CC_1_3	1422	CX600...	CX600	RAID5				
ng1...		CC_1_4	222	USP600...	USP	RAID...				
ng1...		CC_1_3	1422	CX600...	CX600	RAID5				
ilin...		(2)		Bili-CX5...	CX-500, Sym...	[Dat...	0	0	0	0
ilin...				Bili-CX5...	CX-500, Sym...	[Dat...	0	0	0	0
ilin...		ds_bil3	001D	Sym-00...	Symmetrix DM...	[Data...				

Figure 8: VM Utilization Main Table-2

NOTE: Use the Grouping drop-down menu to classify the data more quickly, in this case, using “V-Cluster then Host.”



The following information displays general values for the VM Utilization:

Field	Description
<i>blank</i>	Applicable with any presentation order () other than No Grouping. Column that organizes the data according to the selected grouping format (for example, vendor). The number in parentheses indicates the number of rows reported in each (grouped) row.
V-Cluster	Name of a cluster of virtualization hosts sharing access to the same SAN volumes, or blank for standard physical servers.
I/O (MB/s)	SAN traffic produced by a VM, measured in MB/s.
I/O Utilization (%)	Shows the ratio between a resource usage and the resource capacity. In particular, this shows the ratio between the used MB/s and the HBA's speed (in MB/s).
CPU Load (%)	Displays the percentage of the host's CPU MHZ being used (cpu-usage divided by host-cpu-power).
Memory Load (%)	The “memory load index” column normalizes memory usage across different hosts to enable comparison of memory usage, showing the ratio between the “memory usage” and the “host physical memory” (when retrieved from the Virtual Center).
IP Traffic Utilization (%)	Amount of LAN traffic produced by a virtual machine.
VM	Name of the virtual machine.
Host	Name of Host.
Host Model	Name of model.
Datastore	Name of datastore residing on a volume.
Volume	Volume name, left blank if no volume is mapped to the LUN.
Storage	Name of the storage array. May be empty if no volume is mapped to the LUN.

Field	Description
Storage Model	Model of the storage array. May be empty if no volume is mapped to the LUN.
RAID	Type of RAID implemented by the volume. May be empty if no volume is mapped to the LUN.

3.2 VM Utilization Detail Panes

There are two major Detail Panes beneath the VM Utilization main table that can be opened to provide more detailed information about how virtual machines function:

- Performance Chart 
- Daily Utilization Pattern 

NOTE: To understand the functionality of the standard icons that also appear, refer to the *SANscreen Service Insight User Guide*.

3.2.1 Performance Chart Detail Pane

The Performance Chart displays a chart of performance metrics over a duration of time that can be customized. The Performance Chart is useful for seeing correlations between performance, as well as for displaying anomalies and sudden changes in virtual machine activity over time.

The Performance Chart is available by clicking the Performance Chart icon in the VM Utilization view (see also Chapter 2, “Virtual Machines” and Chapter 4, “VM Hosts”).

In the figure below the performance data is supplied for the highlighted Virtual Machine.

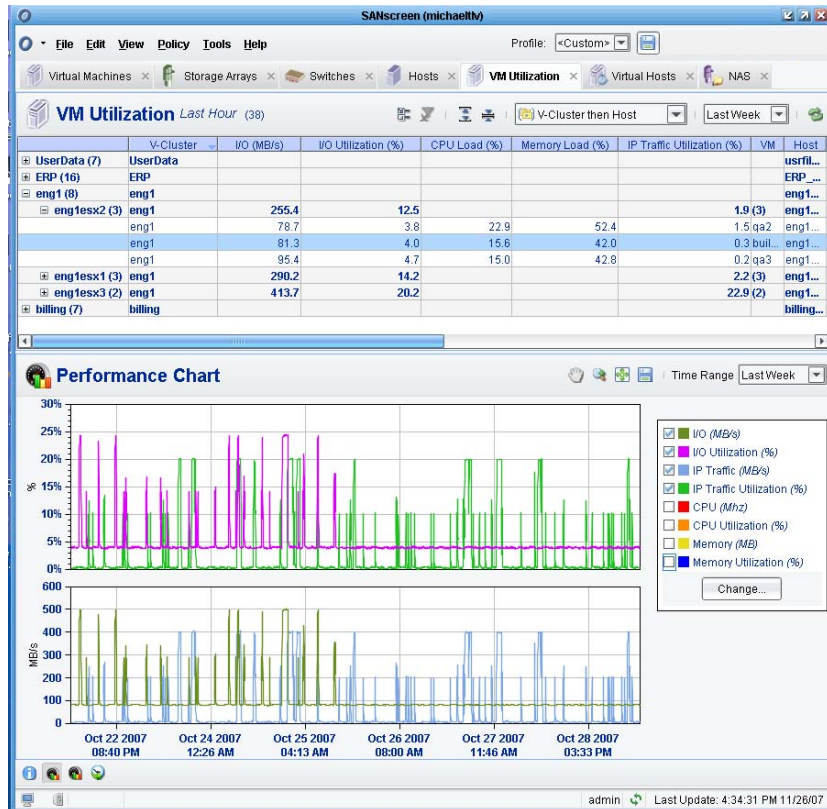
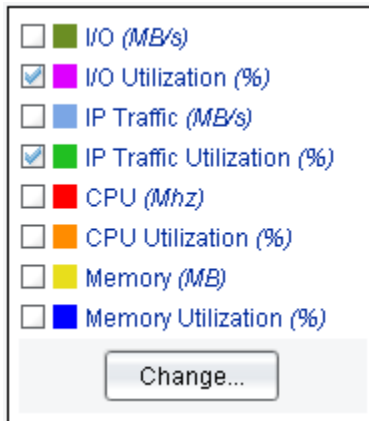


Figure 9: Performance Chart Detail Pane

You can change the time period using the drop-down box in the upper right corner of the Performance Chart pane.

3.2.2.1 Metrics Legend

This Chart Metrics legend contains the different data metrics and their color indications, allowing selection of each or all metrics for viewing:



- When you hover with the mouse above an **unselected** legend entry, a preview of the chart shows on the left side.
- When you hover with the mouse above a **selected** legend entry, the specific line in the chart (or bars in the "daily utilization pattern") blinks – this is useful when looking at multiple lines at the same time.
- When you hover above any entry, two lines are added showing the minimum and maximum values of the particular chart.

3.2.2.2 Data/Time Stamp

The data in the Performance Chart pane is based on the time range selected from the drop-down box in the upper right corner. The data shown within the pane is marked by time stamps indicating when the data was sampled by VM Insight.

3.2.2.3 Time Ranges

This section describes the Time Ranges available for analysis in the Performance Chart pane. Various time ranges are available from the drop down menu in the right corner of the Performance Chart pane.

The following time ranges are available in the performance chart:

Live Sample
Last Hour
Last Day
Last Week
All
Custom

The **Custom...** time range allows the selection of any time range up to the current time. The live time range first retrieves data for the last hour, then continuously asks the server for changes from the last update time to the current time, so long as the chart is visible and the time range is Live Sample.

3.2.2.4 Zooming

The X and T axes of the chart automatically scale to fully contain the entire chart without "too much" space around it.

The chart also supports zooming using the zoom tool. With the zoom tool enabled, clicking and dragging within the chart selects a box that defines the new boundaries of the chart.

Holding down shift and dragging a region will zoom out. The zoom to fit toolbar button resets the view to the default zoom level. The selected metrics and the time range persist in the registry, and will be restored the next time the performance chart is shown.

3.2.3 Daily Utilization Pattern Detail Pane

This chart displays the daily virtual machine metrics pattern. It displays the hourly average (ranged an entire 24 hours) over the selected "time range":

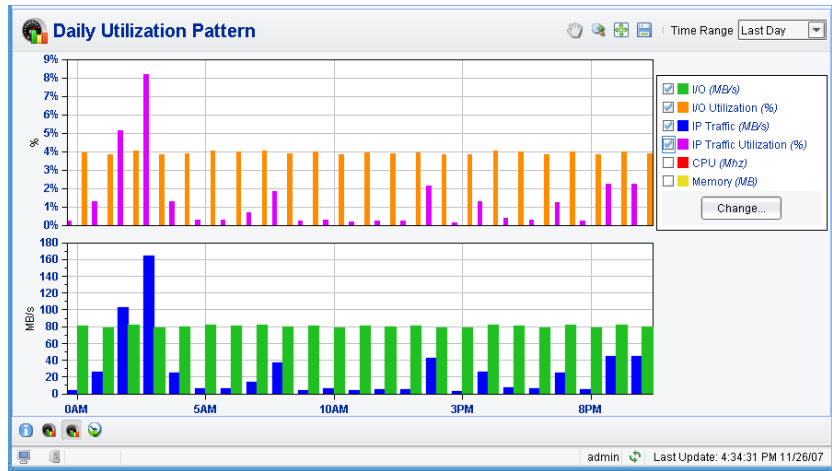


Figure 10: Daily Utilization Pattern

You can view an entire week of data organized on an hourly basis. Using this chart, you can see what virtual machines are active all the time or which ones are free at specified times, and what peak periods exist during the week.

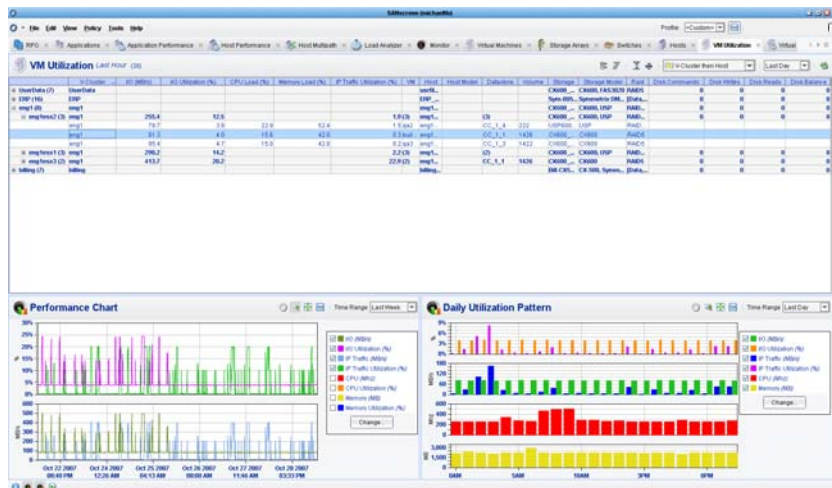


Figure 11: Virtual machines with Associated Daily Utilization Pattern

Looking at the VM Utilization pattern (shown above with both VM Utilization view and the Performance Chart displayed), you can decide whether the CPU usage is too high for use in the daytime.

The monitoring functions of VM Utilization assist in sustaining and improving capacity and usage of the SAN.

Chapter 4 VM Hosts

4.1 VM Hosts

VM Hosts (ESX servers) are shown in SANscreen to detail all the virtual machines available to the host and all the datastores accessible by the host as well as server performance information. The "VM Hosts" view displays the utilization of ESX servers over the selected period (time range):

Host	V-Cluster	I/O (MB/s)	I/O Utilization (%)	I/O Distribution	CPU Usage (MHz)	CPU Load (%)	CPU Distribution
billing1	billing	249.0	24.3	29.9%	1,467.8	91.1	19.7%
billing2	billing	420.8	41.1		612.4	40.8	
eng1	eng1	954.6	46.6	21.3%	3,878.7	149.7	32.4%
eng1esx1	eng1	389.6	19.0		761.2	50.7	
eng1esx2	eng1	317.4	15.5		841.3	49.5	
eng1esx3	eng1	247.6	12.1		2,276.2	49.5	
ERP_srv1	ERP	369.7	9.0	35.6%	1,666.0	49.0	
ERP_srv2	ERP	706.4	34.5		3,847.1	41.8	
ERP_srv3	ERP	706.0	34.5		4,093.5	31.0	
UserData	UserData	593.9	29.0	13.2%	4,760.1	99.4	21.5%
usrfiler1	UserData	246.4	12.0		3,260.9	49.4	
usrfiler2	UserData	347.5	17.0		1,499.2	50.0	

Figure 12: VM Hosts Main Table-1

The colors indicate the level of utilization that has been established by the "Host Virtualization Utilizations" setting (shown under **SANscreen Settings** in the Tools menu and described in section 4.1.2). This helps determine which hosts to use.

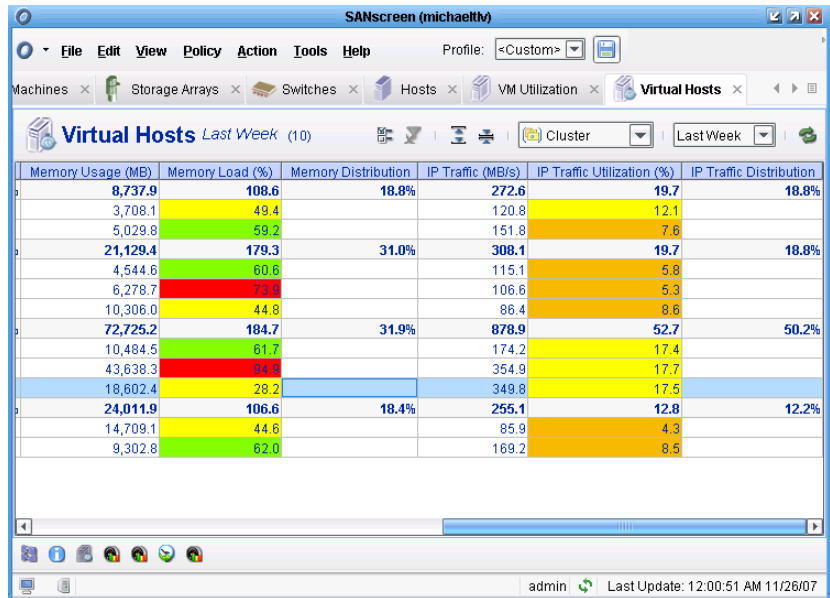
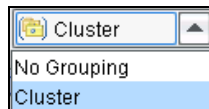


Figure 13: VM Hosts Main Table-2

NOTE: Use the Grouping drop-down menu to classify the data more quickly, in this case, using “Cluster.” SANscreen cannot run on a cluster.



The following information displays general values for the VM Hosts:

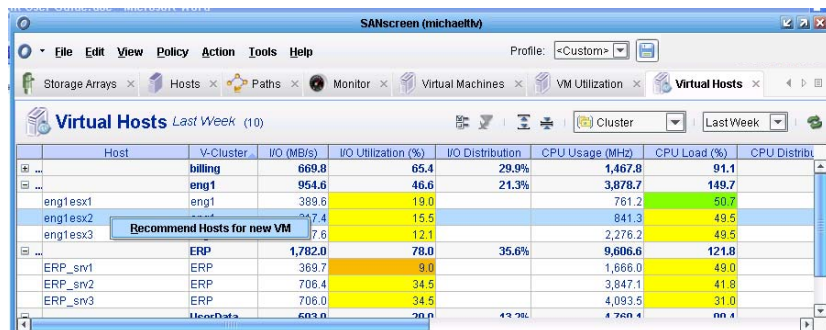
Field	Description
<i>blank</i>	Applicable with any presentation order () other than No Grouping. Column that organizes the data according to the selected grouping format (for example, vendor). The number in parentheses indicates the number of VM Hosts reported in each (grouped) row.
Host	Name of the VM Host.
V-Cluster	Name of the virtual cluster to which the virtual host belongs.
I/O (MB/s)	SAN traffic produced by a VM, measured in MB/s.

Field	Description
I/O Utilization (%)	The utilization shows the ratio between a resource usage and the resource capacity. In particular, this shows the ratio between the used MB/s and the HBA's speed (in MB/s).
I/O Distribution	When looking at a group of hosts, the "distribution" shows the percentage of IO the host is using out of the sum of IO used by all hosts in the group. The same rule applies when comparing groups of hosts.
CPU Usage (MHz)	Amount of CPU used by a host.
CPU Load (%)	Displays the percentage of the host's CPU MHZ being used (cpu-usage divided by host-cpu-power).
CPU Distribution	For each group of rows in the view, the distribution is the percentage of this row's value from the sum of the values of all the rows in the group.
Memory Usage (MB)	Memory used by the host.
Memory Load (%)	The "memory load index" column normalizes memory usage across different hosts to enable comparison of memory usage – will show the ratio between the "memory usage" and the "host physical memory" (retrieved from VC).
Memory Distribution	For each group of rows in the view, the distribution is the percentage of a row's value from the sum of the values of all the rows in the group.
IP (MB/s)	Amount of LAN traffic produced by virtual machine.

Field	Description
IP Traffic Utilization (%)	Shows the ratio between the SAN traffic for the virtual machine and the maximum throughput of the host over the selected period. This is calculated by dividing the total traffic in MB by the host's maximum throughput (during the selected period). The traffic is the sum of the send and receive traffic. The host's maximum throughput is the sum of the speeds of all SAN ports regardless of whether they are connected or not.
IP Traffic Distribution	For each group of rows in the view, the distribution is the percentage of this row's value from the sum of the values of all the rows in the group.

4.1.2 Recommended Hosts

When you have a new virtual machine you want to assign it to the best host (ESX server). Right-click anywhere in this view to get a list of recommended hosts for that virtual machine:



Host	V-Cluster	I/O (MB/s)	I/O Utilization (%)	I/O Distribution	CPU Usage (MHz)	CPU Load (%)	CPU Distrib
...	billing	669.8	65.4	29.9%	1,467.8	91.1	
...	eng1	954.6	46.6	21.3%	3,878.7	149.7	
eng1esx1	eng1	389.6	19.0		781.2	50.7	
eng1esx2		7.4	15.5		841.3	49.5	
eng1esx3		7.6	12.1		2,276.2	49.5	
...	ERP	1,782.0	78.0	35.6%	9,606.6	121.8	
ERP_srv1	ERP	369.7	9.0		1,666.0	49.0	
ERP_srv2	ERP	706.4	34.5		3,847.1	41.8	
ERP_srv3	ERP	706.0	34.5		4,093.5	31.0	
...	HeadData	603.0	20.0	43.3%	4,769.4	60.4	

The next view shows all available hosts. The ones that best suit the functionality can be selected from this view:

Recommended Hosts for new VM										
New VM parameters			I/O Utilization	Low	IP Traffic Utilization	Low	Cpu Utilization	Low	Memory Utilization	Low
Recommended Hosts for new VM Last Day (10)										
Order	Host	V-Cluster	I/O (MB/s)	I/O Utilization (%)	I/O Distribution	CPU Usage (MHz)	CPU Load (%)	CPU Distribution	Memory Usage (MB)	Me
1	usrfltr2	UserData	340.5	16.6		1,507.3	50.2		9,188.0	
2	eng1esx1	eng1	380.8	18.6		770.7	51.4		4,574.9	
3	ERP_env1	ERP	368.8	9.0		1,776.2	52.2		10,244.0	
4	usrfltr1	UserData	234.8	11.5		3,492.4	52.8		14,864.0	
5	billing2	billing	389.4	38.0		836.2	49.2		5,020.3	
6	eng1esx3	eng1	268.1	13.1		2,194.1	47.7		10,185.4	
7	ERP_env3	ERP	747.8	36.5		4,148.1	31.4		18,817.6	
8	billing1	billing	291.1	28.4		623.8	41.6		3,626.5	
NA	eng1esx2	eng1	272.1	1.3		836.4	1.3		6,007.1	
NA	ERP_env2	ERP	684.5	11.4		3,785.5	41.1		42,978.1	

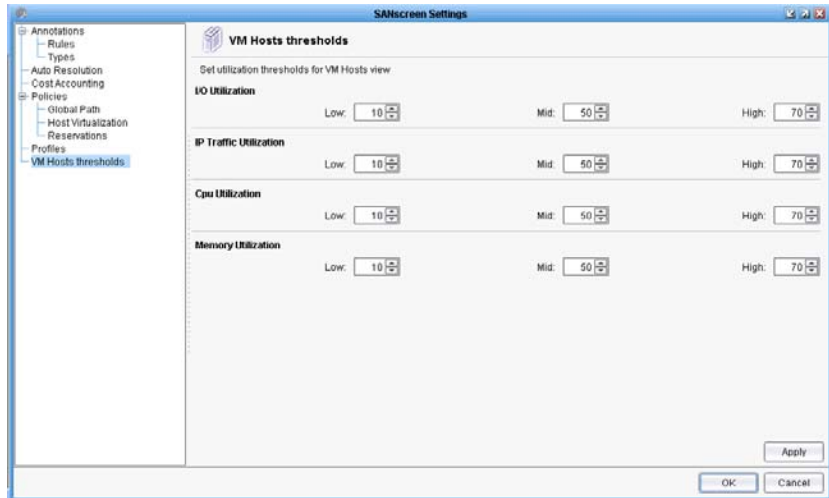
The following table defines a suitable match between the new virtual machine characteristics and the current host utilizations:

New Virtual Machine Expected Utilization	Current Host Utilizations
High	Too low
Medium	Medium; Too Low
Low	Optimal Zone; Medium; Too Low

The hosts are sorted based on the number of parameters (traffic, IP traffic, CPU, memory) that match this table.

Higher characteristics get precedence: The host that has a good match for parameters with **Medium** characteristic will appear in the Recommended Hosts for New Virtual Machine list *before* a host with a good match for parameters with a **Too Low** characteristic.

- Only hosts with **Too Low** utilizations will be suggested for virtual machines with **High** expected utilization.
- Hosts with **Medium** or **Too Low** utilizations will be suggested for virtual machines with **Medium** expected utilization.
- For **Medium** virtual machines, hosts with **Medium** utilization will appear before others that have “**Too Low**” utilizations.



4.2 VM Host Detail Panes

There are four major Detail Panes beneath the VM Hosts main table that can be opened to provide more detailed information about how virtual machines function:

- VM Load Analyzer 
- Performance Chart 
- Daily Utilization Pattern 
- Memory Map 

NOTE: To understand the functionality of the standard icons that also appear, refer to the *Service Insight User Guide*.

4.2.1 VM Load Analyzer

The load analyzer view displays the utilization of all virtual machines. Each row in the view shows traffic, CPU, memory and LAN load and utilization of a single virtual machine as well as the percentage of the entire capacity of the host that the virtual machine is using. (See also Chapter 5, “Performance and Virtual Machine.”)

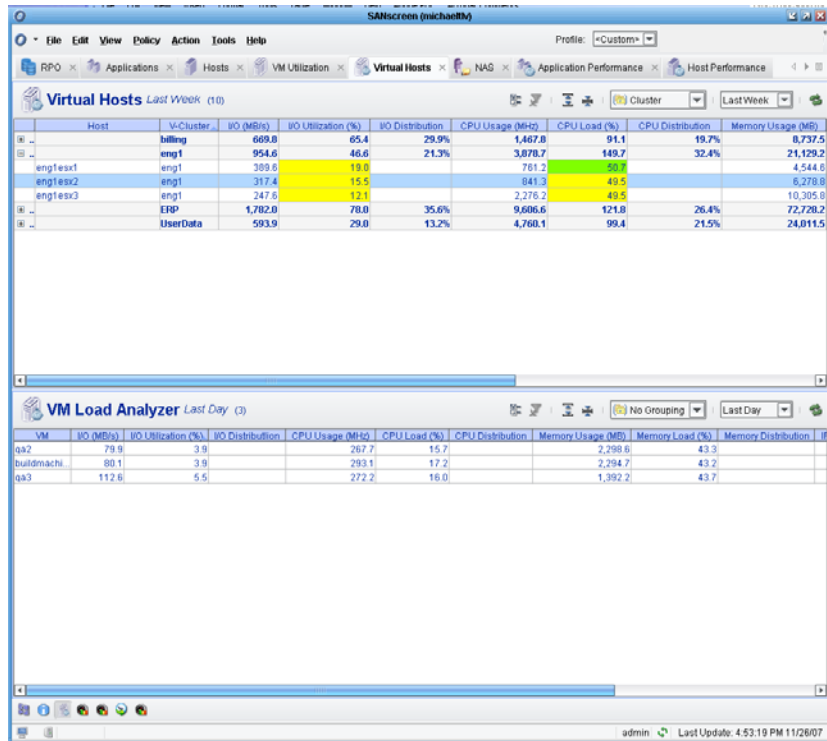
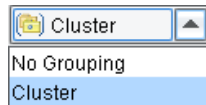


Figure 14: VM Load Analyzer

This view uses “Cluster” grouping to show the distribution:



The following information displays general values for the VM Load Analyzer:

Field	Description
<i>blank</i>	Applicable with any presentation order () other than No Grouping. Column that organizes the data according to the selected grouping format (for example, vendor). The number in parentheses indicates the number of virtual machines reported in each (grouped) row.
VM	Name of the Virtual Machine.
I/O (MB/s)	SAN traffic produced by a virtual machine, measured in MB/s.
I/O Utilization (%)	The utilization shows the ratio between a resource usage and the resource capacity. In particular, this shows the ratio between the used MB/s and the HBA's speed (in MB/s).
I/O Distribution	When looking at a group of hosts, the "distribution" shows the percentage of IO the host is using out of the sum of IO used by all hosts in the group. The same rule applies when comparing groups of hosts.
CPU Usage (MHz)	Amount of CPU used by a host.
CPU Load (%)	Displays the percentage of the host's CPU MHZ being used (cpu-usage divided by host-cpu-power).
CPU Distribution	For each group of rows in the view, the distribution is the percentage of this row's value from the sum of the values of all the rows in the group.
Memory Usage (MB)	Memory used by the host.

Field	Description
Memory Load (%)	The “memory load index” column normalizes memory usage across different hosts to enable comparison of memory usage – will show the ratio between the “memory usage” and the “host physical memory” (retrieved from VC).
Memory Distribution	For each group of rows in the view, the distribution is the percentage of a row’s value from the sum of the values of all the rows in the group.
IP (MB/s)	Amount of LAN traffic produced by virtual machine.
IP Traffic Utilization (%)	Shows the ratio between the SAN traffic for the virtual machine and the maximum throughput of the host over the selected period. This is calculated by dividing the total traffic in MB by the host’s maximum throughput (during the selected period). The traffic is the sum of the send and receive traffic The host’s maximum throughput is the sum of the speeds of all SAN ports regardless of whether they are connected or not.
IP Traffic Distribution	For each group of rows in the view, the distribution is the percentage of this row’s value from the sum of the values of all the rows in the group.

4.2.2 Performance Chart Detail Pane

The Performance Chart displays a chart of performance metrics over a duration of time that can be customized. The Performance Chart is useful for seeing correlations between performance and errors as well as for displaying anomalies and sudden changes in port activity over time.

The Performance Chart is available by clicking the Performance Chart icon in the VM Host view (see also *Chapter 2*, “Virtual Machines” and *Chapter 3*, “VM Utilization “).

In the figure on the next page the performance data is supplied for the highlighted host showing traffic and memory utilization.

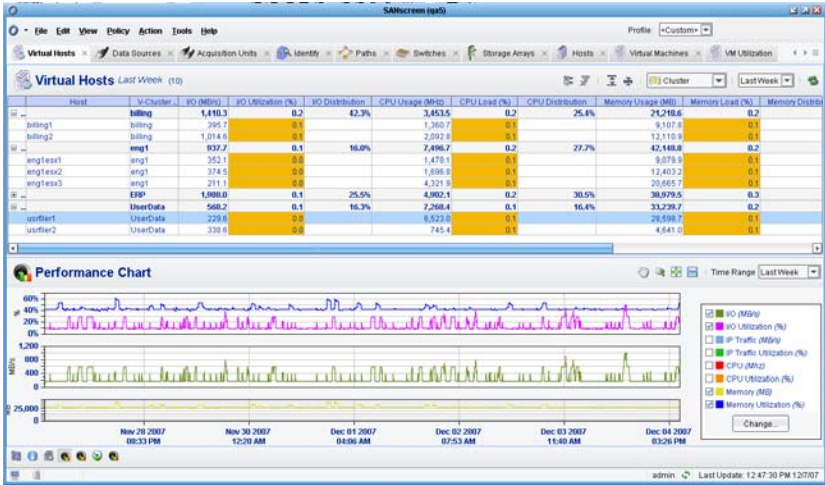
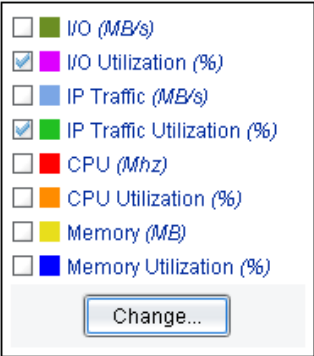


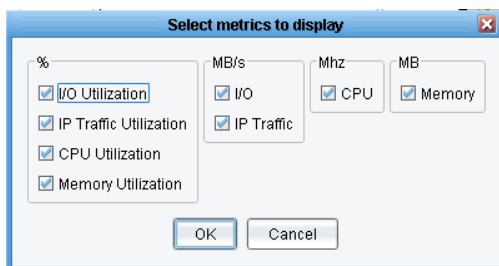
Figure 15: Performance Chart Detail Pane

4.2.2.1 Metrics Legend

This Chart Metrics legend contains the different data metrics and their color indications, allowing selection of each or all metrics for viewing.



Clicking on the Change button lets you set the metrics you want displayed.



4.2.2.2 Data/Time Stamp

The data in the Performance Chart pane is based on the time range selected from the drop-down box in the upper right corner. The data shown within the pane is marked by time stamps indicating when the data was sampled by Application Insight.

4.2.2.3 Time Ranges

This section describes the Time Ranges available for analysis in the Performance Chart pane. A variety of time ranges are available from the drop down menu in the right corner of the Performance Chart pane.

The following time ranges are available in the performance chart:

Live Sample
Last Hour
Last Day
Last Week
All
Custom

The Custom time range allows the selection of any time range up to the current time. The live time range first retrieves data for the last hour, then continuously asks the server for changes from the last update time to the current time, so long as the chart is visible and the time range is Live Sample.

4.2.2.4 Zooming

The Y Axis of the chart automatically scales to 5x greater than the greatest value in the chart. The chart also supports zooming using the

zoom tool. With the zoom tool enabled, clicking and dragging within the chart selects a box that defines the new boundaries of the chart.

Holding down shift and dragging a region will zoom out. The zoom to fit toolbar button resets the view to the default zoom level. The selected metrics and the time range are persisted in the registry, and will be restored the next time the performance chart is shown.

4.2.3 Daily Utilization Pattern Detail Pane

This chart displays the daily virtual machine metrics pattern:

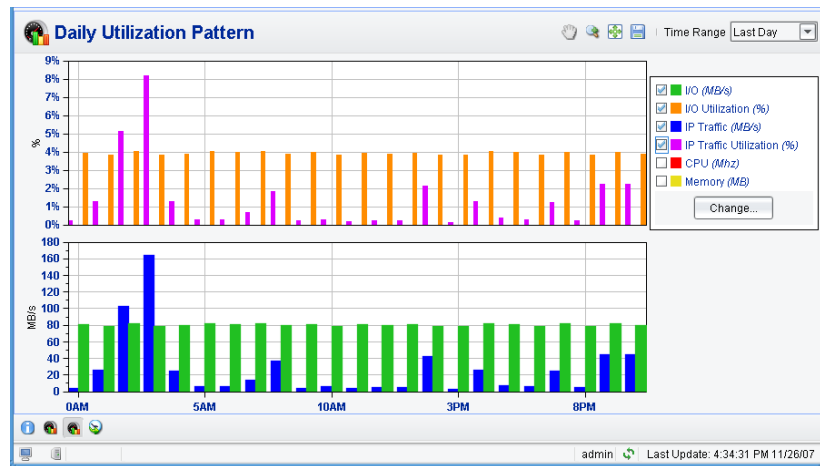


Figure 16: Daily Utilization Pattern

You can view see an entire week of data and view it on an hourly basis. Using this chart, you can see what virtual machines are active all the time or which ones are free at specified times, and what peak periods exist during the week. *This information helps you choose the right virtual machine to meet performance needs.*

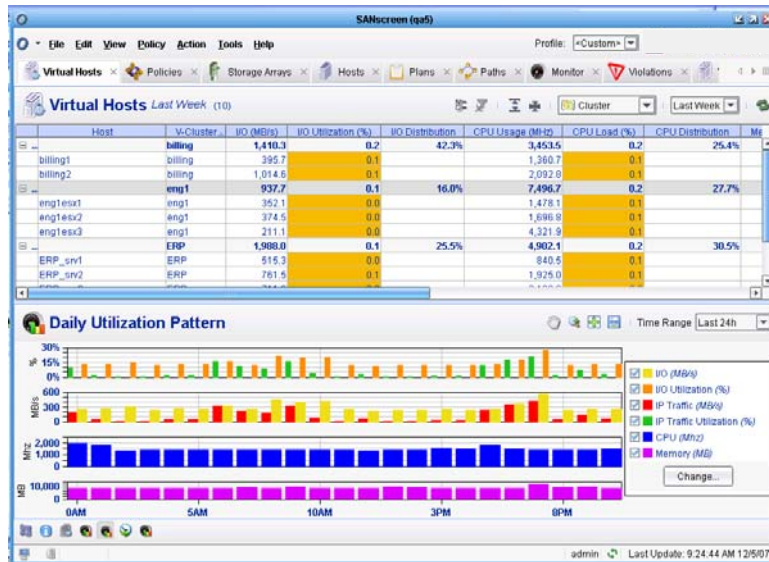


Figure 17: VM Hosts and the Daily Utilization Pattern

4.2.4 Memory Map

Memory map is used by selecting multiple hosts which you want to compare. Each host gets a "balloon" on the diagram:

- The balloon's diameter represents the size of the host's memory.
- Y axis represents the memory utilization of the host.
- X axis represents the memory usage.

In the following example all values are in the **Too Low** area:

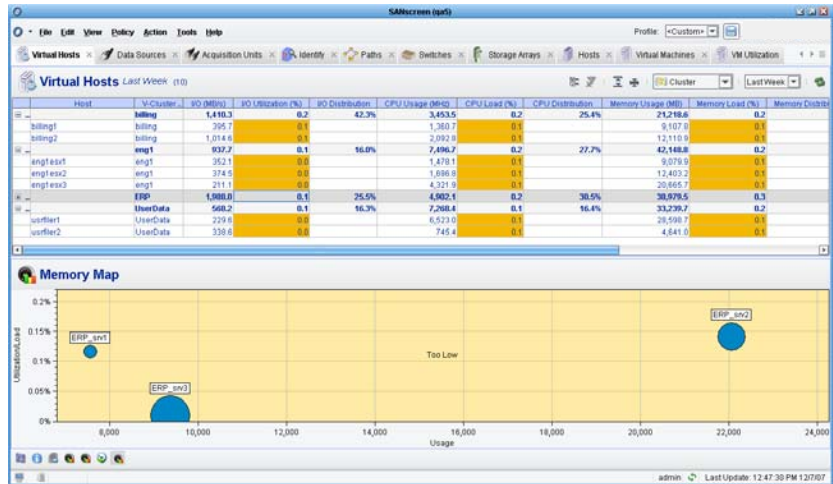


Figure 18: Memory Map

4.3 Applications of the VM Host View in SANscreen

Columns appear in standard SANscreen views to indicate the presence of virtual devices.

4.3.1 Paths

The screenshot displays the SANscreen (michaelth) application window. The top menu bar includes File, Edit, View, Policy, Tools, and Help. Below the menu is a toolbar with icons for Paths, Monitor, Virtual Machines, VM Utilization, and Virtual Hosts. The main view is titled 'Paths (100)' and contains a table with columns: Policy Type, Host, V-Host, V-Cluster, St..., Capacity (GB), Active SP, and Since. The table lists various paths and their properties, including billing1, billing2, userfiler1, and userfiler2. The table is filtered by 'V-Cluster then End Points'.

Policy Type	Host	V-Host	V-Cluster	St...	Capacity (GB)	Active SP	Since
(10) 0	Path	billing1	billing	Bl...	720.00	FA-0A Port0, FA-1A Port...	10/29/07 6:31 AM
(2) 0	Path	billing1	billing	Bl...	640.00	SP A Port0, SP B Port0, ...	10/29/07 6:31 AM
	Path	billing1	billing	Bl...	80.00	SP B Port0	10/29/07 6:31 AM
	Path	billing1	billing	Bl...	80.00	SP A Port0, SP B Port0	10/29/07 6:31 AM
(3) 0	Path	billing1	billing	Sy...	880.00	FA-0A Port0, FA-1A Port0	10/29/07 6:31 AM
	Path	billing1	billing	Sy...	160.00	FA-0A Port0	10/29/07 6:31 AM
	Path	billing1	billing	Sy...	640.00	FA-1A Port0	10/29/07 6:31 AM
	Path	billing1	billing	Sy...	80.00	FA-0A Port0	10/29/07 6:31 AM
	Path	billing1	billing	Sy...	80.00	FA-0A Port0	10/29/07 6:31 AM
(3) 0	Path	billing2	billing	Sy...	880.00	FA-0A Port0, FA-1A Port0	10/29/07 6:31 AM
	Path	billing2	billing	Sy...	160.00	FA-0A Port0	10/29/07 6:31 AM
	Path	billing2	billing	Sy...	640.00	FA-1A Port0	10/29/07 6:31 AM
	Path	billing2	billing	Sy...	80.00	FA-0A Port0	10/29/07 6:31 AM
(2) 0	Path	billing2	billing	Bl...	720.00	SP A Port0, SP B Port0, ...	10/29/07 6:31 AM
(16) 16		UserData				10B000000000001:44...	10/29/07 6:31 AM
(4) 4		UserData				10B000000000001:44...	10/29/07 6:31 AM
		UserData				10B000000000001:45...	10/29/07 6:31 AM
		UserData				10B000000000001:44...	10/29/07 6:31 AM

Figure 19: V-Host Column in SANscreen Paths View

1. **The V-Host column in SANscreen Paths** indicates that a host is a VM Host. The icon with the green arrow indicates that a given path is a currently running:
 - a. **Blank**—The path originates from a standard host.
 - b.  —The path originates from a virtualization host (ESX server).
 - c.  —The path originates from a virtualization host (ESX server) and is currently running, meaning that at least one of the virtual machines accessing this volume from this host is running. Note that since SANscreen's path does not include the storage port, this indication does not show the active path.
 - d.  —The path originates from a virtualization host (ESX server) but the volume is not mounted.
2. **The V-Cluster (Host Group) column** names a group of virtualization hosts sharing access to the same SAN volumes. A V-Cluster is either a VMware HA cluster or a manually-defined group of hosts.
3. **The Active SP (Storage Processor) column** gives the name of the storage processor used by the active path from the host to the volume. There can be only one active path for a given pair of (host, volume) and thus one storage processor.
4. **The V-Policy column** shows whether a Host Virtualization Policy has been applied. The column displays an icon when a host is excluded from the VM Host policy. Otherwise, the column is blank.

4.3.2 Volumes

Volume	Capacity (GB)	Raw Capacity (GB)	Mapped Ports	Masked Hosts	Type	Redundancy	Disk	Disk Group	Device Group	Disk Size (GB)	Disk Speed (RPM)	RDM	DataStore
0002	80.00	160.00	4	4	Volu...	[Data, Data...	SATA			1000,2000	4800		ERP_1_3
000C	320.00	640.00	4	16	Volu...	[Data, Data...	SATA			1000,2000	4800		ERP_1_1...
0010	80.00	160.00	4	16	Volu...	[Data, Data...	SATA			1000,2000	4800		ERP_1_1...
0014	160.00	320.00	4	16	Volu...	[Data, Data...	SATA			1000,2000	4800		ERP_1_1...
0018	160.00	320.00	4	16	Volu...	[Data, Data...	SATA			1000,2000	4800		ERP_1_1...
001C	320.00	640.00	4	16	Volu...	[Data, Data...	SATA			1000,2000	4800		ERP_1_1...
0020	80.00	160.00	4	16	Volu...	[Data, Data...	SATA			1000,2000	4800		ERP_1_1...

Figure 20: Volumes View with Virtual Columns

1. **The Datastore column** shows the names of the datastores residing on each volume (probably only one) in ascending order.
2. **The RDM column** shows the RDM name if the volume is used for raw device mapping.

4.3.3 Masking

ID	Raw Capacity (GB)	Storage Port	LUN	Status	Host	Host WWN	Storage Port WWN	AWWN	Detailed Status	Protocol	Controller	Datastore	RDM
20.00	640.00/CL1-A	4	Allocated	ERP_svr1	(P) 10:80:00:00:00:09:28	10:80:00:00:00:09:62						ERP_1_2...	
20.00	640.00/CL1-A	4	Allocated	ERP_svr1	(P) 10:80:00:00:00:09:30	10:80:00:00:00:09:62						ERP_1_2...	
20.00	640.00/CL1-B	4	Allocated	ERP_svr1	(P) 10:80:00:00:00:09:29	10:80:00:00:00:09:63						ERP_1_2...	
20.00	640.00/CL1-B	4	Allocated	ERP_svr1	(P) 10:80:00:00:00:09:31	10:80:00:00:00:09:63						ERP_1_2...	
20.00	640.00/CL2-A	4	Allocated	ERP_svr1	(P) 10:80:00:00:00:09:28	10:80:00:00:00:09:70						ERP_1_2...	
20.00	640.00/CL2-A	4	Allocated	ERP_svr1	(P) 10:80:00:00:00:09:30	10:80:00:00:00:09:70						ERP_1_2...	
20.00	640.00/CL2-B	4	Allocated	ERP_svr1	(P) 10:80:00:00:00:09:29	10:80:00:00:00:09:71						ERP_1_2...	
20.00	640.00/CL2-B	4	Allocated	ERP_svr1	(P) 10:80:00:00:00:09:31	10:80:00:00:00:09:71						ERP_1_2...	

Figure 21: Masking View with Virtual Columns

1. **The Datastore column** shows the names of the datastores residing on each volume (probably only one) in ascending order.
2. **The RDM column** shows the RDM name if the volume is used for raw device mapping.

Chapter 5 Performance and Virtual Machines

Using the VM Load Analyzer, the SAN administrator can enhance performance in the SAN by:

- Identifying virtualization candidates and visualize post-virtualization storage traffic.
- Identifying low-storage candidates for virtualization.
- Identifying post-virtualization performance.
- Demonstrating the Host view for organizational efficiencies and transparency.
- Ensuring end visibility for virtual machine RPO.

The discussion in this chapter applies most specifically to users who have the Application Insight license.

5.1 Load Analyzer Detail Pane

From the main Monitor view, the Load Analyzer Detail Pane adds details on an alert that has been selected in the center view.

- The view displays all ports for the device selected in the “Connected to” column of the Alerts Detail Pane in the Monitor view.
- A row that is selected in the Alerts column of the Monitor view defines a connection from a switch to some other device. The load analyzer shows the load on all the ports of both devices.

5.2 Load Analyzer Main Table

The Load Analyzer main view shows show both the physical host and virtualization host (ESX server).

The Load Analyzer now indicates whether a host is a virtualization host. The user may choose to open (in a separate window) the VM Load Analyzer on a selected virtualization host.

- **The V-Host column** indicates that a host is a VM Host:
 - a. **Blank**—The host is a standard host.
 - b.  —The host is a virtualization host (ESX server).
 - c.  —There is at least one running virtual machine on the virtualization host.

5.2.1 VM Distribution View in Load Analyzer

The distribution view applies to users that have an Application Insight license.

The VM Distribution view details the distribution of traffic by virtual machines. Each row shows the traffic generated by a virtual machine running on the selected host when it accesses a specific volume.

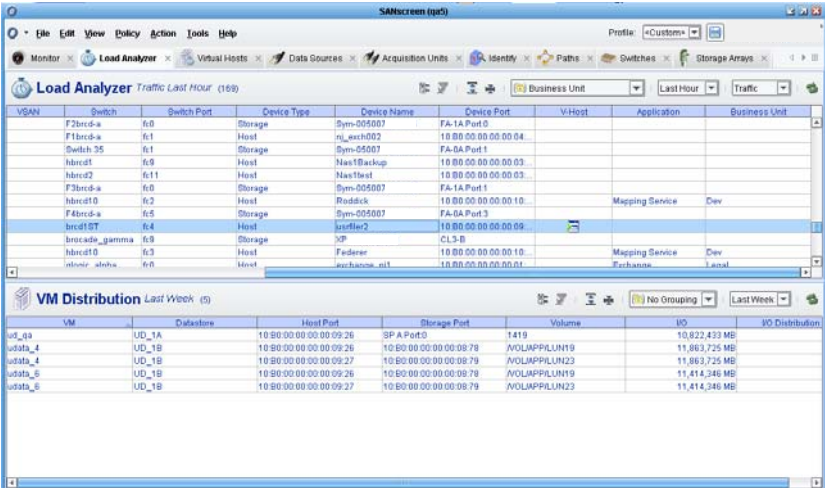


Figure 22: Load Analyzer and VM Distribution View

NOTE: Rows for virtual machine and LUN that do not map to a volume are displayed unless this is the only row for the virtual machine.

5.3 VM Load Analyzer

The VM Load Analyzer enables analysis of the load distribution between virtual machines and ports. The VM Load Analyzer provides the same functionality as the current Load Analyzer in Application Insight except that it adds relevant columns and filters out rows that are not relevant. This view will also show information regarding CPU and memory usage of the virtual machines.

Each row in the view represents a switch port and virtual machine. For each switch port connected to a virtualization host, the load analyzer will display a row for each virtual machine available to the host.

5.4 Hosts

A V-Host column has been added to the Hosts view in Application Insight to indicate that a host is a host virtualization server:

- Blank — The host is a standard host.
-  — The host is a virtual host (ESX server).
-  — There is at least one running virtual machine on the virtualization host.

A V-Cluster column has been added to the Hosts view in Application Insight.

A value for “Balance Index” appears when the Hosts view is grouped by “Application” or “virtual cluster.” The Balance index represents the traffic balance between the hosts in the cluster. The lower the value the more balanced is the traffic between the different hosts in the cluster.

Chapter 6 Host Virtualization Policy

The Host Virtualization Policy lets you activate and deactivate the rules described below.

The “single storage processor” rule applies to the storage models selected in the table below.

The list of models is derived from the storage devices currently known to SANscreen, although it may contain storage devices which were completely deleted.

It should be possible to predefine models which are assumed to be Active/Passive, for which the rule should be applied. (An example would be Clariion storage arrays.)

6.1 Setting Up the Policy

The following rules apply to paths that originate from VM Hosts:

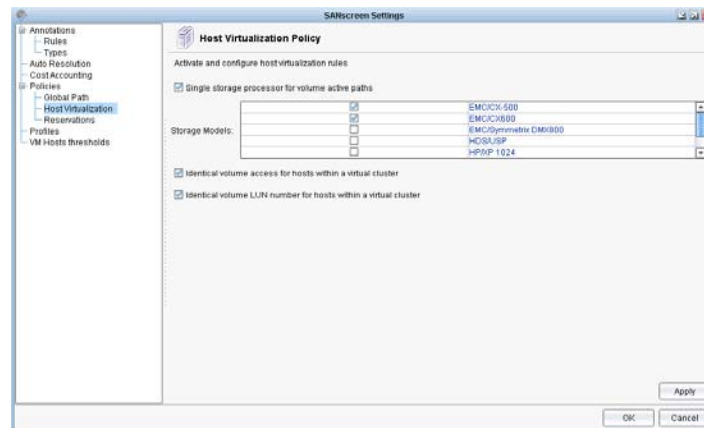


Figure 23: Setting Up Host Virtualization Policy

The Host Virtualization Policy is enabled by default, **with all hosts included** (the policy is applied to all hosts):

1. Single storage processor for a volume's active paths:

Alerts the SAN administrator that a volume is being **actively** accessed via multiple **storage processors**. For storage arrays which maintain active/passive multipathing this will result in storage performance degradation (and even service interruption).

The user will select the storage models that are active/passive and should not allow access through multiple storage processors to the same volume (storage model data is similar to the "Storage Models" column in the Hosts view of Application Insight).

2. Identical volume access for the hosts in a V-Cluster:

Alert the SAN admin that some hosts in a V-Cluster cannot access volumes other members of the group can. Such a configuration may cause these hosts to be unable to run virtual machines that other hosts in the cluster *are* able to run. (This is also applicable for NAS shares.)

3. Identical volume LUN number for V-Cluster hosts:

All the hosts sharing a volume must use the same LUN (this was common with older versions of ESX).

This rule alerts the SAN administrator that a volume is presented to different members of a V-Cluster using different LUN numbers.

The rules defined above will result with the following violations:

Violation	Condition	Issued for
Active path conflict	If a volume in an active/passive storage array is being accessed through multiple storage processors, a situation leading to "path thrashing."	All the paths to the volume being accessed.
Missing V-Cluster paths	If a host in a V-Cluster cannot access some volumes that another host in the group can.	For each host, issued for all the volumes that other hosts in the group can access. That is, issue the violations for each missing path.
Inconsistent LUNs	If a volume is presented (mapped) to different hosts in a group using different LUNs.	All the paths to the volume which are mapped using different LUNs.

6.2 Manual Specification of Virtual Clusters

If you implement a virtual cluster configuration that you have created, this cannot be recognized by SANscreen. The impact of this is that some VM Insight features cannot be actively used or applied to your cluster.

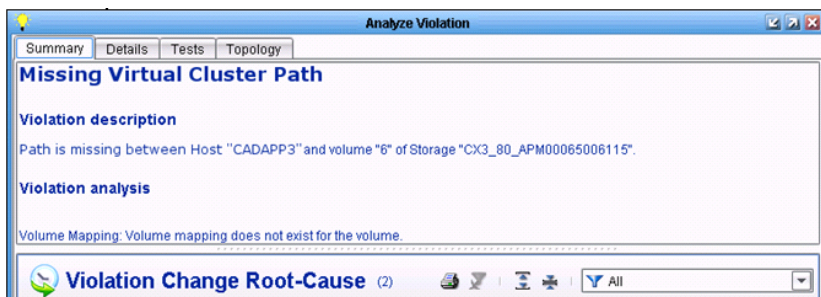
The manual specification of a virtual cluster ensures that SANscreen can identify clusters you have created. A host's application can be added as a manually specified virtual cluster. Such changes to a host's application are then displayed in the Changes detail pane. This feature in VM Insight also enables the correlation of violations to application changes

The "V-cluster" column in the SANscreen views listed below display the cluster name:

- VM Insight views
 - o Virtual Machines main table
 - o VM Hosts main table
 - o Recommended Hosts for new virtual machine
 - o VM Utilization main table
 - o VM Configuration detail pane
- Service Assurance views:
 - o Paths main table
 - o Violations main table
 - o Paths detail pane
 - o Violations detail pane
 - o Path Properties detail pane
 - o Violation Properties detail pane
- Application insight: Host Multipath main table

6.3 Analyzing Violations for “Missing Virtual Cluster Path”

When you select a "Missing Virtual Cluster Path" violation, you can now right-click to select “Analyze Violation” for VM Insight.



The VM Paths detail pane then displays all active VM-paths to the SAN volume (except VM Paths to a NAS share):

Name	Host	State	Datastore	Volume	Storage	Active SP	Policy	Active HBA	Vol
Wildcat (Hrnp test claims server)	labesx1	Running	San-Prod-Lun1	106	CX600_2_APM00035	SP A Port 2	mrn	10:00:00:00:C9:64:D1:D8	
XR4QDC2	labesx1	Running	San-Prod-Lun1	106	CX600_2_APM00035	SP A Port 2	mrn	10:00:00:00:C9:64:D1:D8	
XR42FILE1	labesx1	Running	San-Prod-Lun1	106	CX600_2_APM00035	SP A Port 2	mrn	10:00:00:00:C9:64:D1:D8	
XR48APPTTEST (Applications Te...	labesx1	Running	San-Prod-Lun1	106	CX600_2_APM00035	SP A Port 2	mrn	10:00:00:00:C9:64:D1:D8	
XR41COM3 (Lab Communicato...	labesx2	Running	San-Prod-Lun1	106	CX600_2_APM00035	SP A Port 0	mrn	10:00:00:00:C9:64:D0:FB	
XR41PUB2	labesx2	Running	San-Prod-Lun1	106	CX600_2_APM00035	SP A Port 0	mrn	10:00:00:00:C9:64:D0:FB	
XR43META	labesx2	Running	San-Prod-Lun1	106	CX600_2_APM00035	SP A Port 0	mrn	10:00:00:00:C9:64:D0:FB	
vr48epo (EPO TEST)	labesx2	Running	San-Prod-Lun1	106	CX600_2_APM00035	SP A Port 0	mrn	10:00:00:00:C9:64:D0:FB	
vr48gmed (Ocare Test server)	labesx2	Running	San-Prod-Lun1	106	CX600_2_APM00035	SP A Port 0	mrn	10:00:00:00:C9:64:D0:FB	
	labesx3	Running	San-Prod-Lun1	106	CX600_2_APM00035	SP A Port 2	mrn	10:00:00:00:C9:64:D8:F7	
XR49PACKAOER (MetaFrame D...	labesx6	Running	San-Prod-Lun1	106	CX600_2_APM00035	SP A Port 0	mrn	10:00:00:00:C9:2A:AA:C9	
LonghillQ (MFP)	labesx7	Running	San-Prod-Lun1	106	CX600_2_APM00035	SP A Port 0	mrn	10:00:00:00:C9:31:0B:FA	
SecurityWeb-Staging	labesx7	Running	San-Prod-Lun1	106	CX600_2_APM00035	SP A Port 0	mrn	10:00:00:00:C9:31:0B:FA	
XR47SQL3	labesx7	Running	San-Prod-Lun1	106	CX600_2_APM00035	SP A Port 0	mrn	10:00:00:00:C9:31:0B:FA	
XR49STAGIN01 (MetaFrame De...	labesx7	Running	San-Prod-Lun1	106	CX600_2_APM00035	SP A Port 0	mrn	10:00:00:00:C9:31:0B:FA	

(When selecting a "Missing Virtual Cluster NAS share" violation, the VM Paths detail pane displays all the VM-paths to the NAS-share.)

6.3.1 Examples

Missing Virtual Cluster Path

In a clustered environment, all the hosts should have access to the same SAN volumes. A “Missing Virtual Cluster Path” violation is issued if a host in a cluster does not have access to a volume that is accessible to other hosts in that cluster.

The following questions should be answered while analyzing such violations:

1. Which hosts in the cluster have access to the volume in question? Which hosts do not?
2. Should the hosts in the cluster be accessing this volume at all? If not, then access to the volume should be prevented from all the hosts in the cluster.
3. How can you find out why the host does not have access?. This is similar to analyzing a “Path Outage” violation:
 - a. Connectivity – Are the host and storage active and are connected to the same fabric?
 - b. Zoning – Do the host and storage share zones? Do any of the shared zones contain connected/active ports of the host and storage?
 - c. Volume masking and mapping – Does the storage map and mask the volume to the host using connected ports which are members of the same zone?

To correct this, a sufficient connectivity should be provided and matching zoning, mapping and masking should be configured., thereby granting the host access to the volume in question.

Active Path Conflict

An "Active Path Conflict" violation is issued if a volume in an active/passive storage-array is being accessed via multiple storage-processors.

The following questions should be answered while analyzing such violations:

1. Find all the active paths to the volume in question and determine the set of storage-processors being accessed.
2. Does the LUN-policy of any of the active paths is set to "fixed"?
A fixed policy for multiple LUNs may be forcing the hosts to choose conflicting storage-processors.
3. Is there a host with multiple LUNs mapped to this volume?
Since the ESX is using active/passive connectivity, it will be using a single active-path and it should be possible to switch to another LUN that uses the common SP.
4. Do all the LUNs have active or inactive paths to all the storage-processors? A LUN that does not have a path to a storage processor that other LUNs are accessing will be forced to ignore the "most recently used" SP.
5. Is the volume is mapped/masked to a disconnected host-port or storage-port?

Inconsistent LUNs

An "Inconsistent LUNs" violation is issued if a volume is mapped to ESX hosts using different logical-unit-numbers (LUN).

The following questions should be answered while analyzing such a violation:

1. Find all the LUNs that are mapped to the volume V_0 in the question; then find the most common LUN, L_0 .
2. For each host not using L_0 , verify that L_0 isn't mapped to another volume. If L_0 is not mapped to another volume, then V_0 should be mapped to L_0 .

Missing Virtual Cluster NAS Share

All the hosts in a cluster should be accessing the same NAS shares. A "Missing Virtual Cluster NAS Share" violation is issued if a host in a cluster doesn't access a NAS-share that is being accessed by other hosts in that cluster.

The following questions should be answered while analyzing such violations:

1. Which hosts in the cluster access the NAS-share in question,? Which hosts do not access the NAS-share?
2. Should the hosts in the cluster be accessing this NAS-share at all?
3. What is the reason the host does not access the NAS-share? Unlike SAN volume access, SANscreen cannot help find the reason a host does not access a NAS-share.
4. To correct such violations, the VM administrator should make the host mount the NAS-share by adding an "NFS datastore."

Chapter 7 SANscreen VM Insight VirtualCenter Plug-in

7.1 Overview

VM administrators need to know what storage is being used and how to manage it.

The SANscreen VM Insight VirtualCenter Plug-in, also referred to in this user guide as the VC Plug-in, provides VM administrators with read-only access to SAN information from the SANscreen server. This data allows administrators to have a larger view of their virtual environment and enables more proactive decision-making.

The VC Plug-in enables greater visibility into the SAN, showing:

- Arrays
- Tiers
- Volumes (LUNs)
- Redundancy
- Capacity
- Violations

The SANscreen VM Insight VirtualCenter Plug-in (referred to often in this chapter as just the VC Plug-in), enables access to SANscreen functionality from within the VMware Infrastructure Client:

- Provides visibility into the storage for the VM administrator without requiring access to the SANscreen Client, enabling the VM administrator to monitor SAN aspects of the virtualized environment.
- Provides a common terminology so that the VM administrator and SAN administrator can communicate effectively. The VM administrator can track storage issues and communicate them to the SAN administrator.

- Helps VM administrators see, via a capacity report, the utilization of storage that is allocated to the virtualization servers and help the VM administrator to reclaim capacity and/or order new storage.
- Warns the VM administrator of policy violations from problems in storage configuration. This enables the VM administrator to analyze a problem and determine whether it comes from a storage domain or not.

7.2 Prerequisites

The following environment is necessary to provide optimum use of the VC Plug-in :

- Virtual Center:
Version 2.5
- SANscreen VM Insight:
Version 5.0

7.3 Viewing the SANscreen Tab

Once you have installed all necessary licenses and registered the VC Plug-in (see the *SANscreen Installation and Administration User Guide* for this information), you can see data collected from SANscreen in the VMware Infrastructure Client.

Just open the VI Client *after* the VC Plug-in is registered (the VI Client loads the VC Plug-in during startup) and click on the SANscreen tab:

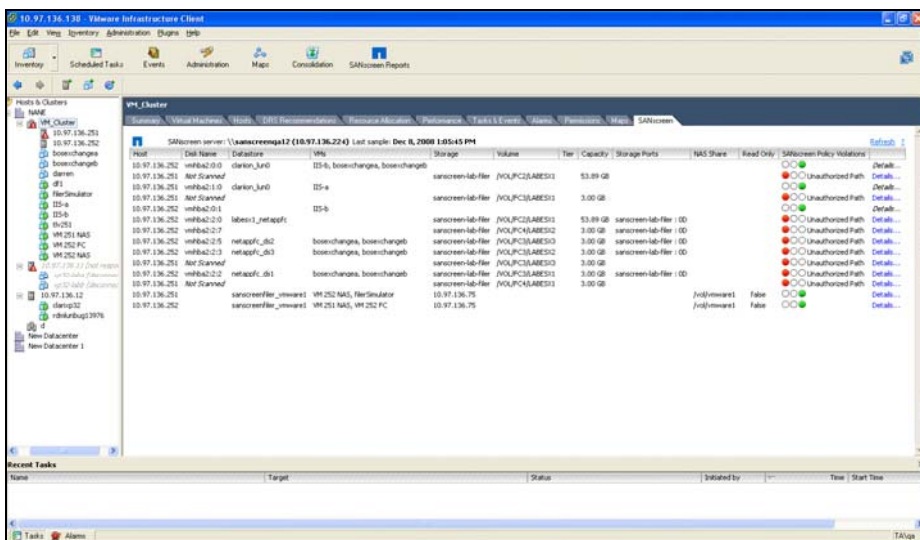


Figure 24: SANscreen Tab

7.3.1 Disabling the VC Plug-in

If at any time you want to disable the VC Plug-in, open the Plug-in Manager and uncheck **Enabled** under the Installed tab:

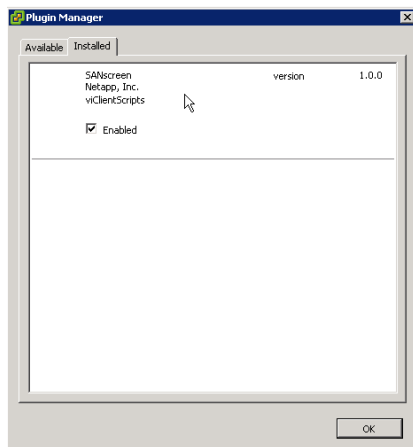


Figure 25: Plugin Manager

Subsequent pages explain how to operate the VC Plug-in and describe what data the VC Plug-in enables users to see.

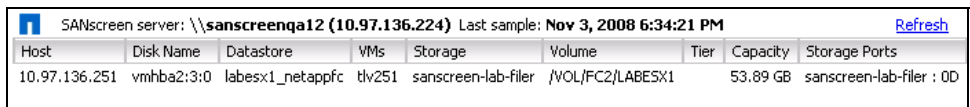
7.4 Storage Visibility

The VC Plug-in enables visibility into paths of all the ESX servers that been managed by the current Virtual Center regardless of the ESX servers that are managed by SANscreen. This allows the VM administrator to monitor SAN elements in the virtualized environment.

7.5 VM Paths View

Under the SANscreen tab the VMware Infrastructure Client displays all the paths for the selected host or cluster. If you select a data center you can see all hosts in that data center. The navigation tree on the left acts as a filter for the SANscreen tab.

Each row in the table represents one path:



The screenshot shows the SANscreen server interface with a table of VM paths. The table has columns: Host, Disk Name, Datastore, VMs, Storage, Volume, Tier, Capacity, and Storage Ports. A single row of data is visible.

Host	Disk Name	Datastore	VMs	Storage	Volume	Tier	Capacity	Storage Ports
10.97.136.251	vmhba2:3:0	labesx1_netappfc	tlv251	sanscreen-lab-filer	/VOL/FC2/LABESX1		53.89 GB	sanscreen-lab-filer : 0D

Figure 26: VM Paths Displayed in the SANscreen Tab

VM Paths can exist for Fibre Channel (FC) or NAS. The columns of data profile each path. Definitions include:

- Host = IP Address of the ESX
- Disk Name = Disk Name = HBA+LUN+Target ID as seen by the host, for example, **vmhba2:3:0**.
- Datastore = Name of the datastore used by the virtual host
- VM = Name of the VM(s)
- Storage = Name of SAN or NAS storage array containing the datastore
- Volume = Volume name (FC) of a path to the volume on a NAS device
- Tier = Volume tier
- Capacity = Capacity (GB) allocated to the VMs on the datastore (this will be the sum of all virtual disks stored on the datastore which are used by the VMs)
- Storage Ports = Storage ports that the active path uses (see page 52 in this *VM Insight User Guide*)
- NAS Share = Path to the share storage volume

- Read Only = For NAS paths only (indicates whether the NAS share is read only or read/write)
- SANscreen Policy Violations = Indicators show red for violation, yellow for pending violation, and green for no violations.

7.5.1 Paths Detailed View

Click on the [Details](#) column at the right end of the table. This expands the path view to provide additional information for the VM path:

Tier	Capacity	Storage Ports	NAS Share	Read Only	SANscreen Policy Violations	
	53.89 GB				○ ○ ○	Details...
	3.00 GB				● ○ ○ Unauthorized Path	Details...
					○ ○ ○	Details...
	53.89 GB	sanscreen-lab-filer : 0D			○ ○ ○	Details...
	3.00 GB	sanscreen-lab-filer : 0D			● ○ ○ Unauthorized Path	Details...
	3.00 GB	sanscreen-lab-filer : 0D			● ○ ○ Unauthorized Path	Details...
	3.00 GB	sanscreen-lab-filer : 0D			● ○ ○ Unauthorized Path	Details...
	3.00 GB	sanscreen-lab-filer : 0D			● ○ ○ Unauthorized Path	Details...
	3.00 GB	sanscreen-lab-filer : 0D			● ○ ○ Unauthorized Path	Details...
	3.00 GB	sanscreen-lab-filer : 0D			● ○ ○ Unauthorized Path	Details...
	3.00 GB	sanscreen-lab-filer : 0D			● ○ ○ Unauthorized Path	Details...
			/vol/vmware1	false	○ ○ ○	Details...
			/vol/vmware1	false	○ ○ ○	Details...

The example of expanded detailed information below shows no violations (green indicator):

Hosts accessing NAS Share /vol/vmware1					
Host	Datastore	VMs	Read Only	SANscreen Policy Violations	
10.97.136.251	sanscreenfiler_vmware1	VM 252 NAS	false	○ ○ ○	
10.97.136.252	sanscreenfiler_vmware1	VM 251 NAS, VM 252 FC	false	○ ○ ○	

Figure 27: VM Paths Detailed View—No Violations

Next is an example with violations (red indicators) and their detailed information:

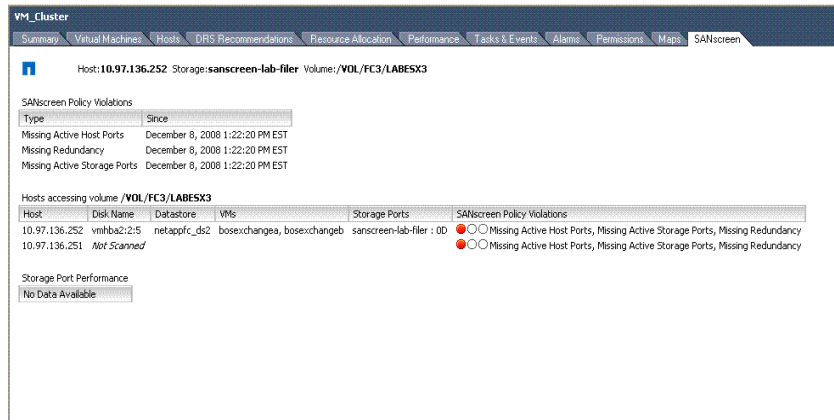


Figure 28: VM Paths Detailed View with Violations

The view is titled, identifying the names of the datastore, disk, storage and volume in that order:

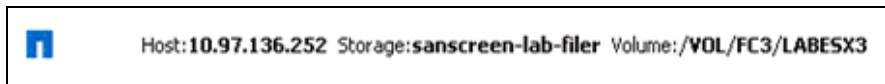


Figure 29: Title of VM Path Detailed

Note: Clicking on [Back button](#) will return you to the default view.

7.5.2 SANscreen Policy Violations

For each violation, the Details view shows the **Type** of policy violation(s) currently attached to the VM path, and in the **Since** column, shows the time at which the violation first occurred.

SANscreen Policy Violations	
Type	Since
Missing Active Host Ports	December 10, 2008 2:44:35 PM EST
Missing Redundancy	December 10, 2008 2:44:35 PM EST
Missing Active Storage Ports	December 10, 2008 2:44:35 PM EST
Unauthorized Sharing	December 10, 2008 2:44:35 PM EST

Figure 30: Policy Violations in the SANscreen Tab

The table on the next page lists all possible violation types and associated descriptions:

Table 1: Types of Violations (see also Chapter 6)

Violation	Description
Active Path Conflict	A volume in an active/passive storage array is being accessed through multiple storage processors, a situation leading to "path thrashing." Issued for all the paths to the volume being accessed.
Missing V-Cluster Paths	A host in a V-Cluster cannot access some volumes that another host in the group can. For each host, issued for all the volumes that other hosts in the group can access. That is, violations issued for each missing path.
Inconsistent LUNs	If a volume is presented (mapped) to different hosts in a group using different LUNs. Issued for all the paths to the volume which are mapped using different LUNs.
Missing Active Host Ports	A path exists (or is planned to exist) between a server and a specific volume, but too few host ports have access to the volume. • Risk: Path performance is compromised.
Missing Redundancy	A path exists between a server and a specific volume, but the required <i>dual-fabric</i> redundancy does not exist. The policy specifies that the host must reach the storage device through at least two different fabrics. • Risk: Because the redundancy level is not met, a single failure could cause downtime.
Path Outage	According to the current SAN configuration, no path exists (or is planned to exist) between a server and a particular volume, but such a path was previously authorized by SANscreen Service Assurance. In other words, a policy was created for the path. The path may have existed previously. • Risk: The path is inactive and the server cannot access its data volume, which results in downtime.

Violation	Description
Single Point of Failure	A path exists (or is planned to exist) between a server and a specific volume, but the required <i>no-SPF</i> redundancy does not exist. The policy specifies that all SAN devices on this path must be redundant. • Risk: Path availability is compromised. Any device that's included in the path could present a single point of failure.
Switch Hop Count	A path exists (or is planned to exist) between a server and a specific volume, but there are too many switch hops in the path. • Risk: Path performance is compromised.
Unauthorized Path	A path exists (or is planned to exist) between a server and a specific volume, but the path is not authorized (that is, no policy is defined for it). • Risk: This could be the result of a SAN change that inadvertently led to the creation of an invalid path, or it might represent a potential security problem.
Unauthorized Sharing	The path volume is shared (or is planned to be shared) and accessible by too many hosts, in violation of the sharing policy. • Risk: Data access violation, security breach, compliance and regulation issues, or a simple mistake that may turn into application downtime and data corruption.

7.5.3 Hosts Accessing Volumes

The detailed view displays a list of paths from all hosts accessing that same volume with some or all of the following columns, according to the host type:

- Host = IP Address
- Disk Name = Disk Name = HBA+LUN+Target ID as seen by the host, for example, **vmhba2:3:0**.
- Datastore = Name of the datastore used by the virtual host
- VMs = Name of the VMs

- Storage Ports (FC only) = Storage ports that the active path (see page 52) uses
- SANscreen Policy Violations = Traffic lights show green, yellow or red. Violation types for the path are marked in red.

7.5.4 Hosts Accessing NAS Share

The detailed view displays a list of paths from all hosts accessing the same NAS Share with the following columns:

- Host = IP Address
- Datastore = Name of the datastore used by the virtual host
- VM = Name of the VM
- Read Only =
- SANscreen Policy Violations = Traffic lights show green, yellow or red. Violation types for the path are marked in red)

7.5.5 Storage Port Performance

The detailed view displays a list of all storage ports that can be accessed by the selected host. The table includes the following columns:

- Storage Port Name
- Storage Port WWN (title "SAN Identifier" as in the VI Client)
- Traffic (TX) within the last 24 hours
- Distribution (A comparison between the displayed ports. For example, if there are 3 ports and the values are 5, 10, and 35, the distribution will be 10%, 20% and 70%.)

7.6 Capacity Reports

The Capacity report is derived from the Host and Datastore utilization information supplied in the VC Plug-in.

The intent of the Capacity report is to help the VM administrator determine what storage resources exist that can be reclaimed from Hosts, datastores and VMs.

Using Capacity reports, the VM administrator can see and monitor the status of capacity and available or free capacity for:

- Storage tiers
- Least utilized storage
- Unused VMs

The report also allows decisions to be made about ordering new storage as needed.

7.6.1 Types of Capacity Reports

A link is provided to SANscreen Capacity Reports using the Reports button on the VMware Infrastructure Client menu. This is shown on the next page together with an example of a capacity graphic report.

This report provides detailed information on storage capacity usage at the level of the host, datastore, and inactive VMs to enable increasing utilization or reclamation of unused capacity:

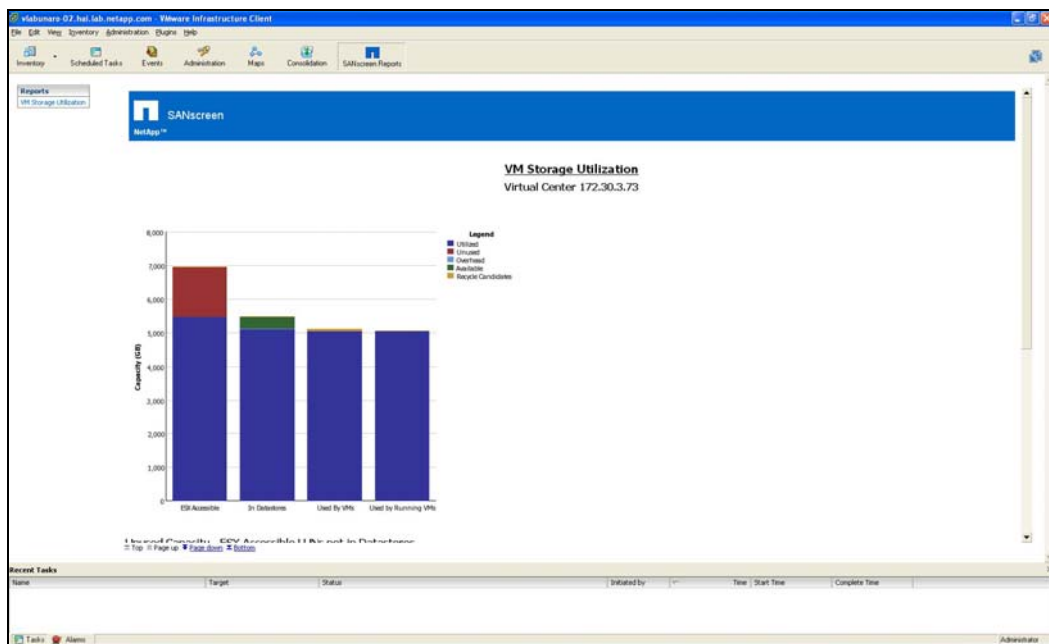


Figure 31: SANscreen Reports Link and Report

Table information displays report values for Unused Capacity –ESX LUNs not in Datastores, letting you identify the inactive virtual machines which are using high tier storage:

Unused Capacity - ESX Accessible LUNs not in Datastores						
ESX	LUN	Capacity (GB)	Tier	Storage	Volume	
billing2, billing1	5	640.00	Silver	Bill-CX500_14_APM00351029314	1629	
englesx3, englesx2, englesx1	6	640.00	Silver	CX600_14_APM00351029314	1414	
englesx3, englesx2, englesx1	6	640.00	Silver	USP600_21112	214	
ERP_srv3, ERP_srv2, ERP_srv1	4	640.00	Gold-Fast	USP600_21112	244	
englesx3, englesx2, englesx1	2	320.00	Silver	CX600_14_APM00351029314	1426	
englesx3, englesx2, englesx1	2	320.00	Silver	USP600_21112	226	
ERP_srv3, ERP_srv2, ERP_srv1	4	320.00	Gold-Fast	USP600_21112	212	
ERP_srv3, ERP_srv2, ERP_srv1	4	320.00	Gold-Fast	USP600_21112	228	
ERP_srv3, ERP_srv2, ERP_srv1	3	320.00	Gold-Fast	USP600_21112	243	
usrfiler2, usrfiler1	3	320.00	Silver	CX600_14_APM00351029314	1411	
usrfiler2, usrfiler1	3	320.00	Silver	FAS3050-sv113c	/VOL/APP/LUN11	
englesx3, englesx2, englesx1	2	160.00	Silver	CX600_14_APM00351029314	1410	
englesx3, englesx2, englesx1	6	160.00	Silver	CX600_14_APM00351029314	1422	
englesx3, englesx2, englesx1	2	160.00	Silver	USP600_21112	210	
englesx3, englesx2, englesx1	6	160.00	Silver	USP600_21112	222	
ERP_srv3, ERP_srv2, ERP_srv1	4	160.00	Gold-Fast	USP600_21112	220	
ERP_srv3, ERP_srv2, ERP_srv1	0	160.00	Gold-Fast	USP600_21112	224	
usrfiler2, usrfiler1	3	160.00	Silver	CX600_14_APM00351029314	1419	
usrfiler2, usrfiler1	7	160.00	Silver	CX600_14_APM00351029314	1423	
usrfiler2, usrfiler1	3	160.00	Silver	FAS3050-sv113c	/VOL/APP/LUN19	

Field	Description
ESX	VMware ESX server.
LUN	Number assigned to a logical unit (volume).
Total Capacity in TB	Total capacity in terabytes.
Tier	Tier where the capacity resides.
Storage	Name of the storage array (may be empty if no volume is mapped to the LUN).
Volume	Volume name (left blank if no volume is mapped to the LUN).

For additional information about this report, see the *Enterprise Reporting for Capacity Manager User Guide*.

7.7 Using VM Insight VirtualCenter Plug-in with SANscreen

Using VM Insight VirtualCenter Plug-in with SANscreen enables you to perform multiple tasks that help to optimize virtualization in the SAN.

EXAMPLES follow that use the screens and information supplied in the previous chapters. Please refer to those sections for additional explanations of terminology and process.

7.7.1 Researching a Violation

What actions are required to address a Missing Virtual Cluster Path violation?

This violation means that a host in a virtual cluster cannot access volumes that another host in the cluster is able to access. A path does not exist for that host within the cluster, and thus, no path exists from the virtual machine to the volume. All hosts in a cluster need access to the same storage to ensure that VMotion-related features will function properly and the VM can be moved successfully to another host in the cluster.

7.7.2 Reclaiming Capacity

Unused storage is a burden on the SAN because it prevents full use of available capacity. The VM administrator can reclaim unused storage that is occupied by least utilized or underutilized VMs.

See the VM Utilization report via the Reports link in the VI Client.

7.7.3 Adding Storage

When adding new storage, the user does not have a lot of information about the available storage to use in a datastore. The device name (for example, **vmhba0:1:0**), total/free capacity and WWN of the HBA port are available.

It is impossible to know where the LUN (volume) is stored, which requires the array and volume name, and other properties such as the tier of the volume. Also, if this volume is being used by another datastore, it is hard to retrieve information about it. You do not see it in the available list when you want to add a new one.

The VC Plug-in shows you the list of volumes accessible by the entity you select. For example, when selecting an ESX, all the volumes that are accessible are listed. If a volume is already in a datastore, you can see it and understand why it is not available.

The VM Administrator can choose the right volume based on more data than what is available through the VMware Infrastructure Client.

In addition, since the VC Plug-in shows the name of the volume and storage, it is easier for the VM Administrator to discuss it with the SAN Administrator.

7.7.4 Symmetric Storage Configuration Between ESX Servers in a Cluster

For VMotion to work, configurations of the ESX in a cluster need to be symmetric. DRS and HA will not work if this is not the case.

For storage configuration it means that all ESXs should have access to all volumes and NAS shares that the VM uses. The LUN number in the ESX for a volume should also be the same. The plug-in shows whether such a configuration exists by listing violations.

Accessing a volume through a different storage processor has a performance penalty. This is why ESX servers should access the same volume through same storage processor. This is especially important when using DRS, where VMs are constantly migrating from ESX to ESX.

The VC Plug-in gives a warning on such cases with the "Active Path Conflict" violation.

7.7.5 SAN Performance

In the Path Details view, you can see how the IO traffic distributes between the different storage ports. This helps to analyze bottle necks, for example, when the storage port that is being used is loaded.

Chapter 8 Using VM Insight with SANscreen

Using VM Insight with SANscreen enables you to perform multiple tasks that help to optimize virtualization in your SAN. Viewing the virtual machine path, for example, lets you see violations and their cause, relocate or make changes to the SAN storage, and know what storage a virtual machine is using. NetApp SANscreen defines the path for you.

EXAMPLES follow that use the screens and information shown and supplied in the previous chapters. Please refer to those sections for additional explanations of terminology and process.

8.1 Research a Violation

What actions are required to address a Missing Virtual Cluster Path violation?

This violation means that a host in a virtual cluster cannot access volumes that another host in the cluster is able to access. A path does not exist for that host within the cluster, and thus, no path exists from the virtual machine to the volume. All hosts need access to the same storage to ensure that in the event of path outage, the virtual machine can failover to another host in the cluster.

The following offers one possible solution using SANscreen:

1. Open the Violations main table and group the **Violation Type** column by “Missing Virtual Cluster Path” (be sure that you have already checked the policy under the Tools/SANscreen Settings/Host Virtualization menu).
2. Then sort by “Active Path Conflict.” Look at the **Volume** column to see if the host is using different active SPs to get to the selected volume. If this is the case, which is likely, *you need to know what virtual machines are affected by this violation before there is performance degradation.*

If an icon with a green triangle  appears in the **V-Host** column, this indicates that a virtual machine is present.

3. Open the VM Paths detail pane. With a path conflict, there will be at least two virtual machines in the **Name** column that are accessing the same volume. Throughput immediately suffers as a result.
4. Go to the Storage view. Find the storage that applies and highlight it.
5. Open VM Paths to see all the virtual machines accessing this volume.
6. In the same view, look at the Active SP column. Any conflict found between the Active SPs must be corrected.

7. To resolve this conflict, the virtual machine has to be manually changed at the Virtual Center. (See the MRU policy to determine the most recently used path to the Controller so the Host uses that.) Backup--in the event that primary storage fails--is now active.

8.2 Set an Active Path for Datastore

This use case illustrates how a VA can get supporting data in order to determine which active path to set for a virtual machine (datastore). The VA would look for a low utilization storage port on the storage array on which the datastore was allocated (in the event of a new datastore) or for the storage processor which is being used already for access by other ESX servers (in the event of an existing datastore and a new ESX server)

1. Open the “Load Analyzer” view.
2. Select “Last week” as the timescale.
3. Filter for Storage arrays and select the storage device with the datastore volume(s).
4. Identify storage ports that have the least utilization (check for connectivity to the same fabric if the host is already connected).
5. If you require a longer historical view, select to view the histogram for selected ports.

8.3 Host Configuration

The VA is adding a new datastore to a single host or a cluster, asking the SA to allocate the capacity and enable access from the hosts. The SA allocates the capacity and configures the storage array and SAN switches to enable multiple redundant paths. The VA creates a datastore on the allocated volume and chooses the preferred paths to achieve load balancing while avoiding path thrashing.

1. Allocate some capacity and configure access for a group of hosts.
2. Use SANscreen Service Insight to identify existing volume allocations for the hosts as supporting data for volume allocation decision (might choose storage array which is already zoned, etc.).
3. Allocate a new volume.
4. Use SANscreen Application Insight to choose the storage port and storage processor that will allow for balanced load.
5. Configure the storage array and fabric switches to enable all hosts to access the volume through multiple paths.
6. Use SANscreen Service Insight to verify that indeed all hosts have access to the volume.
7. Create a datastore on the new volume and configure the preferred path from the hosts.
8. Open the Virtual Machine view and verify that the datastore was added to all hosts in the cluster by viewing the datastore in the Virtual Machine detail pane.
9. Use SANscreen's global policy to continuously verify that the hosts have sufficient redundant access to the volume and that the conditions for path thrashing do not occur (these may be caused by conflicting selection of preferred paths).

8.4 Add Existing Datastore to Host

The VA is adding a host to the group of hosts (virtual cluster) sharing an existing datastore, asking the SA to grant the host access to the datastore's SAN volumes. The SA configures the storage array and SAN switches to enable multiple redundant paths. The VA is adding the datastore to the host and chooses the preferred paths to achieve load balancing while avoiding path thrashing.

1. Ask the SA to grant the host access to the datastore's volumes.
2. Open the Host View and the Virtual Machine detail pane to identify which storage ports and processors are being used to access this datastore by existing Hosts. Then decide on the correct mapping to avoid path thrashing (the SA can also use SANscreen Application Insight to identify load balance issues).
3. Configure the storage array and fabric switches to enable access to the volumes through multiple paths.
4. Use SANscreen to verify that indeed the host has access to the volumes.
5. Add the datastore and configure the preferred path.
6. Verify in SANscreen that there is no active path conflict (in the event of an active-passive storage array).

8.5 Troubleshoot Host Performance

The SA would like to understand whether a specific virtual machine (or virtual machines) is responsible for a host performance issue. This will assist in pinpointing the problem and deciding on potential SA or VA action items.

1. Use AI to troubleshoot up to the host level.
2. Open the VM Load Analyzer view to drill down to the virtual machine at a granular level.
3. The VM Load Analyzer view provides visibility for virtual machine traffic, VM Memory consumption and virtual machine CPU consumption. The VA will be able to review all three parameters and their distribution in order to determine if there is a problem and if so, its root cause.

