
SANscreen®

Application Insight User Guide

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NetApp SANscreen 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.

Documentation Set

The following table lists the full documentation set for NetApp's suite of products. These manuals are available from the client Help menu.

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.
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.
SANscreen VM Insight	Overview of Virtualization in SANscreen.
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. Provides information about how array performance in 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.
SANscreen Service Connect API User Guide	Overview of how to use the API interface to enable integration with other applications, such as reporting and monitoring systems.

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Architecture

This chapter describes the architecture, main components and data flow of Application Insight, which contains three major components:

- ◆ Acquisition Unit - Collects application data
- ◆ Server - Processes storage compression and analysis
- ◆ Client - Presents the information to the user

Acquisition Unit

The Acquisition unit communicates with SAN devices such as arrays and switch devices and continuously discovers and report changes. With Application Insight, switch data sources report on SAN traffic. Then the Acquisition Unit transmits the data to the server for storage and processing.

Server

The server receives the application data samples, compresses all data collected by the acquisition unit and stores it in an effectively lossless compression in the database. Raw samples are kept for seven days before being summarized into daily histograms. The daily histograms are saved for a year before being deleted.

Client

The client is the application launched by users to get access to information and enable the use cases managed by SANscreen.

Note

The Array Performance that is described and explained in the second half of this user guide is an option of the Application Insight product. The Array Performance functionality will only be available if the option was purchased and the licensed was installed.

Setting Up Application Insight

Overview

This chapter lists the steps required to set up Application Insight:

- ♦ [Setting Up Datasources](#)
- ♦ [Verifying Data Sources Operations](#)
- ♦ [Configuring Phone Home](#)

Setting Up Datasources

Datasources are required for SANSscreen to collect application data.

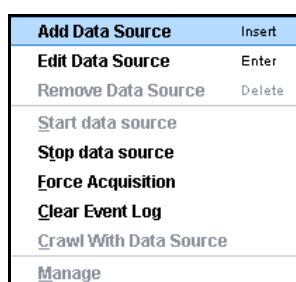
The description below assumes that SANSscreen Service Insight is fully deployed. Otherwise, please follow the procedures in the *SANSscreen Installation and Administration User Guide* to deploy Service Insight before continuing this chapter.

To configure Application Insight, edit all switch datasources and enable Application Insight for each of them as described below.

Enabling Application Data Collection for All Switch Data Sources

Use the following steps to setup and configure new Data Sources.

1. Under Admin in the Launch menu, select Data Sources.
2. Right-click anywhere in the Data Source table and select Edit Data Source.



The 'Add Data Source' dialog box. It has a title bar 'Add Data Source' with a close button. The main content area is titled 'Data source vendor and model' and contains a red 'X' icon and the text 'Enter a name'. Below this is a 'Name:' label followed by a yellow text input field. Underneath are three dropdown menus: 'Acquisition Unit:' with 'local' selected, 'Vendor:' with '3Par' selected, and 'Model:' with 'InServ (SMI-S)' selected. At the bottom are four buttons: '< Back', 'Next >', 'Finish', and 'Cancel'.

3. Click Next to proceed to the next step.
4. In the next screen, a variety of fields will be shown depending on the data source being configured. Enter the appropriate specifications for all of your data sources.
5. Check the Enable Application Insight checkbox.
6. Set the Application poll interval to 10 (seconds). This is the recommended setting.

The image displays three overlapping 'Add Data Source' dialog boxes, each showing a different data source configuration. The top-left box is for a 'Brocade switch' with fields for User name (admin), Password, Poll interval (15), Enable trapping (checked), Minimum time between traps (10), and Ignore Brocade API error -21 on (unchecked). The top-right box is for an 'Address of Control Center server' with fields for User name (administrator), Password, and a list of values (20, 60000, 60) with checkboxes. The bottom-left box is for 'Clariion storage' with fields for User name, Password, Poll interval (40), navicli.exe path (C:/Program Files/EMC/Navisphere CLI/), and DR enabled (checked). All three boxes have 'Import', '< Back', 'Next >', 'Finish', and 'Cancel' buttons at the bottom.

Note

All fields highlighted in yellow are required fields. Red fields indicate invalid values.

7. After all fields are filled in with valid data, the Finish button will be enabled. Click the Finish button.
Refer to "Appendix A: Available Data Source" in the *SANscreen® Installation & Administration User Guide* for device-specific details about each parameter.

8. Check the Enable Application Insight checkbox.

Verifying Data Sources Operations

This section shows you how to validate that application data has been collected successfully. Proceed as follows to verify the Data Sources have collected application data:

1. Wait a few minutes for data sources to complete a few collection cycles and open the Data Sources view.
2. Verify the Recent status column shows success for the status of all switch data sources. See the figure below.
3. In case of errors, examine the main Data Source table and the acquisition event log detail panes for details.
4. If your data sources have not acquired correctly, see Troubleshooting Data Source Activity in the SANscreen Installation and Administration User Guide.

Data Sources (81)							Status of Data Acquisition
Name	IP	Poll Interval	Vendor	Model	State		
ATLCX3sw1	10.73.16.56	15	Cisco	All models using SNMP	Stopping		Stand-by
ATLCX3sw2	10.73.16.57	15	Cisco	All models using SNMP	Stopping		Acquiring device
ATLSANSW01	10.73.16.45	40	McData	Performance using SNMP	Stopped		Success
ATLSANSW02	10.73.16.46	40	McData	Performance using SNMP	Stopped		Success
B7AC101	B7AC101.gsm1900.org	40	Cisco	All models using SNMP	Stopping		Acquiring device
B7AC102	b7ac102.gsm1900.org	40	Cisco	All models using SNMP	Stopping		Acquiring device
B7AH101	b7ah101.gsm1900.org	35	Cisco	All models using SNMP	Stopping		Acquiring device
B7AH102	b7ah102.gsm1900.org	30	Cisco	All models using SNMP	Stopping		Stand-by
B7AH103	b7ah103.gsm1900.org	40	Cisco	All models using SNMP	Stopping		Acquiring device
B7AM101	b7am101.gsm1900.org	40	Cisco	All models using SNMP	Stopping		Acquiring device
B7AS101	b7as101.gsm1900.org	35	Cisco	All models using SNMP	Stopping		Stand-by
B7AS102	b7as102.gsm1900.org	40	Cisco	All models using SNMP	Stopping		Acquiring device
B7AS103	b7as103.gsm1900.org	40	Cisco	All models using SNMP	Stopping		Stand-by
B7AS104	b7as104.gsm1900.org	35	Cisco	All models using SNMP	Stopping		Stand-by
B7BC101	B7bc101.gsm1900.org	30	Cisco	All models using SNMP	Stopping		Acquiring device
B7BC102	b7bc102.gsm1900.org	40	Cisco	All models using SNMP	Stopping		Acquiring device
B7BH101	b7bh101.gsm1900.org	40	Cisco	All models using SNMP	Stopping		Acquiring device
B7BH102	b7bh102.gsm1900.org	30	Cisco	All models using SNMP	Stopping		Stand-by
B7BH103	b7bh103.gsm1900.org	40	Cisco	All models using SNMP	Stopping		Stand-by
B7BM101	b7bm101.gsm1900.org	35	Cisco	All models using SNMP	Stopping		Acquiring device
B7BS101	b7bs101.gsm1900.org	40	Cisco	All models using SNMP	Stopping		Acquiring device
B7BS102	B7BS102.gsm1900.org	30	Cisco	All models using SNMP	Stopping		Acquiring device
B7BS103	b7bs103.gsm1900.org	35	Cisco	All models using SNMP	Stopping		Stand-by
B7BS104	b7bs104.gsm1900.org	40	Cisco	All models using SNMP	Stopping		Acquiring device
Baldrick	10.1.4.117	40	EMC	Clariion CLI	Stopping		Internal error
BrocadeLab	192.168.3.132	15	Brocade	All models using API 3.2	Running		Sending data to server
connectrix	10.65.16.18	15	EMC	Connectrix 7	Stopping		Stand-by
Darling	10.1.4.121	40	EMC	Clariion CLI	Stopping		Internal error
EMILY	10.1.21.81	40	EMC	Clariion CLI	Stopping		Stand-by
EVA_ELUN	waadmassan03.gsm1900.org	50	HP	EVA Storage	Stopping		Failed to execute external utility

Note

As necessary, press <F5> to refresh the display.

Configuring Phone Home

Phone home is an optional configuration that enables data and logs to be sent to NetApp headquarters on a daily basis to be used for proactive support, helping to identify and resolve issues with Application insight before they affect operations. To configure your Phone Home setup, use the following instructions.

1. Launch an Internet browser, and open the SANscreen Administration web portal by going to (<http://localhost/> or <http://<sanscreen server IP address>/>).
2. Select **Troubleshoot**, the second bullet in the lower left.
3. You may be asked to login to SANscreen. Once logged in, select **Phone Home** from the Troubleshooting menu.

The screenshot shows the 'Phone Home Configuration' web page. At the top, it says 'Last sent time: 03/27/08 06:07 PM'. Below this, there are several sections: 'Database:' with a dropdown menu set to 'SANscreen and Application Insight'; 'SANscreen data:' with a dropdown set to 'Current and last 30 days'; 'Application Insight data:' with a dropdown set to 'Last 2 days'; 'Application Insight packages:' with three checkboxes: 'Switch' (checked), 'Array' (checked), and 'Host Virtualization' (unchecked). Below this is the 'Logs:' section with a dropdown set to 'Extended Logs'. The 'Send Method:' section has a dropdown set to 'Http', a 'Size limit:' input field set to '100' MB, and a 'Split files if bigger than:' input field set to '1' MB. The 'Other:' section has a 'Sending duration:' input field set to '3' Days and a 'Site name:' input field set to 'demo'. At the bottom, there are two buttons: 'Update' and 'Update and send now'.

4. The **Phone Home Configuration** screen appears. Select the database and preferred durations for data collection. Check the boxes to activate the desired **Application Insight** package(s).
5. Select the **Logs**: Base Logs or Extended Logs. Select the desired **Send Method** (ftp, https, e-mail) and set the size limit of the data sample to be sent. The recommended data sample size is 100 MB and the recommended split file size is 1 MB. The preferred method of sending the data is, in order, ftp, https, e-mail.
6. Choose a Sending duration and Site name in the **Other** section.
7. Click **Update** or **Update** and **Send Now**.

If you select e-mail, you can increase the size of the data samples to be sent to the maximum e-mail size allowed by your mail server.

8. Finally, click the **Update and send now** button and verify a successful send process has occurred.

Application Insight Views

Overview

The Application Insight Views are listed under **Application Insight** on the Launch menu. The main Application Insight views include:

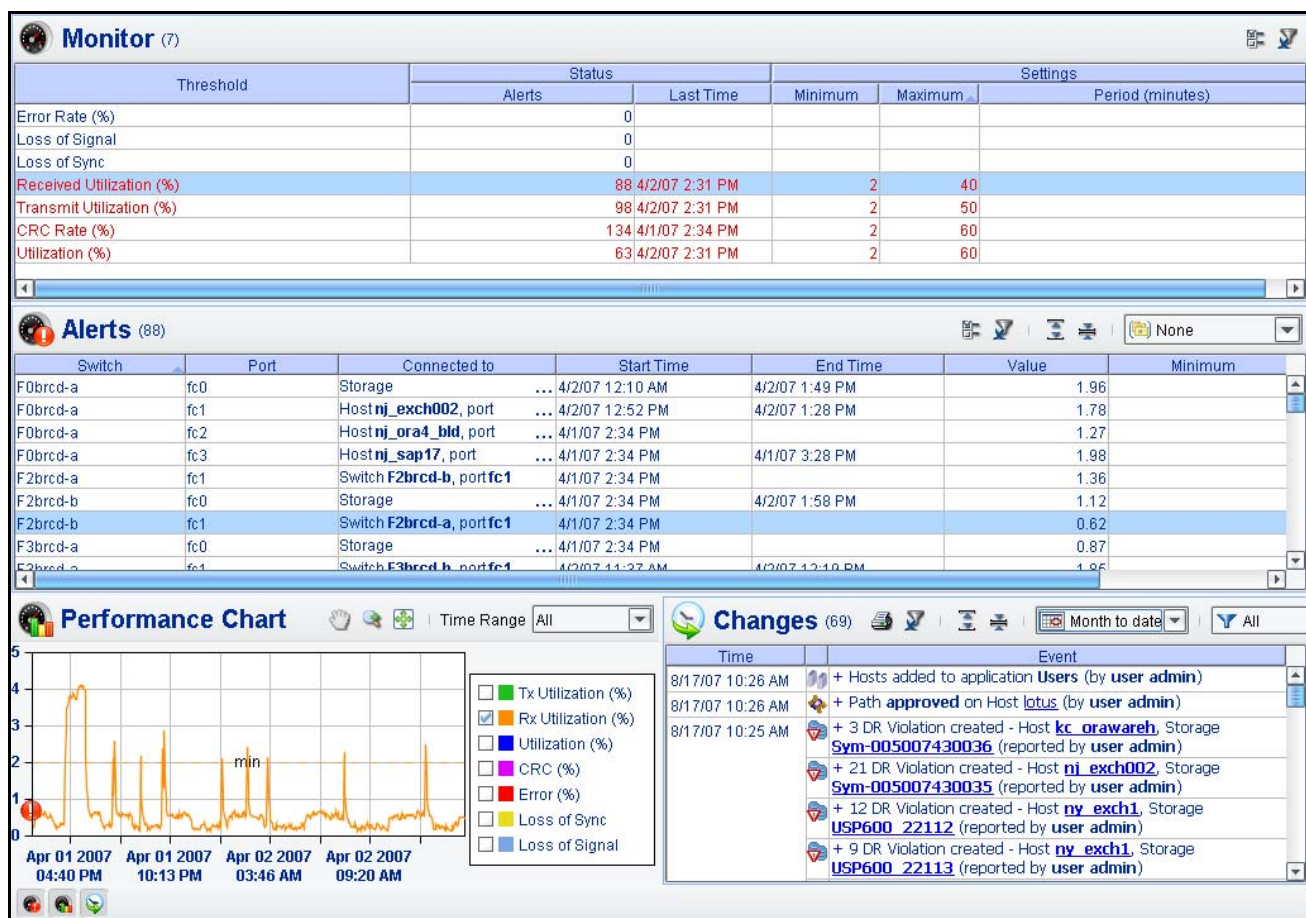
Application Insight View	Navigation Icon	Description
Monitor	 Monitor	Displays views for setting and reviewing thresholds, alerts and charts
Load Analyzer	 Load Analyzer	Displays views for capacity planning
Hosts	 Host Multipath	Displays views for multipath, balancing and congestion analysis
Host Performance	 Host Performance	Identifies all hosts that are consuming array resources
Storage Performance	 Storage Performance	Lets you analyze performance and availability of applications
Application Performance	 Application Performance	Drills down deep into the volume and disk utilization

Monitor

Overview

The Monitor View lets you manage thresholds. If the thresholds are violated, alerts are automatically triggered. The Monitor view also allows for viewing trends via a chart. The following section describe each view, including the table columns and contents.

- ◆ [Monitor Main Table](#)
- ◆ [Alerts Pane](#)
- ◆ [Performance Chart Detail Pane](#)
- ◆ [Changes Detail Pane](#)



Monitor Main Table

The Monitor pane lists the different thresholds set per each metrics including minimum and maximum values and the sampling period. A row is displayed in **red** if the thresholds indicated have been exceeded. The number displayed is the number of alerts issued for the particular threshold as well as the date and time of the last alert received.

For example, in the following illustration, the maximum threshold is set for 75%. This means that if the transmit utilization—the amount of available bandwidth used for Tx—exceeds 75% for a period of at least 15 minutes, an Alert will be issued. When you click a row in the Monitor window, the Alerts pane displays the list of alerts corresponding to the threshold selected in the Monitor Main Table.

Monitor (7)					
Threshold	Status		Settings		
	Alerts	Last Time	Minimum	Maximum	Period (minutes)
CRC Rate (%)	0				
Error Rate (%)	0				
Loss of Signal	0				
Loss of Sync	768	1/23/07 1:08 PM			
Received Utilization (%)	79	2/20/07 4:24 AM		75	15
Transmit Utilization (%)	59	2/20/07 4:24 AM		75	15
Utilization (%)	16	11/9/06 8:24 PM		75	15

Different Threshold Categories	# of Alerts Received	Time/Date of Last Alert	Range which error must fall outside of in order for an Alert to be issued	Length of time which error must occur to signal an Alert
--------------------------------	----------------------	-------------------------	---	--

Monitor Main Table Column Descriptions

Threshold	Status		Settings		
	Alerts	Last Time	Minimum	Maximum	Period (min)
The Metric being measured against the policy specified (see Settings column to the right)	The number of Alerts received for each Threshold	The time and date of the last alert for each Threshold	The minimum amount of Threshold (Utilization, Received, Transmit, etc.) that can occur without an Alert being issued. If any amount less than what has been set is reached for the time Period (in min.) specified, an Alert is issued.	The maximum amount of Threshold (Utilization, Received, Transmit, etc.) that can occur without an Alert being issued. If any amount over what has been set is reached for the time Period (in min.) specified, an Alert is issued.	The amount of time which the error must occur for an Alert to be issued.

Alerts Pane

When you click on a Threshold in the Monitor Pane, any Alerts that have violated that Threshold are displayed in the Alerts Pane. An alert is triggered when the performance metrics for any port exceeds the threshold specified, for the time period specified.

Click the  button at the bottom of the Monitor view to open the Alerts pane, which is shown below sorted by switch and then expanded by port:

Alerts - Sorted by Switch Then Port

Switch Ports

Alerts (56)

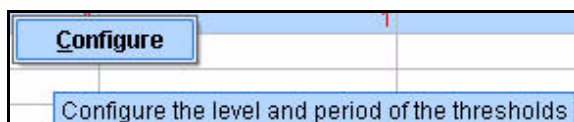
Alerts Table Column Descriptions

Field	Description
Switch	Displays the Switch on which the Alert occurred.
Port	Displays the Port on which the Alert occurred.
Connected To	Name of the host, storage, or switch device that the switch port is connected to.
Start Time	Date and time when the port activity first crossed the threshold. If your list is grouped, this field represents the range of dates/times for all child rows.
End Time	Date and time when the port activity went back below the threshold. If your list is grouped, this field represents the range of dates/times for all child rows.
Value	Average actual (out-of-range) value for the period reported. If your list is grouped, this field represents the range of values for all child rows.
Minimum	Minimum threshold value at the time of the alert.
Maximum	Maximum threshold value at the time of the alert.

Setting Performance Thresholds

SANscreen Application Insight monitors the activity on each switch port. The user can set a variety of performance thresholds that constitute policies. If these policies are violated, an Alert is issued. To create Performance thresholds (policies), use the following steps.

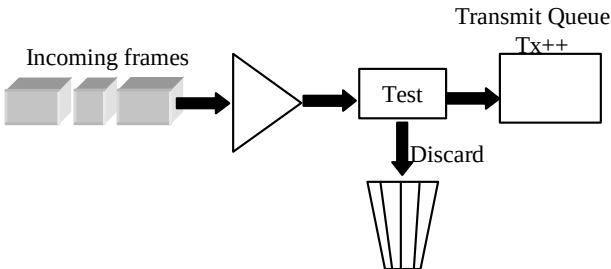
1. To set the Performance thresholds from within the Monitor Pane view, right-click on any Threshold and select Configure from the menu that appears:



2. Set the Threshold fields as desired. For a description of Threshold fields, see [Performance Data Threshold Descriptions](#).
 - ♦ **Min:** The minimum amount of Utilization, Received, Transmit, etc. that can be reached without an Alert being issued. If any amount less than what has been set is reached for the time Period (in min.) specified, an Alert is issued.
 - ♦ **Max:** The maximum amount of Utilization, Received, Transmit, etc. that can be detected without an Alert being issued. If any amount over what has been set is reached for the time Period (in min.) specified, an Alert is issued.
 - ♦ **Period (minutes):** The amount of time which the error must occur for an Alert to be issued.

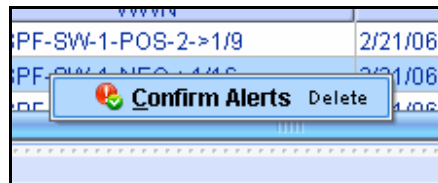
Performance Threshold Configuration		
Utilization (%)	☐ Min:	25
Period (minutes): 15	☒ Max:	75
Received Utilization (%)	☐ Min:	25
Period (minutes): 15	☒ Max:	75
Transmit Utilization (%)	☐ Min:	25
Period (minutes): 15	☒ Max:	75
CRC Rate (%)	☐ Min:	25
Period (minutes): 60	☐ Max:	75
Error Rate (%)	☐ Min:	25
Period (minutes): 60	☐ Max:	75
Loss of Sync	Period (minutes): 60	☐ Max: 1
Loss of Signal	Period (minutes): 60	☐ Max: 1
OK Cancel		

Performance Data Threshold Descriptions

Threshold	Description	Formula
CRC Rate	CRC frame errors as percentage of the total data traffic	$crcErrorRate = \frac{\Delta crcErrors \times 100}{\Delta RxFrames}$ 
Errors Rate	Total number of errors (Loss of Sync, Loss of Signal, and Framing)	$errorRate(\%) = \frac{\Delta error \times 100}{\Delta error + \Delta RxFrames + \Delta TxFrames}$
Loss of Signal	Loss of Signal errors	$lossOfSignal / sec(\%) = \frac{\Delta lossOfSignal \times 100}{\Delta sec}$
Loss of Sync	Loss of Sync errors. The port has to re-sync after each such error, which impacts performance	$lossOfSync / sec(\%) = \frac{\Delta lossOfSync \times 100}{\Delta sec}$
Received Utilization	Percentage of available bandwidth used for Rx	$RxUtilization(\%) = \frac{\Delta RxBits \times 100}{\Delta Seconds \times ActualSpeedBits}$
Transmit Utilization	Percentage of available bandwidth used for Tx	$TxUtilization(\%) = \frac{\Delta TxBits \times 100}{\Delta Seconds \times ActualSpeedBits}$
Utilization	Percentage of available bandwidth used for Tx and Rx	$Utilization(\%) = \frac{\max(\Delta RxBits, \Delta TxBits) \times 100}{\Delta Seconds \times ActualSpeedBits}$

Confirm Alerts

When you're through reviewing an alert, you can confirm and delete that alert from the display. It is easier to select several alerts at once, and then to confirm them as a group. Right-click to open the menu that allows the Confirm operation.



Note

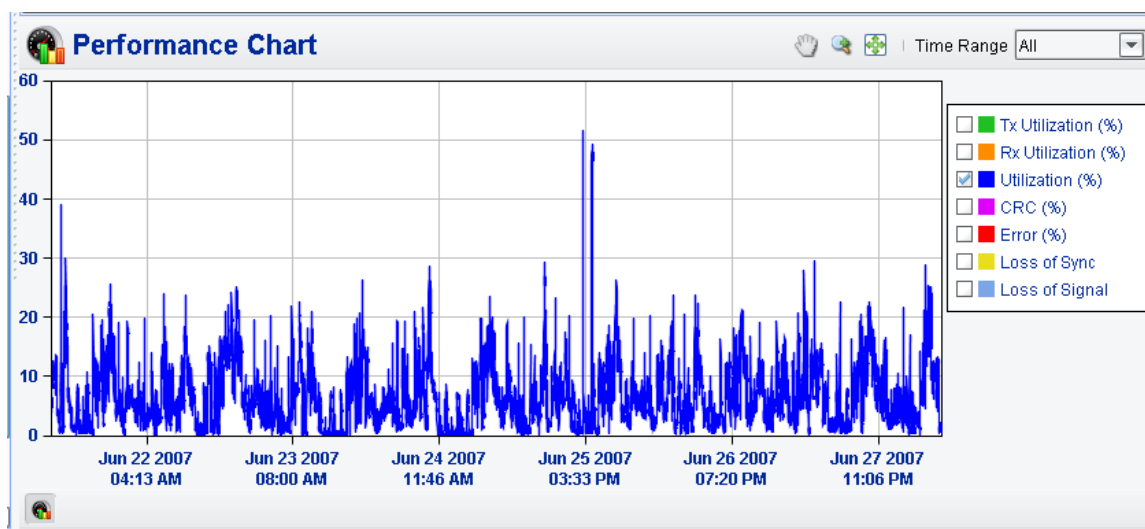
If you do not confirm an Alert, it will appear every time you view the Alert pane.

Performance Chart Detail Pane

The Performance Chart displays a chart of various performance metrics over a time period 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 Monitor view (and the Load Analyzer view--see page 26), or can be selected as a pop-up menu option in the detail panes.

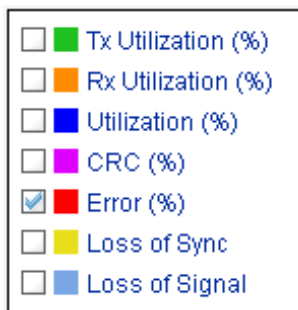
In the figure below the performance of a fabric is displayed. You can change the time period using the drop-down box in the upper right corner of the Performance Chart pane.



Metrics Legend

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

Performance Chart Metrics Legend

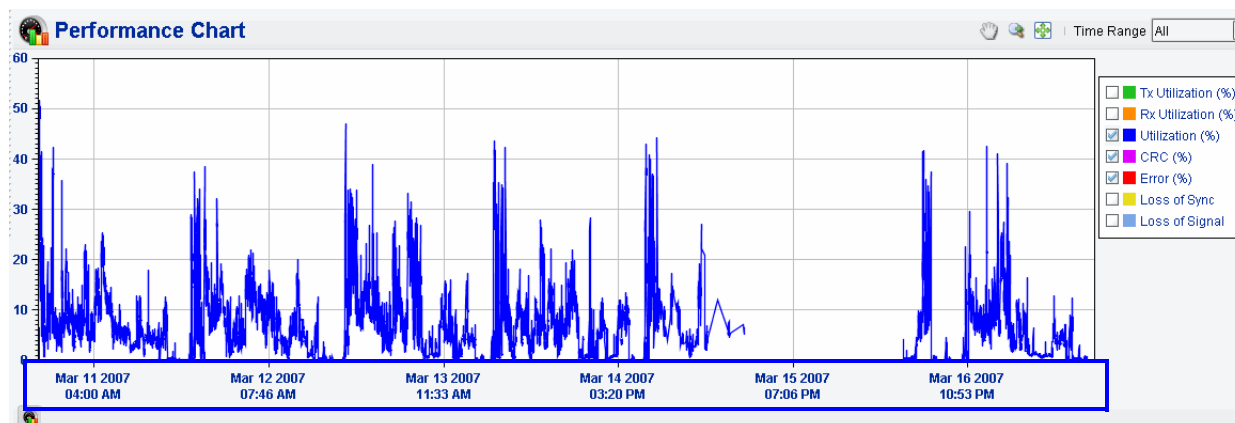


For a detailed description of the Performance Chart Metrics, see the table [Performance Data Threshold Descriptions](#).

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.

Performance Chart View: Data and Time Stamp



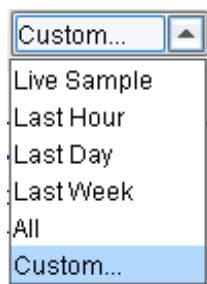
Time Ranges

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:

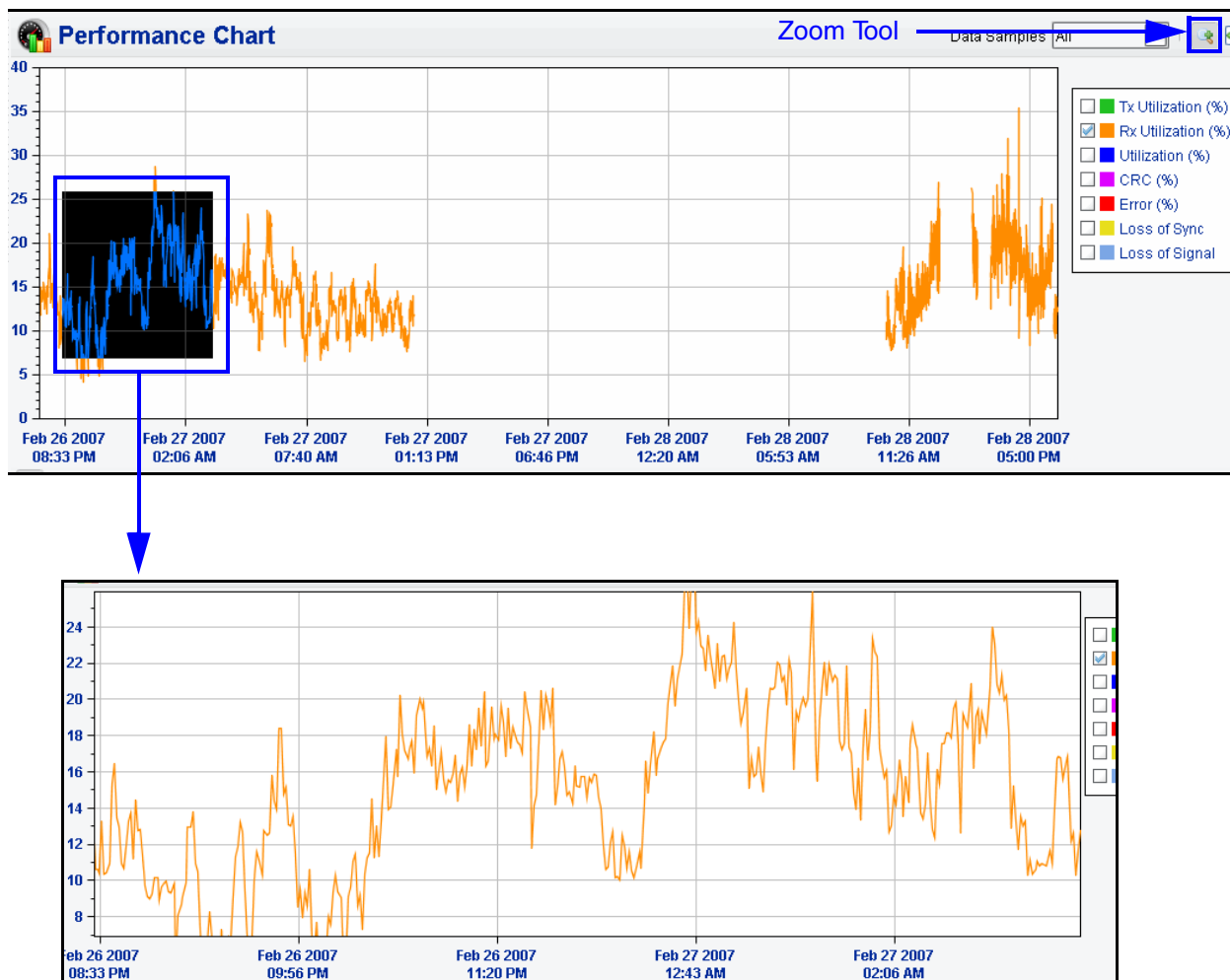
- ◆ Live Sample
- ◆ Last Hour
- ◆ Last Day
- ◆ Last Week
- ◆ All
- ◆ Custom

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.



Zooming

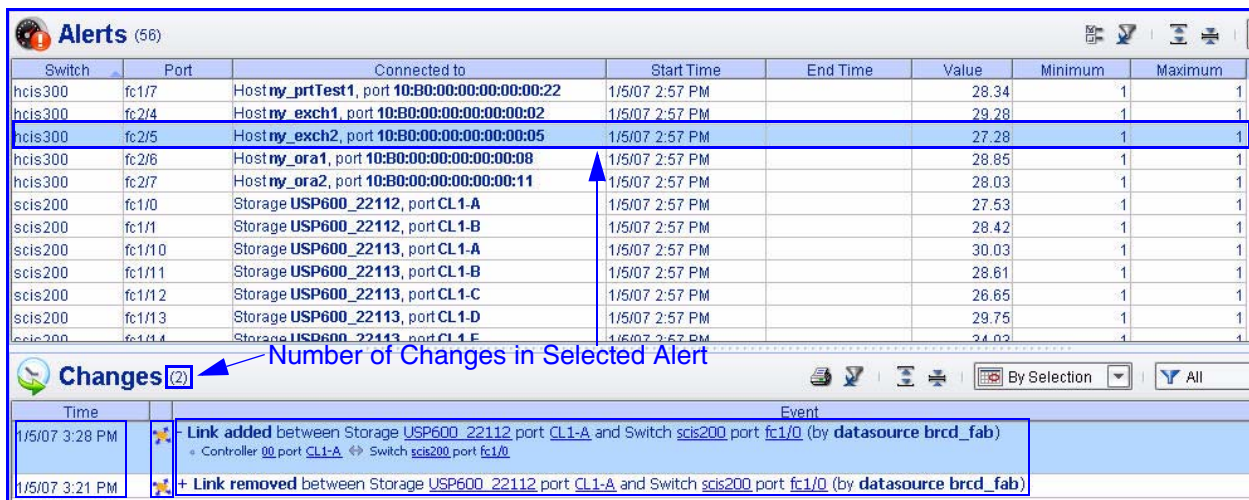
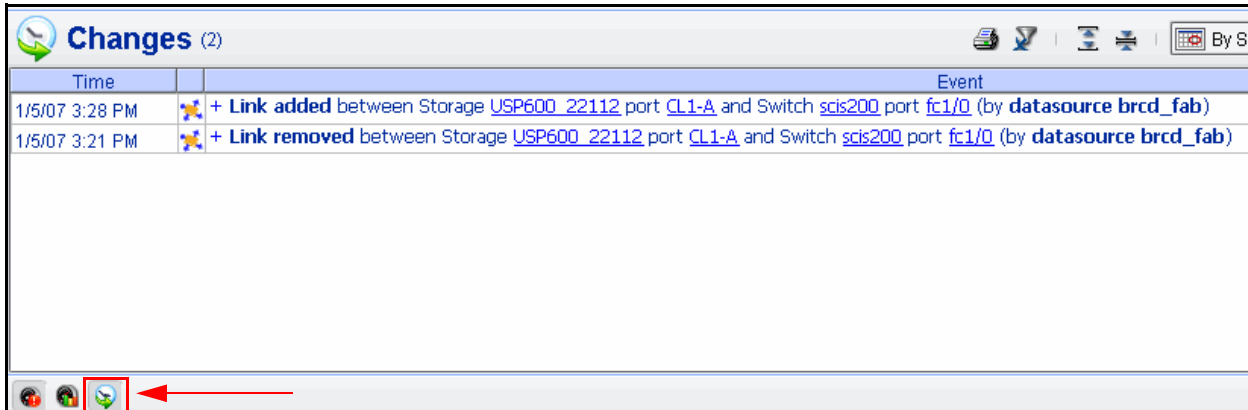
The Y-Axis of the chart automatically scales to 5x greater than the greatest value in the chart. The chart also supports zooming using the zoom tool. With the zoom tool enabled, clicking and dragging within the chart selects a box that defines the new boundaries of the chart.



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.

Changes Detail Pane

The Changes detail pane displays the changes at the time of the alert and can be used for correlation and investigation. Press the  button to toggle the Changes detail pane On or Off.



The Changes detail pane shows changes relating to the currently selected Alert. The changes include physical and logical modifications to SAN devices:

- ◆ Equipment additions and removals
- ◆ Zoning and volume masking changes
- ◆ Cabling reconfigurations
- ◆ Outages
- ◆ Policy changes

The number following the title of the table (in parantheses) identifies the total number of changes in the list. All changes include a time stamp, to identify when the change occurred. Changes that occurred from a single action within the SAN are stamped with the same time.

SANscreen Application Insight displays the following information for each change--or for each set of changes that occurred at a specific date/time:

Changes Pane Table Column Descriptions

Field	Description
Time	Date/time at which a Data Source reported this event(s). The most current change is listed at the top, and the changes are in descending order by time stamp.
Icon	Icon indicating the type of event documented on the line. As necessary, refer to the SANscreen Service Insight User Guide for a list of icons and their meanings.
Event	List of changes reported by the Data Source at the Time indicated. Click the plus sign (+) to display more detailed change information for each event that occurred at the reported date/time (illustrated for Host C in the example above).

Hosts

Overview

The Hosts view lists all hosts for which performance data is available enabling multipath validation and host balancing. The main panes include:

- ◆ [Host Table](#)
- ◆ [Topology Pane](#)
- ◆ [Load Analyzer Detail Pane](#)

Host Table

Overview

The Hosts pane uses a table to display SAN Host data. Every Host in the SAN is listed by name, IP Address, and additional column descriptions.

The figure below shows a sample list in Hosts.

Host Name	IP Address	Multi-Path Risk	Balance Index	Redundancy Policy	Storage Models	Port Count	App	App Priority	Business Unit	OS
PROCRM09	10.133.81.37		0.2		HP/XP 12000	2				HP-UX B.11.11
PROCRM10	10.133.81.38		0.048		HP/XP 12000	2				HP-UX B.11.11
PROCRM11	10.133.81.39		0.047		HP/XP 12000	2				HP-UX B.11.11
PROCRM12	10.133.81.40		0.061		HP/XP 12000	2				HP-UX B.11.11
PROCRM13	10.133.81.41		0.05		HP/XP 12000	2				HP-UX B.11.11
PROCRM14	10.133.81.42		0.05		HP/XP 12000	2				HP-UX B.11.11
PROCRM15	10.133.81.43		0.048		HP/XP 12000	2				HP-UX B.11.11
PROCRM16	10.133.81.44		0.048		HP/XP 12000	2				HP-UX B.11.11
PROCST01	10.1.16.70		2.332		EMC/Symmetrix DMX2000P, ...	18	Custo...	High		HP-UX B.11.23
PROCST02	10.1.16.120		0.03		EMC/Symmetrix DMX2000P, ...	18	Custo...	High		HP-UX B.11.23
PROCST03	10.1.16.181		0.234		EMC/Symmetrix DMX2000P, ...	10	Custo...	High		HP-UX B.11.23
PROCTL04	10.1.24.33		0.01		EMC/Symmetrix DMX2000P, ...	2	Unix c...	High		HP-UX B.11.11
PROCTL05	10.1.24.34		0.067		EMC/Symmetrix DMX2000P, ...	2	Unix c...	High		HP-UX B.11.11
PROCTL06	10.1.24.35		0.008		EMC/Symmetrix DMX2000P, ...	2	Unix c...	High		HP-UX B.11.11

Host Pane Column Descriptions

Host Name	Name of Host on the Network
	Icon indicating that the host is registered to the current user. Each user can register with any number of hosts and then filter on this field to view only the hosts of interest.
IP Address	Internet Protocol of the Host on the Network
Multipath Risk	The Host has been labeled by the user as requiring dual redundancy and may have problems that could violate that policy.
Balance Index	Calculated with Standard Deviation, a measurement of how balanced the load is across switch ports. The further away from 6 this figure is, the more likely the Host load is balanced across switches.
Redundancy Policy	If a icon appears, then the Host has been identified as requiring redundancy by the user policy.
Storage Models	The model name of the storage device the Host is communicating with.
Port Count	The number of ports the Host sends and receives data through.
App	The application or service resides on the Host.
App Priority	How important the application or service is that resides on the Host.

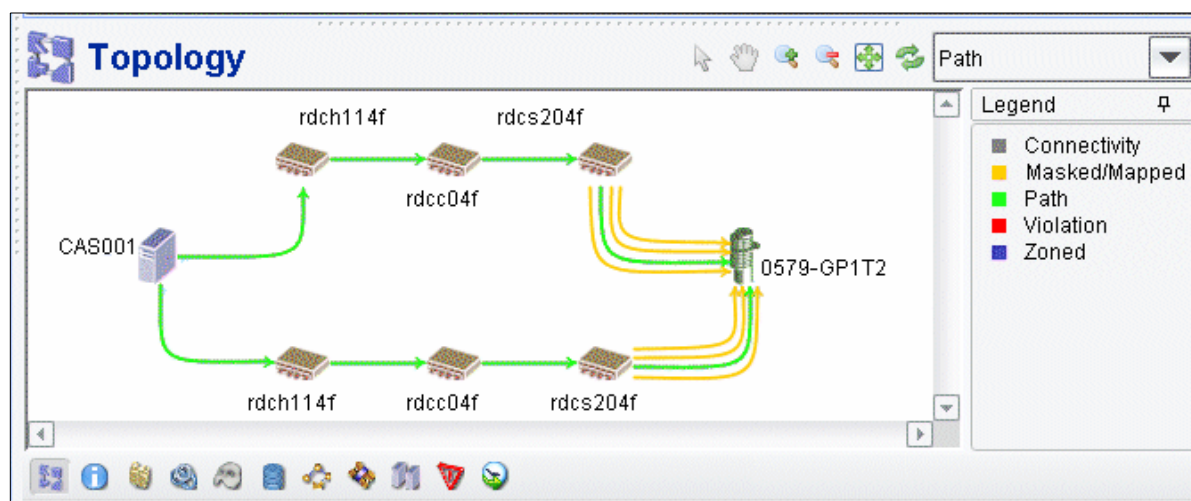
Business Unit	Business unit which owns the application or service that resides on the Host
OS	The operating system running on the Host.

Topology Pane

The Topology pane appears below the Hosts pane and displays the topology of the Host selected. This pane uses icons and graphical elements to visualize the SAN data and analysis. Every SAN device is represented by an icon that represents its device type, while physical connections appear as lines connecting the icons.

The figure below shows the topology of a path that connects the host shown on the left, with the storage device on the right:

Sample Topology Pane View



With the topology view displayed, several detail buttons are available in the toolbar beneath the pane.

- ◆ Click the Topology icon  to toggle display of the selected Host's topology.
- ◆ The drop-down menu in the upper right corner allows for two options: Path and Path With Connectivity.

Load Analyzer

Overview

SAN network traffic is unpredictable. Depending on an application's needs and demands, the amount of data flowing from Hosts through switches, ISLs, and storage arrays can fluctuate greatly. While some applications send and receive less data with time, others may send and receive vastly increasing amounts.

The Load Analyzer view displays an analysis of data flow across all ports in the SAN at any given point in time, or during a range of times. The Load Analyzer view is useful for:

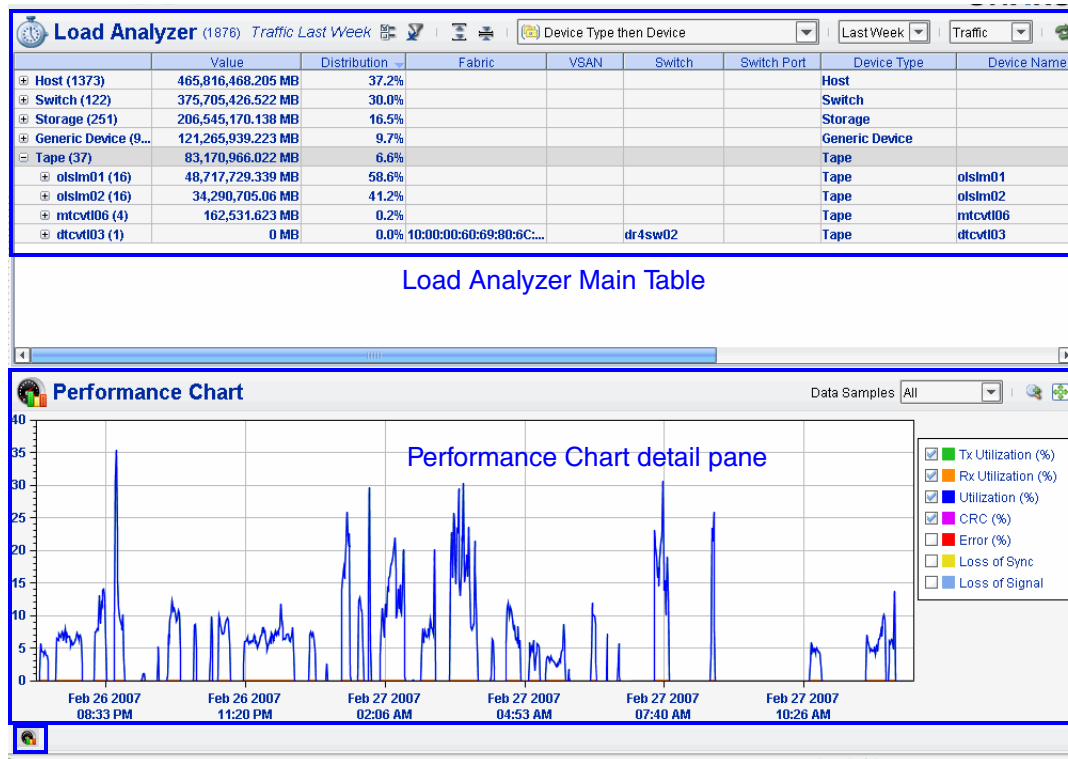
- ♦ evaluating traffic distribution
- ♦ port utilization
- ♦ identifying resources that can be leveraged to improve utilization
- ♦ diagnosing traffic bottlenecks
- ♦ congestion problems
- ♦ determining when to plan to add new capacity
- ♦ determining when to better utilize current capacity

For use cases that utilize the Load Analyzer View, see [Balancing the Data Flow](#).

The following sections provide a reference of Load Analyzer tools.

- ♦ [Load Analyzer Main Table](#)
- ♦ [Performance Chart Detail Pane](#)

Load Analyzer View



Load Analyzer Main Table

The Load Analyzer pane displays traffic distribution data across the different devices on the SAN, i.e. switches, Hosts, storage devices, etc. Every SAN device is listed and can be sorted by data load in percent (%) or in MB, fabric, VSAN, switch, switch port, device type and more. See the table below.

Load Analyzer Pane Column Descriptions

Blank	Applicable with any presentation order () other than No Grouping. Column that organizes the data according to the selected grouping format (by device name, connected device name, etc.). The number in parentheses indicates the number of ports reported in each (grouped) row.
Value	The amount of traffic by the device indicated as being sorted by in the drop-down menu in the upper right corner.
Distribution	Percentage of the total load carried by the path
Fabric	Address of Fabric within the SAN

VSAN	Name of Virtual Storage Area Network
Switch	Name of the switch in the SAN
Switch Port	Name of the switch port on the switch
Device Type	Type of device in the SAN (i.e. switch, host, storage, etc.)
Device Name	Name of the device in the SAN
Device Port	Name of the device port on the SAN
Errors	Number of errors. For a definition of errors see Performance Data Threshold Descriptions .
CRC Errors	Number of CRC errors
Sync Loss Count	Number of Synch Loss errors
Signal Loss'	Number of Signal Loss errors
Application	The application or service resides on the Host.
Business Unit	Business unit which owns the application or service that resides on the Host

Groupings

The Load Analyzer view can group your SAN devices in various ways.

The following sections list an example of each type of grouping:

- ♦ [None \(No Grouping\)](#)
- ♦ [Fabric Then Switch](#)
- ♦ [Device Type Then Device](#)
- ♦ [Business Unit Application Then Application Then Device](#)
- ♦ [Application Then Device](#)
- ♦ [Switch Then Device](#)

None (No Grouping)

The Load Analyzer can be tailored using the grouping drop-down list at the top right corner of the screen.

Selecting **None** as the Grouping option lists the SAN switch ports by no particular grouping method. Clicking on any column head will re-sort the devices shown by the column heading (switch, switch port, device type, etc.). Whenever you return to this group type the last sorting method chosen (switch, switch port, device type, etc.) is displayed.

In the figure below, the switch ports are sorted by total data volume in MB.

Also shown in this view is the Fabric, Device Name, Device Port, Device Type, etc. connected to the switch ports.

Load Analyzer - No Grouping

Amount of Data (in MB)
Flowing Through Switch and Device

Switch and Switch Port

Grouping

Device Port

Device Type

Value	Distribution	Fabric	VSAN	Switch	Switch Port	Device Type	Device Name	Device Port	Application	Business Unit
5,407,013.116 MB		10:00:00:60...		pcbms...	fc7/0	Switch	pcbmsw01	fc1/0		
5,353,864.605 MB		10:00:00:60...		pcbms...	fc8/14	Switch	mr4sw02	fc8/4		
5,295,543.314 MB		10:00:00:60...		pcbms...	fc1/0	Switch	pcbmsw02	fc7/0		
5,279,625.73 MB		10:00:00:60...		mr4sw...	fc8/4	Switch	pcbmsw02	fc8/14		
4,868,697.256 MB		10:00:00:60...		mr3sw...	fc8/1	Switch	mr3sw03	fc2/1		
4,868,111.136 MB		10:00:00:60...		mr3sw...	fc2/1	Switch	mr3sw04	fc8/1		
3,965,243.829 MB		10:00:00:60...		mr3sw...	fc1/15	Switch	mr3sw08	fc7/15		
3,963,984.266 MB		10:00:00:60...		mr3sw...	fc7/15	Switch	mr3sw07	fc1/15		
3,901,633.775 MB		10:00:00:60...		mr2As...	fc1/1	Switch	mr2Asw02	fc8/1		
3,901,445.059 MB		10:00:00:60...		mr2As...	fc8/1	Switch	mr2Asw05	fc1/1		
3,539,748.697 MB		10:00:00:60...		mr4sw...	fc10/10	Storage	APM0006240...	SP B Port: 0		
3,131,276.707 MB		10:00:00:60...		pcbms...	fc7/14	Switch	mr4sw02	fc7/4		
3,125,714.732 MB		10:00:00:60...		mr4sw...	fc7/4	Switch	pcbmsw02	fc7/14		
3,062,419.259 MB		10:00:00:60...		mr2Bs...	fc7/1	Switch	mr2Bsw06	fc3/1		
3,061,353.966 MB		10:00:00:60...		mr2Bs...	fc3/1	Switch	mr2Bsw04	fc7/1		
3,032,282.312 MB		10:00:00:60...		mr2Bs...	fc8/1	Switch	mr2Bsw06	fc1/1		
3,030,159.583 MB		10:00:00:60...		mr2Bs...	fc1/1	Switch	mr2Bsw04	fc8/1		
3,014,829.014 MB		10:00:00:60...		mr4sw...	fc10/11	Generic Device	50:06:01:60:...	SP B Port: 0		
2,984,234.741 MB		10:00:00:60...		mr2As...	fc8/12	Storage	APM0006250...	SP A Port: 0		
2,938,639.646 MB		10:00:00:60...		mr2Bs...	fc8/12	Storage	APM0006250...	SP A Port: 1		

Fabric Then Switch

The Load Analyzer can be tailored using the grouping drop-down list at the top right corner of the screen.

Selecting **Fabric then Switch** as the Grouping option lists the SAN devices by fabric then switch. Expanding a fabric category displays the individual switches on that fabric.

Expanding an individual switch shows the switch ports and the devices that this switch-port is connected to; the connected device can be Storage, Tape, Host or ISP. For example, in the figure below, the first fabric has been expanded and the first switch has been expanded, showing a list of the switch ports and the connected devices.

The distribution of data (from highest to lowest) across all fabrics is shown in this view. You can also see the distribution of data across each switch on each fabric.

In the example below, the data distribution across each port on one switch on one of the SAN fabrics is shown. Also shown in this view is the device name and the device port connected to the switch.

Load Analyzer - Fabric then Switch

	Value	Distribution	Fabric	VSAN	Switch	Switch Port	Device Type	Device Name	Device Port	Application
10:00:00:60...	96,189,251.587 MB	21.6%	10:00:00:60...							
mr4sw0...	34,945,000.097 MB	36.3%	10:00:00:60...		mr4s...					
	5,279,625.73 MB	15.1%	10:00:00:60...		mr4sw...	fc8/4	Switch	pcbmaw02	fc8/14	
	3,539,748.697 MB	10.1%	10:00:00:60...		mr4sw...	fc10/10	Storage	APM0006240...	SP B Port: 0	
	3,125,714.732 MB	8.9%	10:00:00:60...		mr4sw...	fc7/4	Switch	pcbmaw02	fc7/14	
	3,014,829.014 MB	8.6%	10:00:00:60...		mr4sw...	fc10/11	Generic Device	50:06:01:60:...	SP B Port: 0	
	2,226,362.611 MB	6.4%	10:00:00:60...		mr4sw...	fc9/6	Tape	olslm01	50:01:04:F0:0...	
	2,207,900.234 MB	6.3%	10:00:00:60...		mr4sw...	fc9/10	Storage	APM0006240...	SP A Port: 1	
	2,007,452.625 MB	5.7%	10:00:00:60...		mr4sw...	fc9/11	Generic Device	50:06:01:60:...	SP A Port: 0	
	1,755,775.648 MB	5.0%	10:00:00:60...		mr4sw...	fc10/1	Tape	olslm02	50:01:04:F0:0...	
	1,614,435.27 MB	4.6%	10:00:00:60...		mr4sw...	fc9/3	Tape	olslm01	50:01:04:F0:0...	
	1,529,520.407 MB	4.4%	10:00:00:60...		mr4sw...	fc9/5	Tape	olslm01	50:01:04:F0:0...	
	1,333,172.969 MB	3.8%	10:00:00:60...		mr4sw...	fc10/15	Switch	pcbmaw02	fc10/15	
	1,038,382.074 MB	3.0%	10:00:00:60...		mr4sw...	fc9/2	Tape	olslm01	50:01:04:F0:0...	
	961,165.297 MB	2.8%	10:00:00:60...		mr4sw...	fc10/5	Tape	olslm02	50:01:04:F0:0...	
	657,460.993 MB	1.9%	10:00:00:60...		mr4sw...	fc10/0	Tape	olslm02	50:01:04:F0:0...	
	623,166.959 MB	1.8%	10:00:00:60...		mr4sw...	fc9/4	Tape	olslm01	50:01:04:F0:0...	
	564,248.365 MB	1.6%	10:00:00:60...		mr4sw...	fc9/4	Tape	olslm01	50:01:04:F0:0...	

Device Type Then Device

The Load Analyzer can be tailored using the grouping drop-down list at the top right corner of the screen.

Selecting **Device Type then Device** as the Grouping option lists the SAN devices by device type. Expanding a device type category displays the individual devices of that category. For example, in the figure below, the Storage device category has been expanded, listing all individual storage devices. Expanding a storage device shows the individual ports on that device.

The distribution of data (from lowest to highest in the example below) across all devices in this view is shown. In the example below, the data distribution across every storage array on the SAN is shown. Note that several storage arrays have not experienced any data traffic over the past week. Expanding a storage device shows the individual ports on that device and the data distribution for the storage device across each individual port.

Also shown in this view is the Fabric on which the device operates, the switch ports the device is connected to and the device name.

Load Analyzer - Device Type then Device

Device Type
Devices

Fabric

Grouping

Time Period

	Value	Distribution	Fabric	VSAN	Switch	Switch Port	Device	Device Name	Device Port
None (1)	0 MB	0.0%	10:00:00:60:69:80:6C...		dr4as...				
Tape (37)	3,052.175 MB	7.4%						Tape	
Storage (60)	4,417.329 MB	10.7%						Storage	
APM00...	0 MB	0.0%	10:00:00:60:69:80:6C...		dr4sw...			Storage APM000534...	
APM00...	0 MB	0.0%						Storage APM000535...	
APM00...	0 MB	0.0%	10:00:00:60:69:80:6C...		dr4sw...			Storage APM000604...	
AX100 ...	0 MB	0.0%	10:00:00:60:69:80:6C...		dr4sw...			Storage AX100	
Sym-00...	0.563 MB	0.0%	10:00:00:60:69:80:6C...		dr4sw...			Storage Sym-000187...	
APM00...	0.598 MB	0.0%						Storage APM000526...	
APM00...	1.833 MB	0.0%						Storage APM000534...	
APM00...	2.012 MB	0.0%						Storage APM000526...	
APM00...	2.399 MB	0.1%						Storage APM000535...	
APM00...	5.114 MB	0.1%						Storage APM000404...	
Sym-00...	8.123 MB	0.2%						Storage Sym-000190...	
Sym-00...	16.206 MB	0.4%						Storage Sym-000187...	
AMS10...	26.115 MB	0.6%						Storage AMS1000@...	
Sym-00...	38.97 MB	0.9%						Storage Sym-000187...	
Sym-00...	74.036 MB	1.7%						Storage Sym-000185...	
APM00...	85.82 MB	1.9%						Storage APM000626...	
APM00...	101.584 MB	2.3%						Storage APM000548...	
APM00...	126.696 MB	2.9%						Storage APM000404...	
Sym-00...	132.311 MB	3.0%						Storage Sym-000187...	
Sym-00...	159.105 MB	3.6%						Storage Sym-000187...	
Sym-00...	239.455 MB	5.4%						Storage Sym-000187...	
Sym-00...	295.909 MB	6.7%						Storage Sym-000187...	
Sym-00...	529.754 MB	12.0%						Storage Sym-000190...	
APM00...	1,068.998 MB	24.2%						Storage APM000349...	
APM00...	1,501.728 MB	34.0%						Storage APM000624...	
Generic De...	7,254.942 MB	17.6%						Generi...	
Switch (60)	0.403.043 MB	23.0%						Switch	

Business Unit Application Then Application Then Device

The Load Analyzer can be tailored using the grouping drop-down lists at the top right corner of the screen.

Selecting **Business Unit Application Then Application Then Device** as the Grouping option lists the Business Unit Application in use. Expanding the Business Unit Applications lists the Applications under it. Expanding the Applications lists the Devices that carry data for each Application. Expanding each device lists the various switch ports that data from the device flows through (listed under the column title Switch Port).

For example, in the figure below, the first Business Unit has been expanded and the second Application has been expanded, showing a list of devices the expanded Application is connected to and the switch ports through which it is connected to those devices.

The distribution of data (from highest to lowest in the example) across all fabrics is shown in this view. You can also see the distribution of data as it flows through switch port onto various devices and device ports.

When a device is expanded, the amount of data flowing through it is broken down by switch port. For example, if one device has 22.2% of an Application's data flow, of that 22.2%, 92.1% could be flowing through one switch port and 7.9% through another. See "Data Breakdown" in the figure below. Also shown in this view is the device name and the device port connected to the various switches.

Load Analyzer - Business Unit then Application then Device

Application Device Data Distribution Grouping

Application	Device	Value	Distribution	Fabric	VSAN	Switch	Switch Port	Device Type	Device Name	Device Port	Application
None (1033)		445,404,362.094 MB	100.0%								
None (1032)		408,627,436.698 MB	91.7%								
XDR MTC (26)		12,723,794.23 MB	2.9%					Host			XDR MTC
	xdrdb_mtc02	2,825,672.62 MB	22.2%					Host	xdrdb_mtc02		XDR MTC
		2,603,313.674 MB	92.1%	10:00:00:60...		mr2As...	fc9/4	Host	xdrdb_mtc02	10:00:00:00:C...	XDR MTC
		222,358.946 MB	7.9%	10:00:00:60...		mr2Bs...	fc9/4	Host	xdrdb_mtc02	10:00:00:00:C...	XDR MTC
	xdrdb_mtc01	2,816,251.371 MB	22.1%					Host	xdrdb_mtc01		XDR MTC
	xdrdb_mtc07	1,238,495.869 MB	9.7%					Host	xdrdb_mtc07		XDR MTC
		621,547.013 MB	50.2%	10:00:00:60...		mr2As...	fc10/6	Host	xdrdb_mtc07	10:00:00:00:C...	XDR MTC
		616,948.855 MB	49.8%	10:00:00:60...		mr2Bs...	fc10/6	Host	xdrdb_mtc07	10:00:00:00:C...	XDR MTC
	xdrdb_mtc04	707,046.558 MB	5.6%					Host	xdrdb_mtc04		XDR MTC
	xdrdb_mtc06	704,094.622 MB	5.5%					Host	xdrdb_mtc06		XDR MTC
	xdrdb_mtc05	698,899.713 MB	5.5%					Host	xdrdb_mtc05		XDR MTC
	xdrdb_mtc03	696,196.994 MB	5.5%					Host	xdrdb_mtc03		XDR MTC

Amount of Data (in MB)
Flowing Through Device

Application Then Device

The Load Analyzer can be tailored using the grouping drop-down list at the top right corner of the screen.

Selecting **Application then Device** as the Grouping option lists the SAN devices by application and then by device. Clicking on any column head will re-sort the devices shown by the column heading. Whenever you return to this group type the last sorting method chosen is displayed.

The table below shows performance traffic over specific hosts that are part of the application. By expanding the application, you can see where applications have an uneven distribution of data across the SAN. In some instances there is no traffic across devices.

The view also shows the Fabric, VSAN, Switch name and port, Device name, port and type, and Business Unit.

Load Analyzer (146) Traffic Last Hour				Application then Device			Last Hour	Traffic	
	Value	Distribution	Fabric	VSAN	Switch	Switch Port	Device Type	Device Port	Device Name
Lotus notes (2)	18,695 MB	0.5%	Development				lost		lotus
lotus (2)	18,695 MB	100.0%	Development				lost		lotus
	6,040 MB	32.3%	Development		stbrcd1	fc8	Host	10:B0:00:00:00:00:02:38	lotus
	12,655 MB	67.7%	Development		hbrcd2	fc4	Host	10:B0:00:00:00:00:02:39	lotus
WebSite (2)	44,069 MB	1.1%					lost		ny_prtTest1
Users (4)	45,343 MB	1.2%	Development				lost		
Exchange, Versi...	50,607 MB	1.3%	Development				lost		
Clearcase1 (...)	17,462 MB	34.5%	Development				lost		Clearcase1
	3,839 MB	22.0%	Development		stbrcd1	fc1	Host	10:B0:00:00:00:00:02:25	Clearcase1
	13,623 MB	78.0%	Development		hbrcd1	fc1	Host	10:B0:00:00:00:00:02:24	Clearcase1
Clearcase2 (...)	33,144 MB	65.5%	Development				lost		Clearcase2
Japan (6)	140,574 MB	3.6%					lost		
OracleERP, Use...	160,100 MB	4.1%					lost		
DevTrack (6)	178,067 MB	4.6%	Development				lost		
Lotus notes, Ex...	285,606 MB	7.3%					lost		
kc_orawareh...	23,652 MB	8.3%					lost		kc_orawareh
ny_exch2 (3)	42,156 MB	14.8%					lost		ny_exch2
	9,573 MB	22.7%	VSAN0301	301	hcis300	fc1/1	Host	10:B0:00:00:00:00:00:04	ny_exch2
	14,783 MB	34.9%	VSAN0101	101	hcis200	fc1/1	Host	10:B0:00:00:00:00:00:03	ny_exch2
	17,881 MB	42.4%	VSAN0301	301	hcis300	fc2/5	Host	10:B0:00:00:00:00:00:05	ny_exch2
nj_exch002 ...	84,352 MB	29.5%					lost		ny_exch002
ny_exch1 (3)	135,445 MB	47.4%					lost		ny_exch1
Mapping Servic...	1,143,857 MB	29.3%	Mapper				lost		
None (90)	1,843,185 MB	47.1%							
HP1_bm (1)	0 MB	0.0%	20:D0:00:00:00:00:...		Switch 26		lost		HP1_bm
Switch 27 (1)	0 MB	0.0%	20:D0:00:00:00:00:...		Switch 26		Switch		Switch 27
	0 MB		20:D0:00:00:00:00:...		Switch 26	fc0	Switch	fc0	Switch 27
Linx_dev1 (1)	0 MB	0.0%	20:D0:00:00:00:00:...		Switch 28		lost		Linx_dev1
Switch 29 (1)	0 MB	0.0%	20:D0:00:00:00:00:...		Switch 28		Switch		Switch 29
Linx_dev2 (1)	0 MB	0.0%	20:D0:00:00:00:00:...		Switch 30		lost		Linx_dev2
Switch 31 (1)	0 MB	0.0%	20:D0:00:00:00:00:...		Switch 30		Switch		Switch 31
F3brcd-a (1)	7,587 MB	0.4%	20:D0:00:00:00:00:...		F3brcd-b		Switch		F3brcd-a
hbrcd2 (1)	7,686 MB	0.4%	Development		stbrcd1		Switch		hbrcd2
F3brcd-b (1)	9,492 MB	0.5%	20:D0:00:00:00:00:...		F3brcd-a		Switch		F3brcd-b

Device Type

Switch Then Device

The Load Analyzer can be tailored using the grouping drop-down list at the top right corner of the screen.

Selecting **Switch then Device** as the Grouping option lists the SAN devices by Switch then device. A list of all the switches on the SAN is displayed showing the distribution of data across all the switches on the SAN. Expanding a Switch displays the individual devices (followed by the device name) attached to that switch (Switch, Tape, Storage, Generic Device, etc.) and lists the data distribution across devices for the expanded switch.

Expanding an individual device shows the switch ports carrying the data traffic for that device. For example, in the figure below, the second switch has been expanded showing a list of devices the expanded switch is connected to. The third device under the expanded switch has been expanded and shows the switch ports it is connected to.

The distribution of data on the expanded device reveals one switch port carrying roughly twice as much data as the other.

Also shown in this view is the device name, Fabric, Device Port, Device Type, and Device name connected to the switch.

Annotations in the image:

- Switch:** Points to the 'Switch' column header.
- Device:** Points to the 'Device' column header.
- Amount of Data (in MB) Flowing Through Device:** Points to the 'Value' column header.
- Data Distribution:** Points to the 'Distribution' column header.
- Grouping:** Points to the 'Switch then Device' dropdown menu.
- Switch Port:** Points to the 'Switch Port' column header.
- Device Type:** Points to the 'Device Type' column header.

Switch	Value	Fabric	Distribution	VSAN	Switch	Switch Port	Device Type	Device Name	Device Port	Application	Business U
pcbmsw02 (51)	191,285,381.762 MB	10:00:00:60:69:80:6B...	15.3%		pcbmsw...						
mr4sw02 (44)	180,304,481.76 MB	10:00:00:60:69:80:6B...	14.4%		mr4sw02						
Switch - pcbmsw02...	51,078,047.147 MB	10:00:00:60:69:80:6B...	28.3%		mr4sw02		Switch	pcbmsw02			
Tape - olism01 (8)	36,372,351.526 MB	10:00:00:60:69:80:6B...	20.2%		mr4sw02		Tape	olism01			
Storage - APM0006...	28,207,964.361 MB	10:00:00:60:69:80:6B...	15.6%		mr4sw02		Storage	APM00062...			
	18,755,440.089 MB	10:00:00:60:69:80:6B...	66.5%		mr4sw02	c10/10	Storage	APM000624...	GP B Port: 0		
	9,452,524.272 MB	10:00:00:60:69:80:6B...	33.5%		mr4sw02	c9/10	Storage	APM000624...	GP A Port: 1		
Generic Device - 50...	26,022,425.517 MB	10:00:00:60:69:80:6B...	14.4%		mr4sw02		Generic D...	50:06:01:60...			
Tape - olism02 (8)	25,505,992.023 MB	10:00:00:60:69:80:6B...	14.1%		mr4sw02		Tape	olism02			
Switch - mr4sw01 (2)	4,959,271.831 MB	10:00:00:60:69:80:6B...	2.8%		mr4sw02		Switch	mr4sw01			
Storage - Sym-0001...	3,634,103.803 MB	10:00:00:60:69:80:6B...	2.0%		mr4sw02		Storage	Sym-00018...			
Storage - Sym-0001...	2,798,999.443 MB	10:00:00:60:69:80:6B...	1.6%		mr4sw02		Storage	Sym-00018...			
Storage - APM0006...	767,598.838 MB	10:00:00:60:69:80:6B...	0.4%		mr4sw02		Storage	APM00062...			
Storage - Sym-0001...	542,072.158 MB	10:00:00:60:69:80:6B...	0.3%		mr4sw02		Storage	Sym-00018...			
Storage - Sym-0001...	341,474.546 MB	10:00:00:60:69:80:6B...	0.2%		mr4sw02		Storage	Sym-00018...			
Storage - Sym-0001...	74,180.565 MB	10:00:00:60:69:80:6B...	0.0%		mr4sw02		Storage	Sym-00019...			
pcbmsw01 (59)	119,276,952.497 MB	10:00:00:60:69:80:6B...	9.5%		pcbmsw...						
dr4bsw10 (135)	108,231,780.304 MB	10:00:00:60:69:80:6C...	8.7%		dr4bsw10						

Load Analyzer Detail Pane

The Load Analyzer pane is an optional pane in the Hosts view. There is also a Load Analyzer pane available from the Load Analyzer View, but this pane displays an analysis of all ports in the SAN; the Load Analyzer pane in the Hosts view displays an analysis of all ports for a particular Host, or another device if one has been selected from the Topology pane.

See the Load Analyzer Main Table.

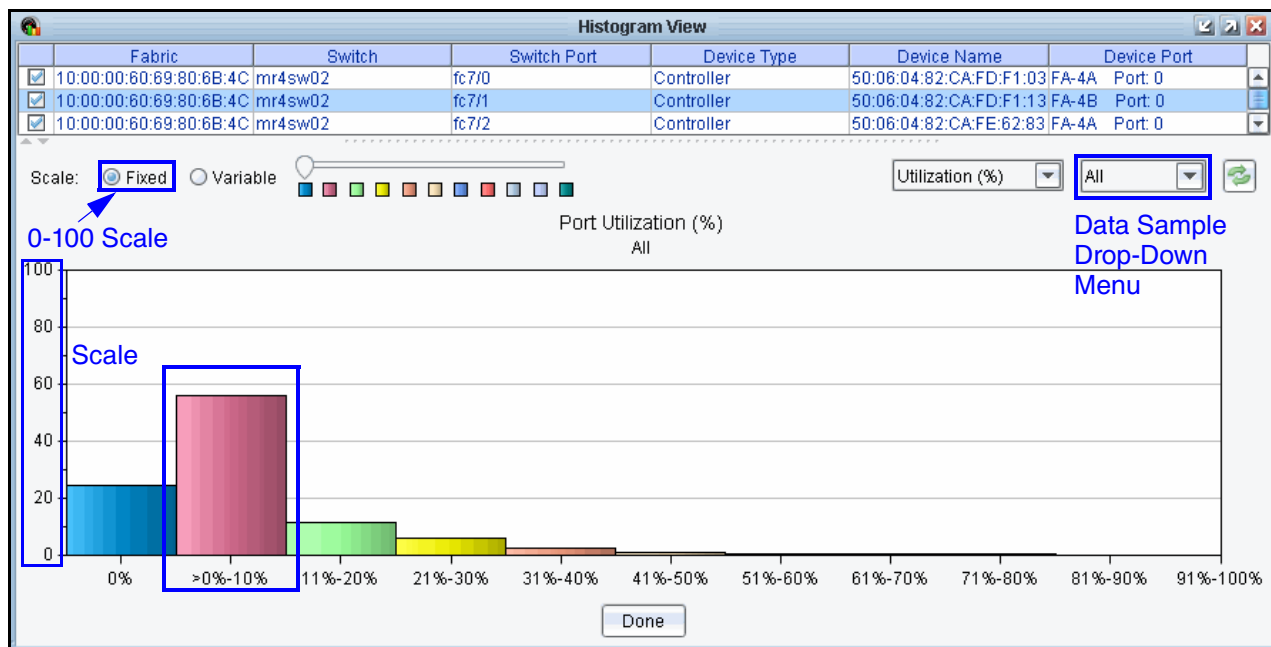
Performance Histograms

Overview

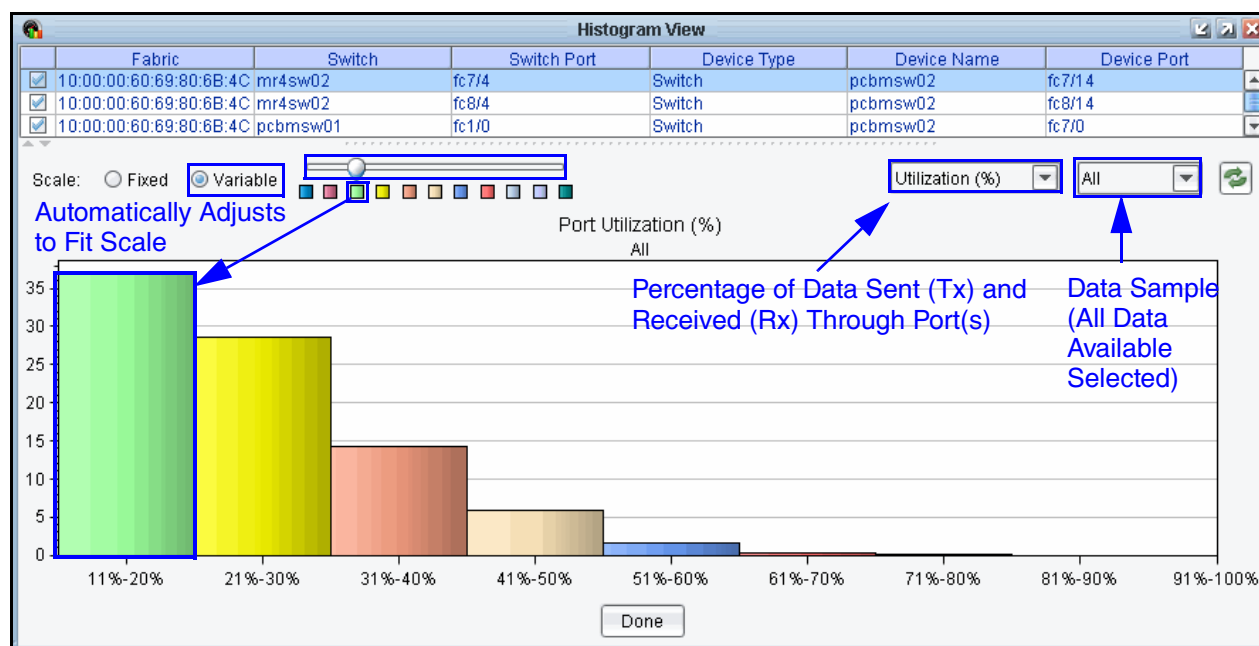
The Performance histogram view is available as a sub-view from the Load Analyzer display. (You can also reach the histogram indirectly using Inventory on the console. Right-click on a selected switch, host, or storage array and select **Analyze Congestion**, which brings up the Load Analyzer.)

The performance histogram shows the relative amount of time the selected ports spent in the given utilization levels. For instance, in the figure below, the selected ports had a utilization rate of 0%-10% for 58% of time in the last year. The amount of time for which the data rates are displayed can be changed by selecting the period from the data sample drop-down menu in the mid-right corner of the Histogram pane. See the figure.

Histogram - Fixed Scale View



Histogram - Variable Scale View



The Fabric, Switch, and Switch Port columns always reflect a port on a switch. The Device Type, Device Name, and Device Port show the information about the port on the other end of the path.

The table is sortable and filterable like other tables in SANscreen. The first column of the table allows the selection/deselection of individual ports. The histogram display reflects all of the visible, selected rows in the table above.

The possible metric values are:

Threshold	Description	Formula
Rx Utilization (%)	Percentage of available bandwidth used for Received data.	$RxUtilization(\%) = \frac{\Delta RxBits \cdot 100}{\Delta Seconds \cdot ActualSpeedBits}$
Tx Utilization (%)	Percentage of available bandwidth used for Transmitted.	$TxUtilization(\%) = \frac{\Delta TxBits \cdot 100}{\Delta Seconds \cdot ActualSpeedBits}$
Utilization (%)	Percentage of available bandwidth used for Tx and Rx.	$Utilization(\%) = \frac{\max(\Delta RxBits, \Delta TxBits) \cdot 100}{\Delta Seconds \cdot ActualSpeedBits}$

Time Ranges:

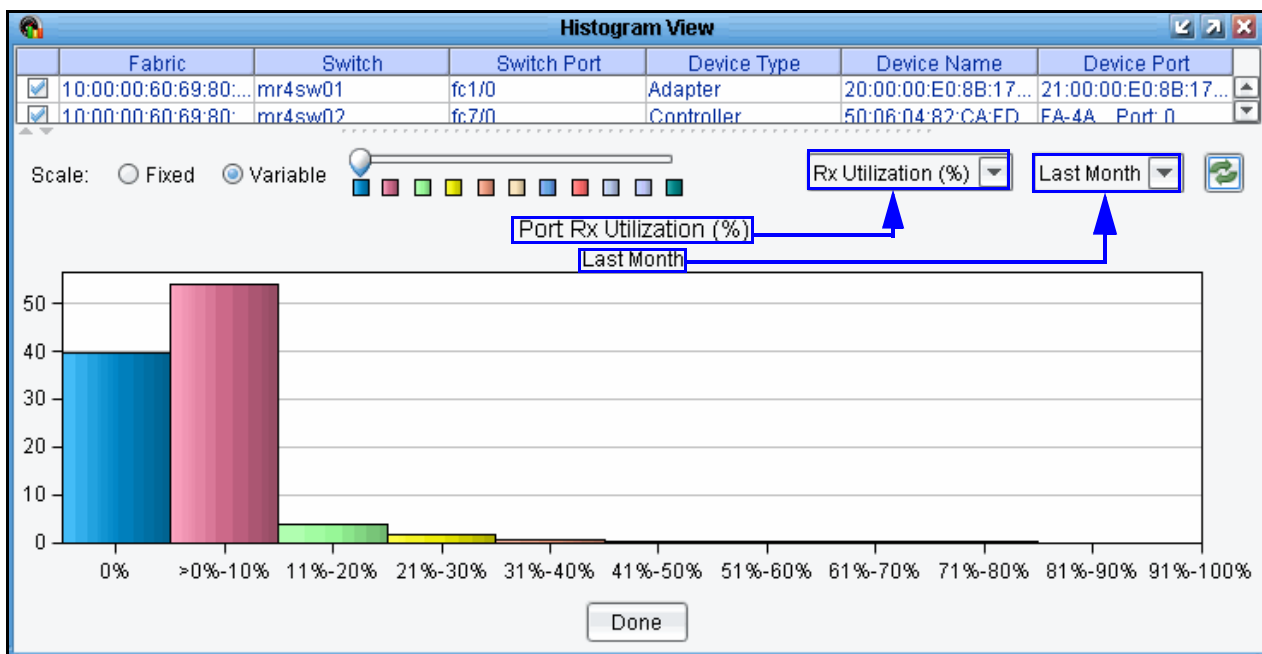
The time ranges are specified by the time range combo (shows Last Year in the screenshot). The possible values are Last Hour, Last Day, Last Week, Last Month, Last Year, All, and Custom. The Custom option allows the selection of any time range up to the current time.

Fixed:

If the Scale is set to Fixed, the Y-axis of the chart has a fixed scale of 100%; otherwise the Y-axis is scaled to fit the highest bar in the currently showing chart. The slider next to the Variable scale option drops columns from the left side of the chart and rescales to the new maximum column. This allows zooming in on smaller columns (this assumes with normal network usage the columns on the left will be much higher than columns on the right). Hovering over a column with the mouse will show the actual value in a tooltip.

Histogram Chart:

The histogram chart has a title that shows the metric and time range the chart reflects. Changing the selected ports, metric type or time range does not take effect immediately. Because the calculation of the histogram can potentially take a long time, the chart is only refreshed after the first showing when the refresh button is pushed. When the chart is up to date, the icon on the refresh button is dull. When a refresh is necessary to reflect the currently selected options, the refresh button's icon becomes brighter.



The histogram view dialog size and position, the selected scale, metric and time range, and the position of the split pane between the table and chart are all persisted in the registry and will be restored the next time the histogram is shown.

Analyzing Traffic Patterns

The Daily Traffic Pattern graph provides you with the ability to identify the flow of traffic by hour, day, week or by a custom calendar setting. The graph identifies when there are traffic pattern spikes or troughs during a single day and identifies the average hourly traffic for a given set of days (up to a week).



You can select multiple ports and see the collective impact of traffic on the switch or check individual ports for periods of high or low traffic.

The Traffic Pattern graph shows you in one glance what the utilization percentages are. With this information, you can better schedule tasks or make changes to storage allocations because you know ahead of time what the likely impact will be on the switch.

Multipath Symptom Monitoring

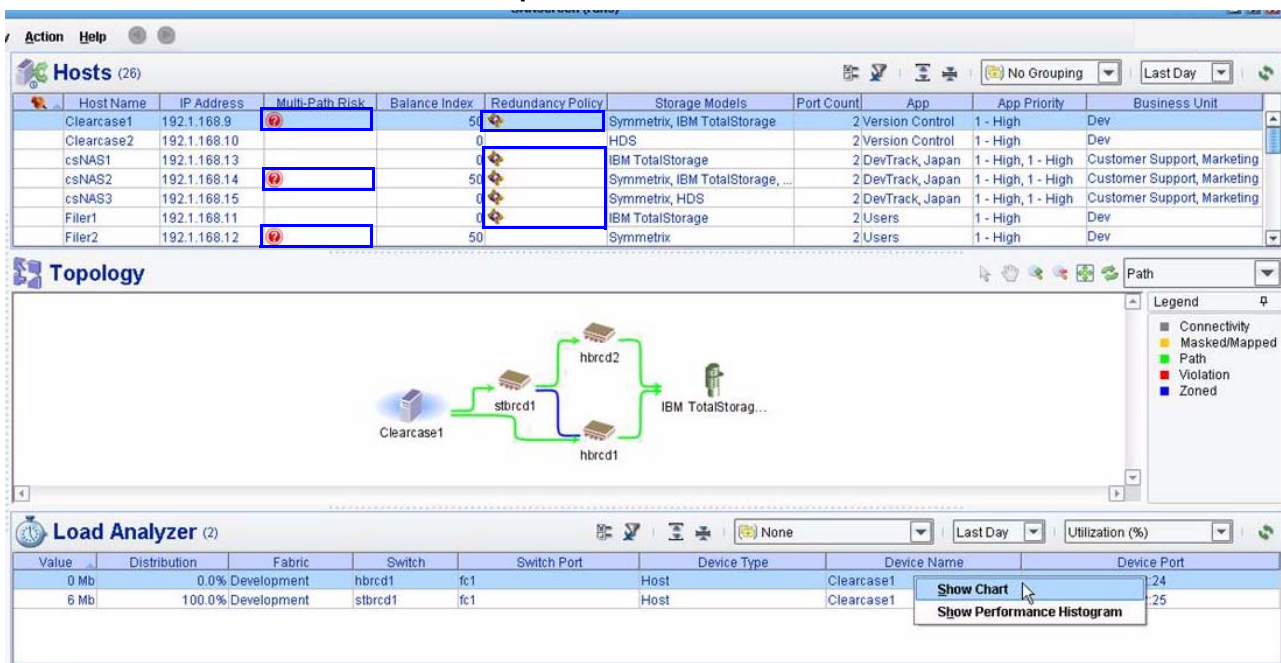
Overview

Quite often regular maintenance and network operations such as updating firmware, replacing cables, adding Hosts, adding storage arrays or upgrading switches can result in lost paths, overutilized devices, data loss, and ultimately a decrease in the amount and storage service quality. Ensuring redundancy depends on Host configurations being set correctly. Symptoms indicating multipath problems and lost redundancy include all or most of a Host's data traffic going through only one of the Host's ports.

Multipath Symptom Monitoring allows for:

- ♦ Validating traffic flow on all Host ports
- ♦ Symptom identification for host configuration including:
 - Interoperability
 - OS
 - Multipath Issues

Multipath Errors in Hosts View



Identify Multipath Problem Hosts

Multipath configurations are placed on Hosts that have been identified as requiring redundancy. Discovering all traffic going through one host port is a symptom indicating a multipath problem. Use the following procedures to identify Hosts that have data traffic through only one port, indicating a multipath failure.

1. Click on the Hosts icon  Hosts in Application Insight.
2. Click the Multipath Risk category to sort or filter by  to view Hosts with potential multipath problems.
3. Optionally, you can also check for Hosts that have been labeled as Hosts requiring redundancy (set by the user) by clicking the Redundancy Policy column.
4. Click the filter icon  next to the Storage Models category and type in the name of those arrays that support active/active environments. See the example below. You can also filter out unwanted storage devices by entering a minus symbol (-) followed by the letters to exclude (ex. Tape).

Redundancy Policy		Port Count	App
	EMC/Symmetrix DMX800	2	Mapping Service
	EMC/Symmetrix DMX800	2	
	EMC/Symmetrix DMX800	2	Mapping Service
	EMC/Symmetrix DMX800	2	Lotus notes, Exchange
	EMC/Symmetrix DMX800	2	
	EMC/Symmetrix DMX800	2	Mapping Service
	EMC/Symmetrix DMX800	2	Mapping Service
	EMC/Symmetrix DMX800	2	Mapping Service
	EMC/Symmetrix DMX800	2	Mapping Service
	EMC/Symmetrix DMX800	2	Mapping Service

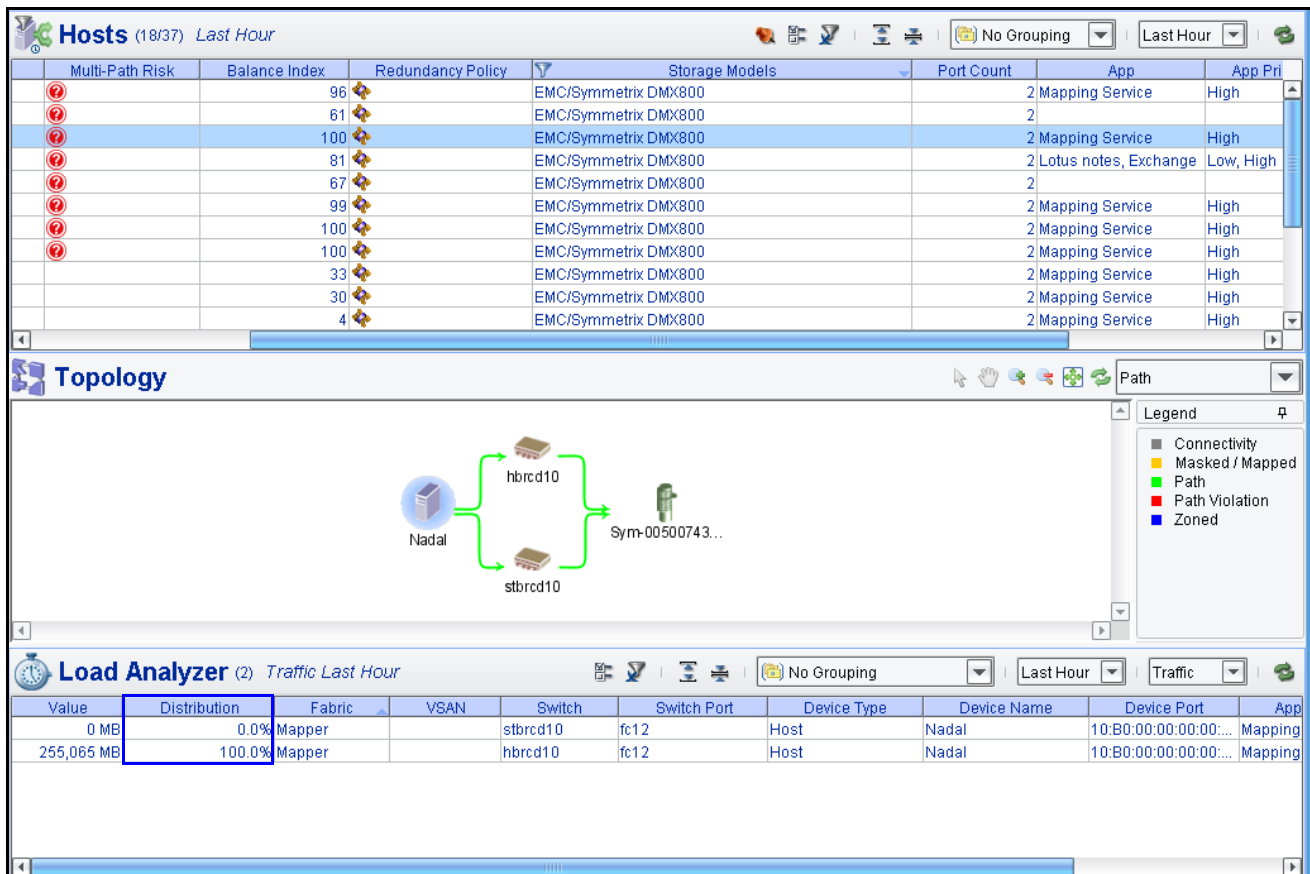
Note

After the filter is set, if you mouse over the filter icon  the filter in place is displayed:



5. Now you can see only those Hosts connected to storage arrays that require multipath redundancy whose paths are at risk of failure.
6. Select a Host with a Balance Index of 100. This indicates that a switch attached to a Host requiring redundancy is carrying very little or no data for the time period selected in the drop-down menu and a severe data imbalance exists.

7. Click the Load Analyzer  Icon to open the Load Analyzer detail pane (see below). Optionally you can also view a sample of the device topology by clicking the Topology icon  and opening the Topology Pane.



8. As the figures shows, the Host is sending 0% of its data through one switch and 100% of its data through the second switch. This means:
 - a. A multipath symptom exists. If the multipath configuration was working correctly, data traffic would visible through both ports.
 - b. One switch may be overutilized, which could result in slower applications.
 - c. If the switch carrying the data fails or is taken offline, the Host will fail immediately.

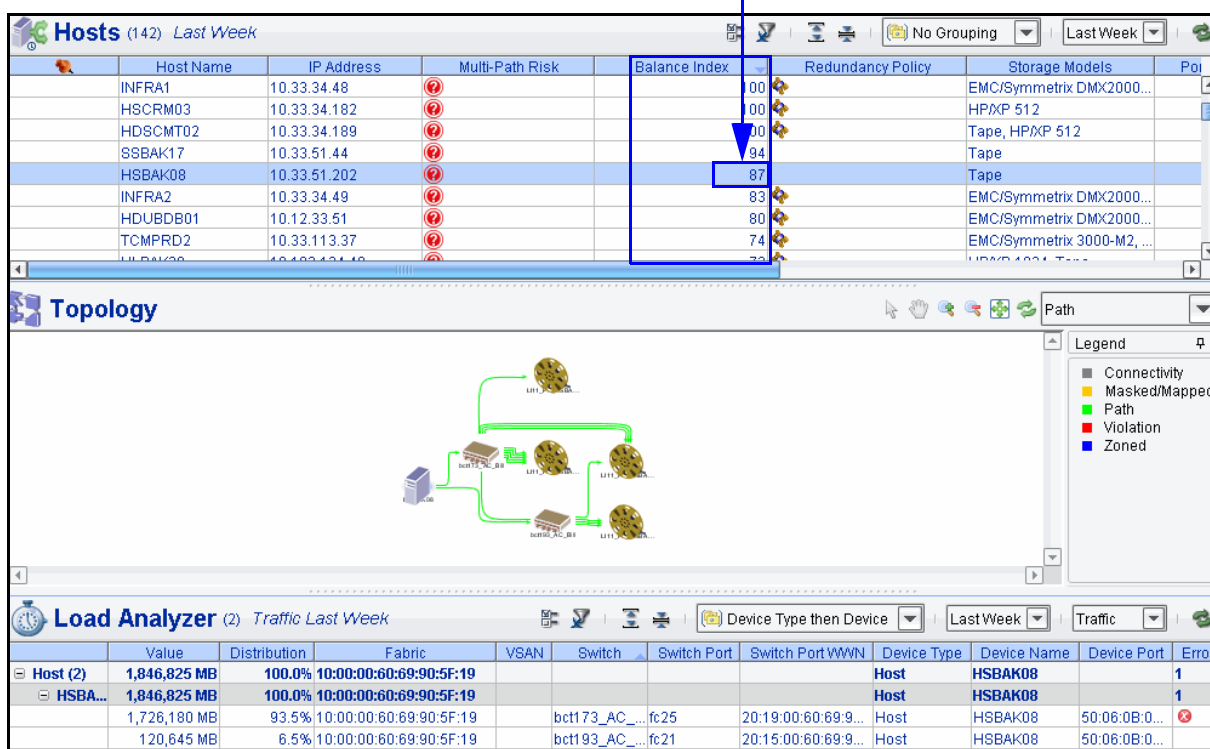
Identify Imbalanced Hosts

If the ports of a Host are connected and active but some are transmitting/receiving most of the data while others are transmitting/receiving very little, this is a symptom of a multipath problem.

Use the following instructions to optimize and balance the load of network traffic across Host ports.

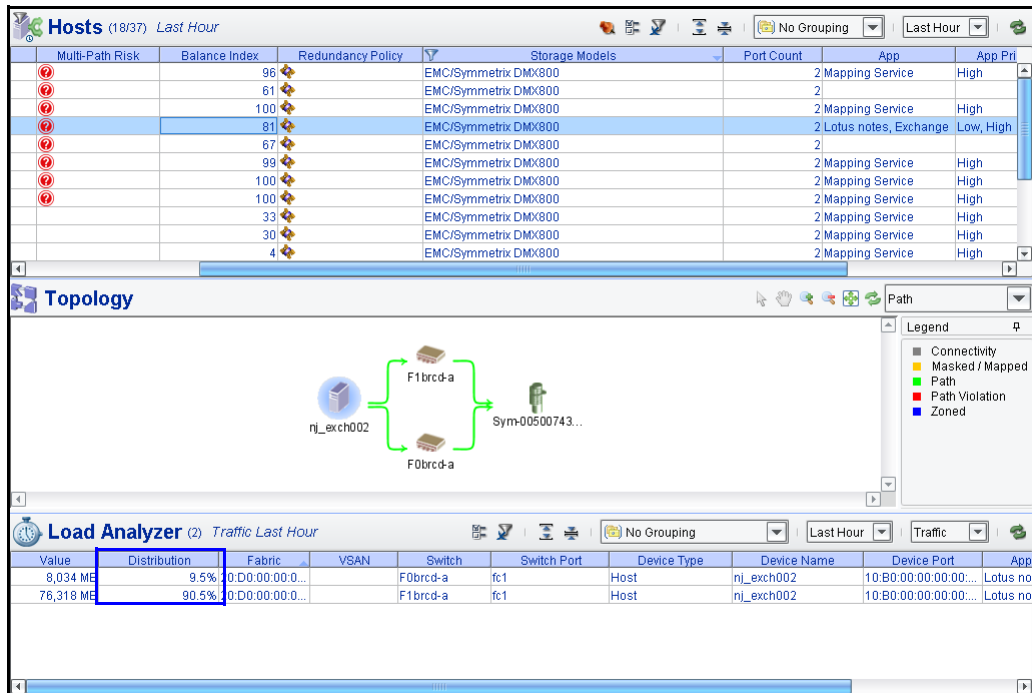
1. Click on the Hosts icon  Hosts in Application Insight.
2. Click the Balance Index category to sort the Hosts by the Balance Index value, from high to low. The Balance Index is the standard deviation from the traffic average for all of the host's ports; a high value (above 50) signifies a ratio problem between the host ports, i.e. some ports are experiencing a large amount of traffic and others very low, indicating a potential problem.

High Balance Index



3. Select a Host with a high Balance Index.

4. Click the Load Analyzer  Icon to open the Load Analyzer detail pane (see below). Optionally you can also view a sample of the device topology by clicking the Topology icon  and opening the Topology Pane.



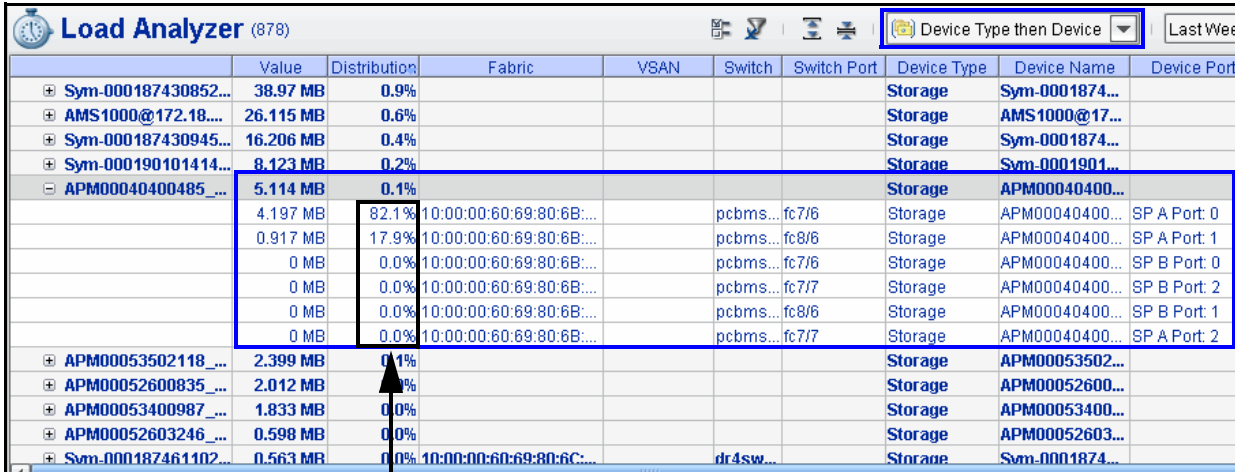
5. As the figure shows, the Host is sending 90.5% of its data through one switch and 9.5% of its data through the second switch. This means:
 - a. A multipath symptom exists. If the multipath configuration was working optimally, data traffic would be roughly equal through both ports.
 - b. One switch may be overutilized, which could result in slower applications.
 - c. If the switch carrying the data fails or is taken offline, the Host will experience severe performance degradation.

Balance Data Flow Across Storage Array Ports

Storage arrays are a very important part of any SAN. If large amounts of data are flowing through a small number of storage array ports, the array cannot operate efficiently. To maximize the performance of your storage arrays, ensure the data is distributed equally across all storage array ports.

1. Click on the Load Analyzer icon  Load Analyzer in Application Insight.
2. From the upper-right drop-down menus, select Device Type then Device and the desired time period, in this example, data sample to be viewed is over the Last Week.
3. Expand the Storage category. Select a storage array and expand it.
4. Click the Distribution category to sort Storage Array data distribution from high to low. This will display the data traffic flow across the storage ports on the array in descending order. See the figure.

Traffic Through All Storage Ports of One Array



	Value	Distribution	Fabric	VSAN	Switch	Switch Port	Device Type	Device Name	Device Port
⊕ Sym-000187430852...	38.97 MB	0.9%					Storage	Sym-0001874...	
⊕ AMS1000@172.18...	26.115 MB	0.6%					Storage	AMS1000@17...	
⊕ Sym-000187430945...	16.206 MB	0.4%					Storage	Sym-0001874...	
⊕ Sym-000190101414...	8.123 MB	0.2%					Storage	Sym-0001901...	
⊖ APM00040400485...	5.114 MB	0.1%					Storage	APM00040400...	
	4.197 MB	82.1%	10:00:00:60:69:80:6B...		pcbms...	fc7/6	Storage	APM00040400...	SP A Port: 0
	0.917 MB	17.9%	10:00:00:60:69:80:6B...		pcbms...	fc8/6	Storage	APM00040400...	SP A Port: 1
	0 MB	0.0%	10:00:00:60:69:80:6B...		pcbms...	fc7/6	Storage	APM00040400...	SP B Port: 0
	0 MB	0.0%	10:00:00:60:69:80:6B...		pcbms...	fc7/7	Storage	APM00040400...	SP B Port: 2
	0 MB	0.0%	10:00:00:60:69:80:6B...		pcbms...	fc8/6	Storage	APM00040400...	SP B Port: 1
	0 MB	0.0%	10:00:00:60:69:80:6B...		pcbms...	fc7/7	Storage	APM00040400...	SP A Port: 2
⊕ APM00053502118...	2.399 MB	0.1%					Storage	APM00053502...	
⊕ APM00052600835...	2.012 MB	0.0%					Storage	APM00052600...	
⊕ APM00053400987...	1.833 MB	0.0%					Storage	APM00053400...	
⊕ APM00052603246...	0.598 MB	0.0%					Storage	APM00052603...	
⊕ Sym-000187461102...	0.563 MB	0.0%	10:00:00:60:69:80:6C...		dr4sw...		Storage	Sym-0001874...	

Data Distribution Across the Ports of One Storage Array

5. As the illustration above shows, despite having many different ports, only a few of the array's ports are receiving any traffic at all and of those one is experiencing over 80% of the total data flow. The flow of data across storage array ports could be balanced better.
6. Redirecting data traffic going to the array's ports through one of the unutilized (or in most cases, under-utilized) storage ports will alleviate the bottleneck. Additionally, a large amount of unutilized ports makes this array a good candidate to house data for new applications or to house data from other storage arrays that are experiencing very high amounts of data traffic.

Balancing the Data Flow

Overview

Balancing the data flow means extracting more utilization out of the SAN without impacting application performance. Application Insight gives you the unique ability to analyze the amount of network traffic on your SAN as well as the distribution of that traffic on all devices and ports.

Using the Load Analyzer tool, you can see the distribution of data traffic across all Hosts, Switches, Storage Arrays or individual ports on any SAN device, Identify bottlenecks and re-route data flows to under-utilized devices and ports.

SAN network traffic is impossible to plan for and very difficult to track. Depending on the applications residing on a given Host, data flow from Hosts through switches, ISLs, and storage arrays can be distributed very unevenly. A large amount of data traffic can be flowing through a few devices and a small number of device ports: this results in device performance degradation, errors, failures and slower application performance. Misunderstanding the flow of data on your SAN also results in unnecessary purchases of new, expensive devices, such as storage arrays. Money can be saved and performance increased if data flow is distributed equally over existing SAN devices.

This section contains two examples of balancing data flows:

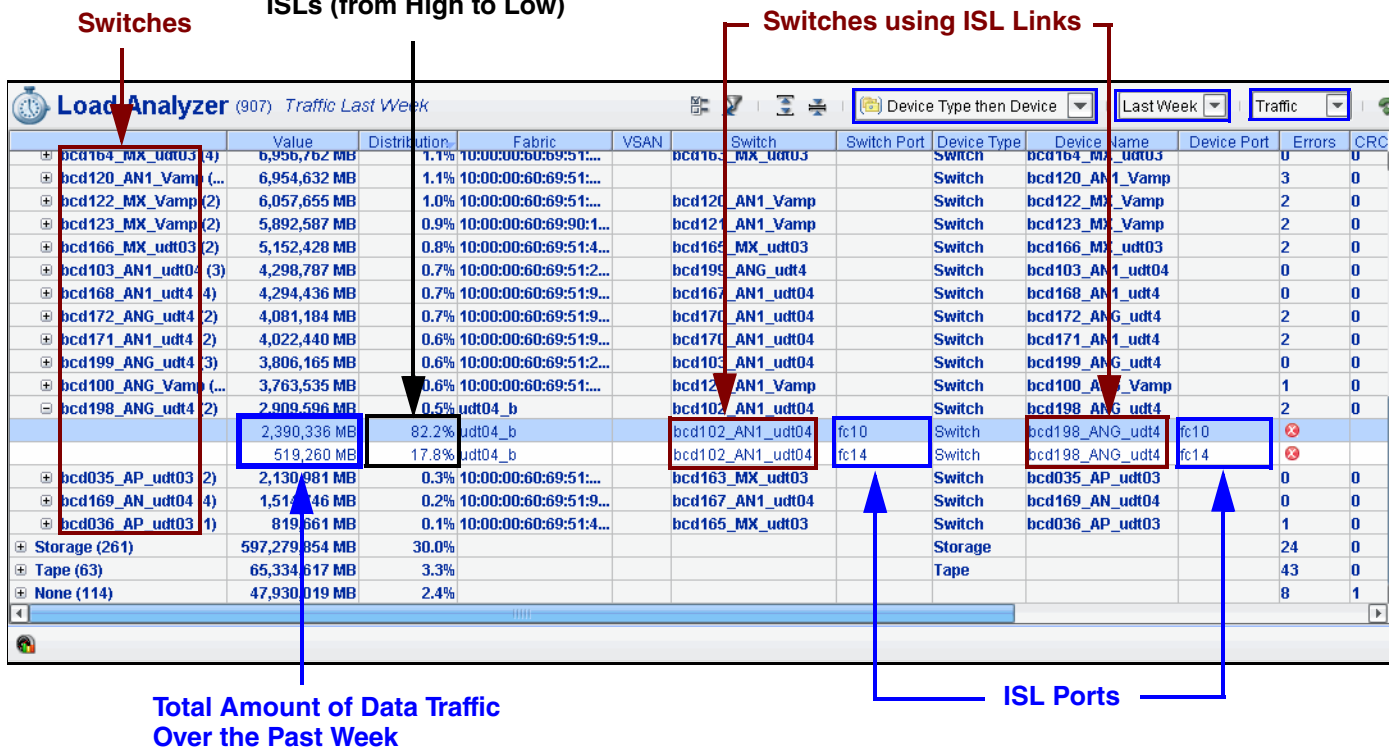
- ♦ [Balance Data Flow Across Storage Array Ports](#)
- ♦ [Balance Data Flow Across ISLs](#)

Balance Data Flow Across ISLs

Inter-Switch links (ISLs) connect high-speed switches. If large amounts of data are flowing through only one ISL port while other ISL ports experience small amounts of data flow, the ISL is imbalanced and operating very inefficiently. To maximize the performance of your ISLs, ensure the data is distributed equally across all ISL ports. Use the following procedure to balance the flow of data across ISLs.

1. Click on the Load Analyzer icon  Load Analyzer on the Launch menu.
2. From the upper-right drop-down menus, select Device Type then Device and select Last Week as the desired time period over which the data sample is to be viewed.
3. Click the Distribution category to view the data distribution from high to low. This will display the data traffic flow across the switch ports in descending order. See the figure.
4. Expand the Switch category. Select an individual switch and expand it.
5. You can now see the traffic moving between ISLs on the expanded switch. Notice that the switch under Device Name is the switch that is expanded in the far-left column. The second switch is identified under the heading Switch See the figure.

Data Distribution Across ISLs (from High to Low)



6. As the figure above shows, one ISL link is carrying nearly 5 times the amount of data as the second link. While it is possible that are reasons for this imbalance to exist, it is very likely that this imbalance is the result of a misconfiguration or other problem and should be corrected immediately.

Identifying Resources for Storage Allocation

Overview

Identifying resources for storage allocation can be a difficult task. The first step to allocating resources for storage allocation is understanding your current storage environment. Once you know how much data you have and where and how much bandwidth current individual SAN paths (switches, ports) provide, you can then decide how much data can be allocated to existing devices and the path through which the data can flow. You will also then know if new hardware is necessary and where on your SAN new hardware is needed the most.

This section describes how to identify SAN devices to manage the data flow for new storage capacity requests and how to identify Hosts that utilize so little of their Tier 1 storage capacity, they can be safely migrated to cheaper, Tier 2 storage arrays.

Use the following sections to Identify resources for new storage allocation:

- ♦ [Identify an Available Storage Array](#) that meets the requirements (available space, bandwidth, tier, etc.)
- ♦ [Select Storage Port\(s\)](#) based on performance and connection
- ♦ [Select Volume\(s\)](#) based on the array they are a member of, their speed and availability
- ♦ [Select the Switch Port\(s\)](#) based on the amount of available bandwidth

Use the following section to identify Tier 1 storage migration candidates:

- ♦ [Identifying Tier 1 to Tier 2 Data Migration Candidates](#)

Identify an Available Storage Array

Use the following procedure to identify a storage array that is a good capacity candidate.

1. Click on the Load Analyzer icon  Load Analyzer on the Launch menu.
2. From the drop-down menus in the upper right corner, select Device Type then Device, Last Week and Traffic from the drop-down menus. This will display a view of all devices including storage devices as well as the amount of data traffic in Megabytes per storage device and the amount of data traffic per storage device as a percentage of all storage data traffic.
3. Expand the Storage category.
4. If your storage array must be in a certain location, or of a certain type, you can filter the storage arrays shown by clicking the filter icon  at the top of the column and typing in letters or words to include (e.g., CX) or exclude (e.g., -900) the appropriate arrays.

Identifying Resources for Storage Allocation : Identify an Available Storage Array

- Select a storage array with a low distribution percentage. A low distribution percentage indicates that the storage device has been utilized very little over the past week and has neither received nor sent much data, making it a good resource candidate for new storage allocation. The array could also be used to house data for an existing over-utilized storage array.

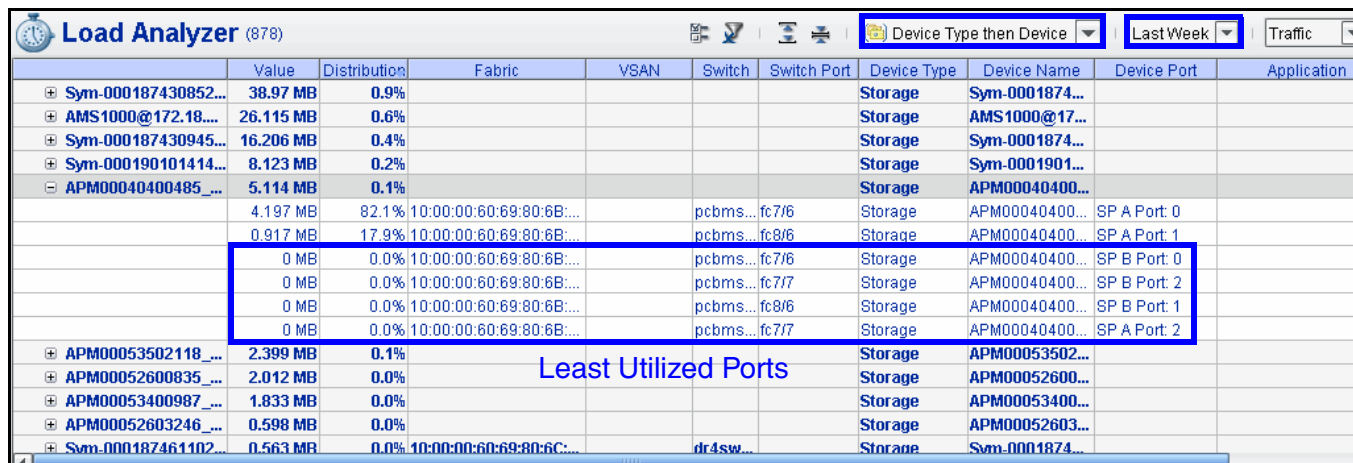
Load Analyzer (878)								
	Value	Distribution	Fabric	VSAN	Switch	Switch Port	Device Type	Device Name
Storage (124)	4,417.329 ...	10.7%					Storage	
APM00062402709_...	1,501.728 ...	34.0%					Storage	APM00062402...
APM00034901716_...	1,068.998 ...	24.2%					Storage	APM00034901...
Sym-000190101507...	529.754 MB	12.0%					Storage	Sym-0001901...
Sym-000187431306...	295.909 MB	6.7%					Storage	Sym-0001874...
Sym-000187431042...	239.455 MB	5.4%					Storage	Sym-0001874...
Sym-000187461221...	159.105 MB	3.6%					Storage	Sym-0001874...
Sym-000187940221...	132.311 MB	3.0%					Storage	Sym-0001879...
APM00040400931_...	126.696 MB	2.9%					Storage	APM00040400...
APM00054800906_...	101.584 MB	2.3%					Storage	APM00054800...
APM00062604720_...	85.82 MB	1.9%					Storage	APM00062604...
Sym-000185500366...	74.036 MB	1.7%					Storage	Sym-0001855...
Sym-000187430852...	38.97 MB	0.9%					Storage	Sym-0001874...
AMS1000@172.18...	26.115 MB	0.6%					Storage	AMS1000@17...
Sym-000187430945...	16.206 MB	0.4%					Storage	Sym-0001874...
Sym-000190101414...	8.123 MB	0.2%					Storage	Sym-0001901...
APM00040400485_...	5.114 MB	0.1%					Storage	APM00040400...
APM00053502118_...	2.399 MB	0.1%					Storage	APM00053502...
APM00052600835_...	2.012 MB	0.0%					Storage	APM00052600...
APM00053400987_...	1.833 MB	0.0%					Storage	APM00053400...
APM00052603246_...	0.598 MB	0.0%					Storage	APM00052603...
Sym-000187461102...	0.563 MB	0.0%	10:00:00:60:69:80:6C...		dr4sw...		Storage	Sym-0001874...
APM00053503025_...	0 MB	0.0%					Storage	APM00053503...
APM00053405434_...	0 MB	0.0%	10:00:00:60:69:80:6C...		dr4sw...		Storage	APM00053405...
APM00060402264_...	0 MB	0.0%	10:00:00:60:69:80:6C...		dr4sw...		Storage	APM00060402...
AX100 (1)	0 MB	0.0%	10:00:00:60:69:80:6C...		dr4sw...		Storage	AX100

Least Utilized Arrays
(ports based on low
distribution of traffic)

Select Storage Port(s)

Use the following procedure to identify the storage port(s) that are good candidates for your capacity project needs.

1. Once the best storage array has been identified, expand the storage device and look at the list of ports.
2. Select a storage port with a low distribution percentage and low value. A low value in both categories is optimal. This indicates that the storage port has been utilized very little, making it a good candidate to mask volumes to the port.



	Value	Distribution	Fabric	VSAN	Switch	Switch Port	Device Type	Device Name	Device Port	Application
⊕ Sym-000187430852...	38.97 MB	0.9%					Storage	Sym-0001874...		
⊕ AMS1000@172.18....	26.115 MB	0.6%					Storage	AMS1000@17...		
⊕ Sym-000187430945...	16.206 MB	0.4%					Storage	Sym-0001874...		
⊕ Sym-000190101414...	8.123 MB	0.2%					Storage	Sym-0001901...		
⊖ APM00040400485_...	5.114 MB	0.1%					Storage	APM00040400...		
	4.197 MB	82.1%	10:00:00:60:69:80:6B...		pcbms...	fc7/6	Storage	APM00040400...	SP A Port: 0	
	0.917 MB	17.9%	10:00:00:60:69:80:6B...		pcbms...	fc8/6	Storage	APM00040400...	SP A Port: 1	
	0 MB	0.0%	10:00:00:60:69:80:6B...		pcbms...	fc7/6	Storage	APM00040400...	SP B Port: 0	
	0 MB	0.0%	10:00:00:60:69:80:6B...		pcbms...	fc7/7	Storage	APM00040400...	SP B Port: 2	
	0 MB	0.0%	10:00:00:60:69:80:6B...		pcbms...	fc8/6	Storage	APM00040400...	SP B Port: 1	
	0 MB	0.0%	10:00:00:60:69:80:6B...		pcbms...	fc7/7	Storage	APM00040400...	SP A Port: 2	
⊕ APM00053502118_...	2.399 MB	0.1%					Storage	APM00053502...		
⊕ APM00052600835_...	2.012 MB	0.0%					Storage	APM00052600...		
⊕ APM00053400987_...	1.833 MB	0.0%					Storage	APM00053400...		
⊕ APM00052603246_...	0.598 MB	0.0%					Storage	APM00052603...		
⊕ Sym-000187461102...	0.563 MB	0.0%	10:00:00:60:69:80:6C...		dr4sw...		Storage	Sym-0001874...		

Select Volume(s)

Use the following procedure to identify the appropriate volume(s) for your capacity project needs.

1. Once the best storage array and storage port has been identified, select the best volume by first clicking Storage Arrays on the left side under Inventory.
2. Select the Storage Array chosen earlier. You can sort or filter by name.
3. Click on the  and  icons to open the Masking and Volumes panes, respectively.
4. From this view, you can see all the available volumes on the selected Storage Array.
5. Expand the No Mapping and/or No Masking categories in the Masking pane and select the volume that meets your requirements for available space and capacity. The No Mapping and No Masking views display only those volumes for the selected storage array that have not yet been mapped or masked, respectively, in the SAN.

Select the Switch Port(s)

When selecting the appropriate storage array, the applicable storage ports will also be viewable. See [Select Storage Port\(s\)](#). When selecting a storage array for a new project, it can be very useful to view the traffic going through the SAN switch ports. Identifying and choosing a switch port with a low utilization rate will ensure the requisite performance and ensure the rest of your SAN is not adversely affected by bringing additional storage into use. Use the following procedure to identify the optimum switch port(s).

1. Click on  Load Analyzer icon on the Launch menu.
2. From the drop-down menus in the upper right corner, select Device Type then Device, Last Week and Traffic from the drop-down menus. This displays a view of all devices including switches and the amount of data traffic in Megabytes that has traveled through each device over the past week.
3. If your switch must be in a certain location, or of a certain type, you can filter the switches shown by clicking the filter icon  at the top of the Switch column and typing in letters or words to include switches (for example, FG if the available switches have those letters in their names) or exclude switches (for example, typing -CX and/or -100 if those letters are included in the names of all switches that cannot be considered). See [TBD](#) in Appendix A: Available Data Sources for more information.
4. Click the Distribution column heading to sort in descending order the switches experiencing the most data traffic.
5. Expand the Switch category. Expand the individual switches that you know to be good candidates based on location, mapping, etc.
6. The switch ports with the smallest percentage of total data traffic are good candidates to carry the data traffic for new applications, projects, etc.

Identifying Tier 1 to Tier 2 Data Migration Candidates

To use your SAN as efficiently as possible, applications should be matched to devices that deliver appropriate services. High-traffic applications utilizing critical data need Tier 1 storage. Lower-traffic applications can safely use lower Tier, cheaper storage devices. Applications that have requested and are assigned Tier 1 status sometimes use only a fraction of Tier 1 performance and can be safely migrated to cheaper storage arrays, freeing up expensive storage capacity preventing the unnecessary purchase of additional, expensive, Tier 1 storage and better utilizing existing devices.

Use the following steps to identify low-traffic Tier 1 storage:

1. Click on the Load Analyzer icon  Load Analyzer
2. From the drop-down menus in the upper right corner, select BU then App then Device, Last Week and Traffic from the drop-down menus. This displays a list of all Business Units, the Applications they use and the devices those Applications reside on. This view also shows the amount of data traffic in Megabytes that has traveled through each device over the past week.
3. Click the Distribution column heading to sort the arrays in descending order the storage arrays experiencing the most data traffic.

Identifying Resources for Storage Allocation : Identifying Tier 1 to Tier 2 Data Migration Candidates

- Expand a Business Unit and then the Applications that are experiencing low levels of data traffic. If the Applications showing little data through their respective Hosts reside on a Tier 1 storage array, they can safely be migrated to a lower Tier array. In the current view, you can also expand the Host to see the amount of data flowing to all its ports.

Applications Data Traffic Hosts Data Traffic on Storage

Load Analyzer (90%) Traffic Last Week

BU then App then Device Last Week Traffic

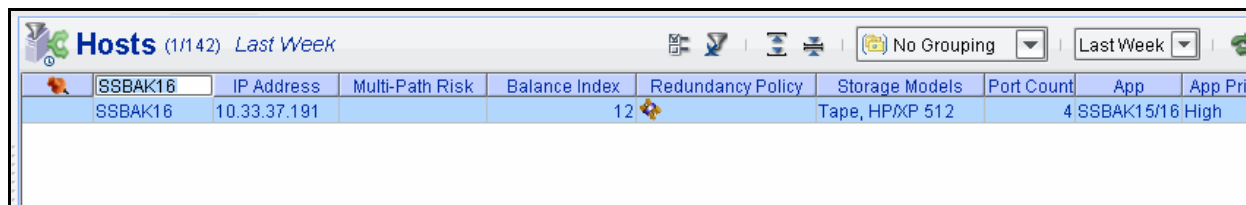
	Value	Distributi...	Fabric	VSAN	Switch	Switch Port	Device Name	Device Type	Device Port	Errors	CRC
None (90%)	1,992,219,565 MB	100.0%								264	1
None (875)	1,982,063,535 MB	99.5%								245	1
SDOSSR01/02 (4)	3,811,677 MB	0.2%						Host		3	0
TIBPRD2/3 (5)	2,547,207 MB	0.1%						Host		3	0
SDOSSC01/02 (4)	2,259,197 MB	0.1%						Host		3	0
UKWVMH12/13 (4)	595,302 MB	0.0%						Host		1	0
UKWVMH15/16 (2)	559,525 MB	0.0%					UKWVMH16	Host		1	0
SDOSSG01/02 (4)	273,603 MB	0.0%						Host		3	0
SSBAK15/16 (2)	106,507 MB	0.0%					SSBAK16	Host		2	0
SSBAK16 (2)	106,507 MB	100.0%					SSBAK16	Host		2	0
SSBAK37/38 (4)	3,011 MB	0.0%						Host		3	0
SSBAK38 (2)	1,808 MB	60.1%					SSBAK38	Host		2	0
	1,030 MB	56.9%	10:00:00:60:69:51:...		bcd122_MX_Va...	fc12	SSBAK38	Host	10:00:00:00:C9:3E...	✗	
	779 MB	43.1%	10:00:00:60:69:90:1...		bcd123_MX_Va...	fc12	SSBAK38	Host	10:00:00:00:C9:3A...	✗	
SSBAK37 (2)	1,203 MB	39.9%					SSBAK37	Host		1	0
	715 MB	59.5%	10:00:00:60:69:90:1...		bcd101_ANG_V...	fc12	SSBAK37	Host	10:00:00:00:C9:3E...		
	488 MB	40.5%	10:00:00:60:69:51:...		bcd100_ANG_V...	fc12	SSBAK37	Host	10:00:00:00:C9:3E...	✗	
INFRA3/4 (3)	0 MB	0.0%	2B:CC:00:0D:EC:0E:...	3020	ccc216-MX-Red			Host		0	0
HDUT01 (1)	0 MB		2B:CC:00:0D:EC:0E:...	3020	ccc216-MX-Red		HDUT01	Host		0	0
INFRA3 (1)	0 MB		2B:CC:00:0D:EC:0E:...	3020	ccc216-MX-Red		INFRA3	Host		0	0
INFRA4 (1)	0 MB		2B:CC:00:0D:EC:0E:...	3020	ccc216-MX-Red		INFRA4	Host		0	0

Note

You can filter the storage arrays shown by clicking the filter icon  at the top of the Device Name column and typing in letters or words to include arrays (for example, **FG** if the available arrays have those letters in their names) or exclude arrays (for example, typing **-CX** and/or **-100** if those letters are included in the names of all arrays that cannot be considered).

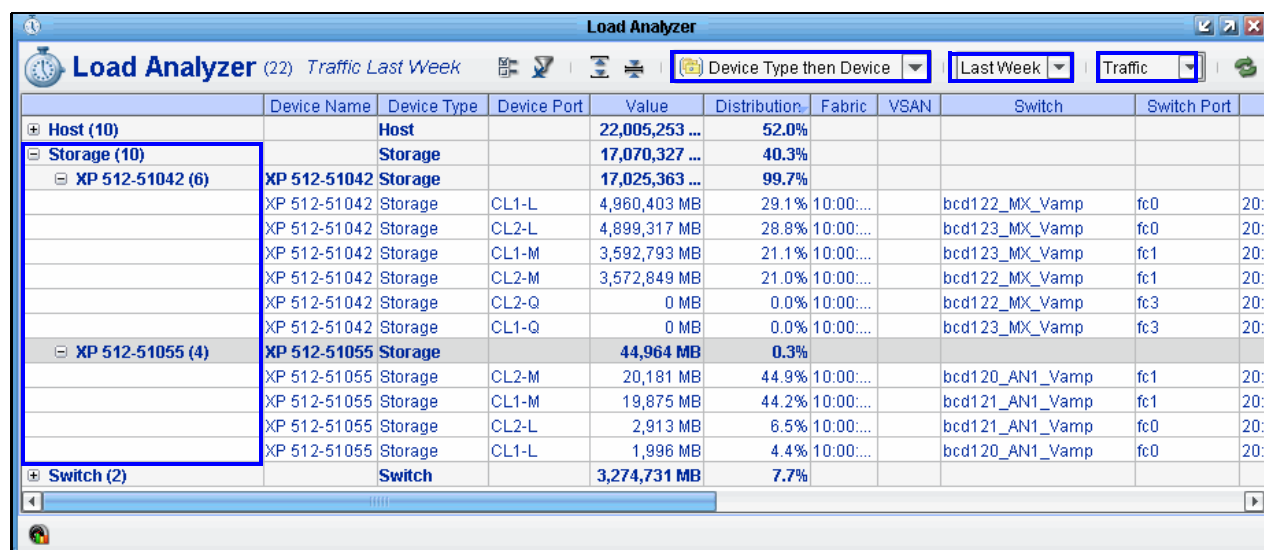
- Copy the Host name by double-clicking on the Host name in the Device Name column and pressing Ctrl+c.

- Click on the  Hosts icon in Application Insight.
- Click the filter icon  in the Host Name column and press Ctrl+v to paste the name of the for the copied Host. Press Enter. The copied Host is displayed. See the figure.



SSBAK16	IP Address	Multi-Path Risk	Balance Index	Redundancy Policy	Storage Models	Port Count	App	App Pri
SSBAK16	10.33.37.191		12		Tape, HP/XP 512	4	SSBAK15/16	High

- Right-click on the Host and select Analyze Congestion. The Load Analyzer screen appears showing the storage arrays and ports the selected host is connected to:



Device Name	Device Type	Device Port	Value	Distribution	Fabric	VSAN	Switch	Switch Port
Host (10)	Host		22,005,253 ...	52.0%				
Storage (10)	Storage		17,070,327 ...	40.3%				
XP 512-51042 (6)	Storage		17,025,363 ...	99.7%				
XP 512-51042	Storage	CL1-L	4,960,403 MB	29.1%	10:00:...		bcd122_MX_Vamp	fc0
XP 512-51042	Storage	CL2-L	4,899,317 MB	28.8%	10:00:...		bcd123_MX_Vamp	fc0
XP 512-51042	Storage	CL1-M	3,592,793 MB	21.1%	10:00:...		bcd123_MX_Vamp	fc1
XP 512-51042	Storage	CL2-M	3,572,849 MB	21.0%	10:00:...		bcd122_MX_Vamp	fc1
XP 512-51042	Storage	CL2-Q	0 MB	0.0%	10:00:...		bcd122_MX_Vamp	fc3
XP 512-51042	Storage	CL1-Q	0 MB	0.0%	10:00:...		bcd123_MX_Vamp	fc3
XP 512-51055 (4)	Storage		44,964 MB	0.3%				
XP 512-51055	Storage	CL2-M	20,181 MB	44.9%	10:00:...		bcd120_AN1_Vamp	fc1
XP 512-51055	Storage	CL1-M	19,875 MB	44.2%	10:00:...		bcd121_AN1_Vamp	fc1
XP 512-51055	Storage	CL2-L	2,913 MB	6.5%	10:00:...		bcd121_AN1_Vamp	fc0
XP 512-51055	Storage	CL1-L	1,996 MB	4.4%	10:00:...		bcd120_AN1_Vamp	fc0
Switch (2)	Switch		3,274,731 MB	7.7%				

- If the storage arrays shown are Tier 1 arrays, it is advantageous to move one or more applications on the Host to cheaper, lower Tier arrays.

Analyzing Congestion

Overview

Congestion on a SAN device or across devices on a SAN can cause a variety of problems that eventually result in application performance problems and/or failures. SAN congestion often negatively impacts service levels.

A variety of factors can cause a congested device on your SAN. The congestion root - cause analysis action can be invoked for different devices from a variety of views. The following is a sampling of analyzing that can be performed on any SAN device.

- ♦ [Analyzing Congested Hosts](#)
- ♦ [Analyzing Congested Storage Ports](#)

Analyzing Congested Hosts

Hosts are a crucial part of the SAN as they house the applications that perform vital business operations. When a Host becomes congested, business applications experience degraded performance, or fail. Using Application Insight, you can locate congested Hosts, analyze the cause of the congestion, identify SAN devices responsible for the Host's congestion, and solve the problem.

Analyze the Cause of the Congestion

Once the congested Host has been identified, identify the storage ports the Hosts sends and receives traffic from, identify other SAN devices accessing those same storage ports and find the SAN device that is preventing the storage ports from sending and receiving data to the congested Host.

Solve the Cause of the Congestion

Once the cause of the congestion has been identified taking the necessary steps to solve the problem may include rerouting data from a Host to a different storage port or fixing a hardware problem.

Note

Many times it is suspected that a congested host is the result of a slow switch or overutilized volume, when in actuality, the host is congested because other hosts are overutilizing the same storage port.

Identifying a Congested Host

The following procedure describes how to identify a congested Host, and identify the cause of the congestion by proactively finding errors occurring on all Hosts. Hosts experiencing errors are most likely experiencing congestion.

1. Start by identifying the problem host. (If you already know the name of the problem Host, skip this step). Click on the Load Analyzer icon  Load Analyzer to open the Load Analyzer.
2. From the drop-down menus in the upper right corner, select Device Type then Device, Last Week and Traffic from the drop-down menus. This will display a view of all devices including storage devices as well as the amount of data traffic in Megabytes per storage device and the amount of data traffic per storage device as a percentage of all storage data traffic.
3. Examine the errors on each Host by clicking the Errors column.
4. Select a Host with a high number of errors and a high amount of data traffic as a potential candidate. Click the Host name in the Device Name column and press Ctrl+c to copy the Host name.

Analyzing the Cause of the Congested Host

1. Click the Hosts icon  Hosts under Service Insight in the Launch menu. The Hosts view appears. Sort the displayed Hosts by name or click the filter icon in the Host Name column and paste the name of the host by pressing Ctrl+v and pressing Enter. Only the selected Host now appears in the Hosts main table.
2. Right-click on the Host and select Analyze Congestion from the bottom of the sub-menu that appears.
3. In the Load Analyzer window that appears, group the contents by Device Type then Device by selecting that entry from the drop-down menu in the upper-right corner. In this window appears the congested Host, the storage ports that the selected Hosts accesses as well as all other devices that access the same storage ports as the congested Host.

Shown are all the devices that access the same problem storage port. The amount of data flowing through these devices to all storage arrays is displayed. The Host displaying the most amount of data traffic is the most likely cause of the storage port's congestion.

Analyzing Congested Storage Ports

When a Storage port becomes congested, Hosts experience degraded performance, and applications suffer. Using Application Insight, you can locate congested storage ports, analyze the cause of the congestion, identify SAN devices most likely responsible for the congestion, and solve the problem.

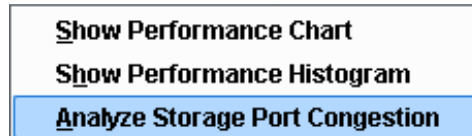
A number of various factors can cause a congested storage port including:

- ◆ High amount of Host data traffic (from a busy application) accessing a volume through the storage port
- ◆ a malfunctioning switch port
- ◆ other factors

Use the following procedure to investigate possible causes of storage port congestion.

1. Start by identifying the problem storage port. Click on the Load Analyzer icon  Load Analyzer to open the Load Analyzer.
2. From the drop-down menus in the upper right corner, select Device Type then Device, Last Week and Traffic from the drop-down menus. This will display a view of all devices including storage devices as well as the amount of data traffic in Megabytes per storage device and the amount of data traffic per storage device as a percentage of all storage data traffic.
3. Select a Storage array with a high number of errors and a high amount of data traffic as a potential candidate. Expand the storage array. Write-down the name of the storage array ports or select an individual port. Click the storage name in the Device Name column and and press Ctrl+c to copy the storage name.
4. Select  Storage Arrays under Service Insight on the Launch menu.
5. Click the Storage Name Column heading to sort the Storage devices by name and browse to the problem storage device or click the filter icon  and type in the name of the problem storage device. Alternatively, you can paste the copied name of the problem Storage Array into the filter by pressing Ctrl+v. See the note above. Press Enter. The view resets and displays only the filtered array.

6. Expand the storage array.
7. Open the Ports  detail pane. Right-click on the desired Storage array port and select Analyze Storage Port Congestion from the sub-menu that appears. This will show you all the devices that access the problem storage port.



8. In the screen that appears, select Device Type then Device from the Grouping drop-down menu and click the refresh button. You can now see a list of all the devices (by type) that access the congested storage port. Note that the congested storage port will also appear in this view.

Shown are all the devices that access the problem storage port. The amount of data flowing through these devices to all storage arrays is displayed. The Host displaying the most amount of data traffic is the most likely cause of the storage port's congestion.

Application Insight Report

Overview

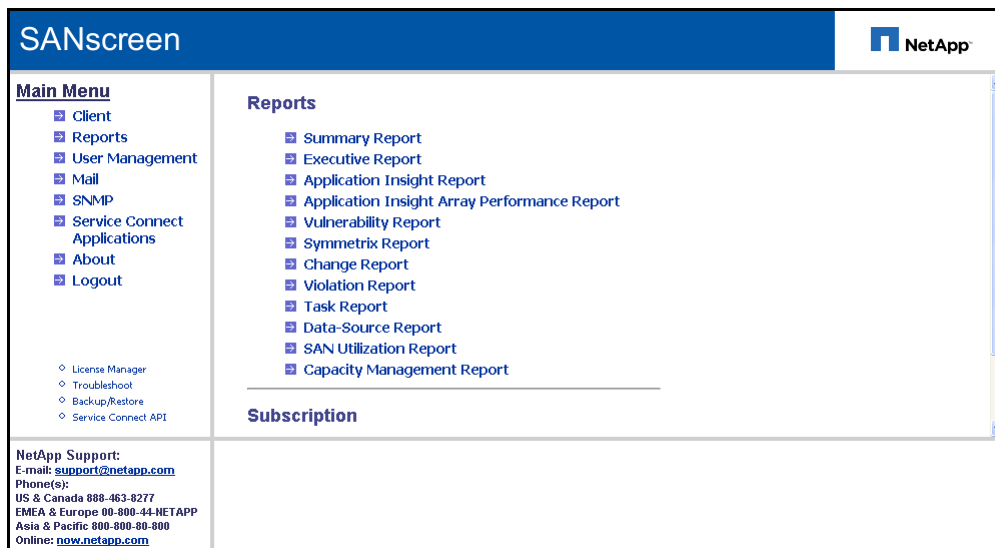
The Application Insight Report lets you identify quickly the most utilized hosts, ISLs and arrays. Orphaned volumes and unbalanced ISLs are also identified. IT can use this report to explain the deferment of capital expenditures, apply non-utilized resources to new projects or applications, identify resources for consolidation or justify a tiering strategy.

- ♦ [Accessing the Report](#)
- ♦ [Using the Application Insight Report](#)

Accessing the Report

To generate the Application Insight Report, first open the administration portal to access the SANscreen Web services.

1. With the portal screen open, click the Reports link on the left to access this display:



2. Click the Application Insight Report link to open the configuration view. If you do not want to use the defaults, change the number of devices and threshold levels here. You can return to this page at any time to revise the configuration:

Create Application Insight Report

Report on Last Hour

The number of utilized/underutilized Hosts, Arrays and ISLs

Unutilized Volumes Traffic Threshold (MB)

Unbalanced ISLs Index Threshold

3. Click Generate Report. The next pages describe the information that is made available in each section of the report.

Using the Application Insight Report

There are four sections to the Application Insight Report, including:

- ◆ A summary of all data
- ◆ The top ten most- and least-utilized devices
- ◆ Unutilized volumes by storage array
- ◆ Unbalanced ISLs (with connected ports)

Summary of All Data

The Summary of All Data report shows the start and end timestamp for the measurements taken, the performance threshold you have set for the host and the ISL (Inter-Switch Link) Balance Index:

Name	Description
From date	2007-08-23 15:23:05
To date	2007-08-23 16:23:05
Minimum host traffic threshold	0
ISL balance index threshold	50

Minimum Host Traffic Threshold: Shows the minimum threshold (Utilization, Rx, Tx, etc.) that can occur without an alert being issued. By setting minimum utilization thresholds, Application Insight will alert you as soon as it detects under-utilized host ports and storage array ports.

ISL Balance Index: Indicates how far out of balance the traffic is. The default setting is 50, which means that any time the ISL Balance Index is 50 or above, the traffic between ports is unbalanced. This is then flagged with a red icon in the Multipath Risk column applied to Hosts on the client.

Top Ten Most Utilized and Least Utilized Devices

Knowing the top ten most utilized and least utilized storage devices lets you assess the effectiveness of load balancing in the SAN, which impacts performance.

Highly utilized storage devices experience near threshold data traffic, indicating the possible need to relocate applications to less utilized storage arrays. The Most Utilized list also helps determine whether redirecting data traffic going to ports of specific arrays through under-utilized storage ports will alleviate the potential for bottlenecks.

A low distribution percentage in the Least Utilized list indicates that the storage device has been utilized very little over the designated period of time and has neither received nor sent much data, making it a good resource candidate for new storage allocation. The array could also be used to store data for an existing over-utilized storage array.

Most Utilized

Hosts				
Host	Traffic (MB)	Distribution	Application	Business Unit
Agass1	432,767	18.3%	Mapping Service	Dev
Sampras	303,872	12.8%	Mapping Service	Dev
Nadal	255,065	10.8%	Mapping Service	Dev
ny_exch1	135,445	5.7%	Lotus notes, Exchange	Marketing, PM
csNAS3	113,266	4.8%	DevTrack	Customer Support
ny_oral2	91,735	3.9%	OracleERP, Users	Dev, Trading
Nas2Backup	91,706	3.9%		
jp_nas_2	85,586	3.6%	Japan	Marketing
nj_exch002	84,352	3.6%	Lotus notes, Exchange	Marketing, PM
ny_oral	68,366	2.9%	OracleERP, Users	Dev, Trading
ISLs				
Switch Port	Connected Switch Port	Traffic (MB)	Distribution	
Switch 24 port fc0	Switch 25 port fc0	143,906	56.8%	
stbrcd1 port fc15	hbrcd1 port fc0	23,476	9.3%	
hbrcd2 port fc15	stbrcd1 port fc0	17,862	7.0%	
Switch 24 port fc2	Switch 25 port fc2	14,838	5.9%	
F2brcd-b port fc1	F2brcd-a port fc1	12,790	5.0%	
scis300 port fc2/14	hcis300 port fc2/14	10,133	4.0%	
F3brcd-a port fc1	F3brcd-b port fc1	9,492	3.7%	
hcis200 port fc2/14	scis200 port fc2/14	9,300	3.7%	
scis300 port fc2/15	hcis300 port fc2/15	6,814	2.7%	
hcis200 port fc2/15	scis200 port fc2/15	4,892	1.9%	
Arrays				
Storage	Traffic (MB)	Distribution		
USP600_22113	371,506	41.2%		
USP600_22112	305,448	33.9%		
Sym-005007430036	77,626	8.6%		
Sym-005007430035	76,776	8.5%		
IBM TotalStorage DS8100 2107 model 921-751204	41,738	4.6%		

Least Utilized

Hosts				
Host	Traffic (MB)	Distribution	Application	Business Unit
linx_dev1	0	0.0%		
linx_dev2	0	0.0%		
HP1_bm	0	0.0%		
jp_nas_1	9,057	0.4%	Japan	Marketing
kc_exchdr004	10,843	0.5%		
Safin	13,605	0.6%	Mapping Service	Dev
Becker	13,855	0.6%	Mapping Service	Dev
Filer2	15,002	0.6%	Users	Dev
kc_exchdr003	17,136	0.7%		
Clearcase1	17,462	0.7%	Exchange, Version Control	Dev, Marketing
ISLs				
Switch Port	Connected Switch Port	Traffic (MB)	Distribution	
Switch 28 port fc0	Switch 29 port fc0	0	0.0%	
Switch 26 port fc0	Switch 27 port fc0	0	0.0%	
Switch 30 port fc0	Switch 31 port fc0	0	0.0%	
hcis200 port fc2/15	scis200 port fc2/15	4,892	1.9%	
scis300 port fc2/15	hcis300 port fc2/15	6,814	2.7%	
hcis200 port fc2/14	scis200 port fc2/14	9,300	3.7%	
F3brcd-a port fc1	F3brcd-b port fc1	9,492	3.7%	
scis300 port fc2/14	hcis300 port fc2/14	10,133	4.0%	
F2brcd-b port fc1	F2brcd-a port fc1	12,790	5.0%	
Switch 24 port fc2	Switch 25 port fc2	14,838	5.9%	
Arrays				
Storage	Traffic (MB)	Distribution		
FA83020-sv105c	28,036	3.1%		
IBM TotalStorage DS8100 2107 model 921-751204	41,738	4.6%		
Sym-005007430035	76,776	8.5%		
Sym-005007430036	77,626	8.6%		
USP600_22112	305,448	33.9%		
USP600_22113	371,506	41.2%		

Unutilized Volumes by Storage Array

This list summarizes the storage resources in the SAN that are not being utilized at all and which are available.

Storage	Model	Volume	Raw Capacity (GB)	Hosts Ports Count	Hosts	Hosts Ports Total Traffic (MB)
Sym-005007430039	EMC/Symmetrix DMX800	0000	16.0		1 HP1_bm	0
Sym-050074300311	EMC/Symmetrix DMX800	0000	16.0		1 Linx_dev2	0
Sym-050074300310	EMC/Symmetrix DMX800	0000	16.0		1 Linx_dev1	0

Unbalanced ISLs (with connected ports)

The ISL Balance Index is a calculated Standard Deviation; it is a measurement of how balanced the load is across switch ports.

Switch	Ports	Connected Switch	Connected Switch Ports	Balance Index	Traffic (MB)	Distribution
Switch 24	fc2, fc0	Switch 25	fc2, fc0	81	158,744	62.6%
stbrcd1	fc15	hbrcd1	fc0	0	23,476	9.3%
hbrcd2	fc15	stbrcd1	fc0	0	17,862	7.0%
scis300	fc2/14, fc2/15	hcis300	fc2/14, fc2/15	20	16,947	6.7%
hcis200	fc2/15, fc2/14	scis200	fc2/15, fc2/14	31	14,192	5.6%
F2brcd-b	fc1	F2brcd-a	fc1	0	12,790	5.0%
F3brcd-a	fc1	F3brcd-b	fc1	0	9,492	3.7%
Switch 28	fc0	Switch 29	fc0	0	0	0.0%
Switch 30	fc0	Switch 31	fc0	0	0	0.0%
Switch 26	fc0	Switch 27	fc0	0	0	0.0%

The further away from 1 that the ISL Balance Index is, the more likely the host load is going to be imbalanced across switches. A high value (above 50) signifies a ratio problem between the host ports; i.e., some ports are experiencing a large amount of traffic and others a very low amount, indicating a potential problem. This demonstrates the need to balance data flow across ISLs.

Array Performance

Overview

The Array Performance component is an option of the Application Insight product and the functionality of Array Performance will only be available if the option was purchased and the licensed was installed.

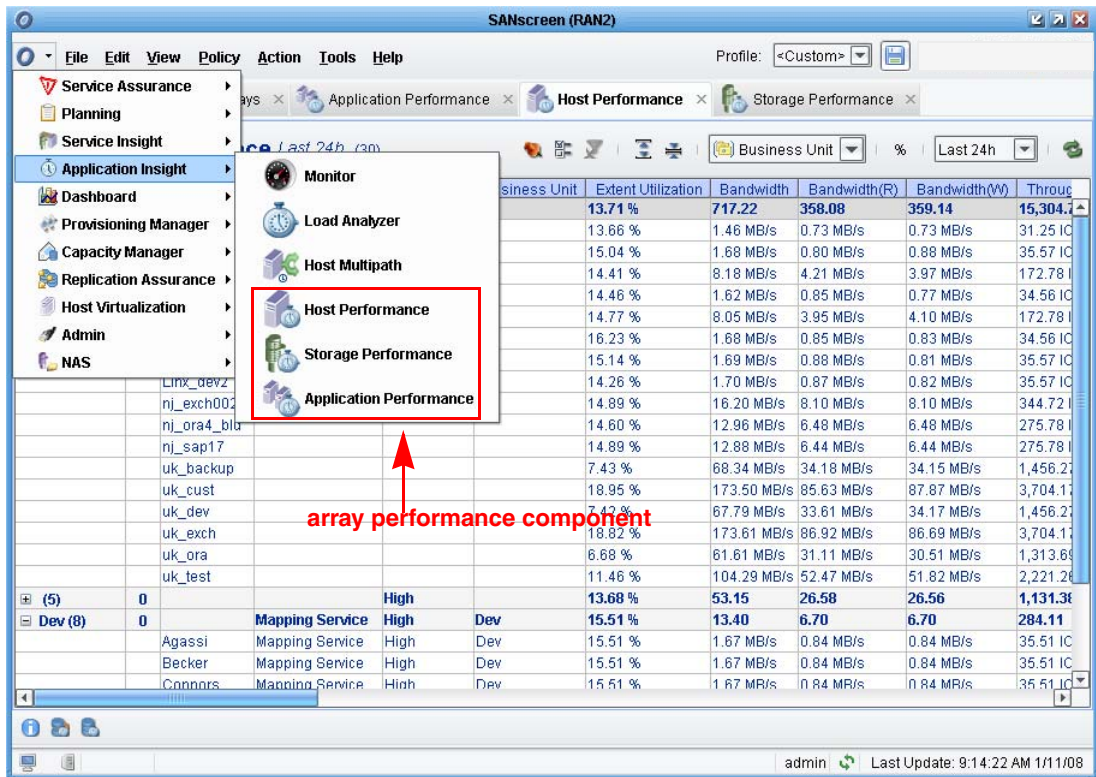
Array Performance enables the SAN administrator to ensure that applications are receiving the right performance from array resources. By showing how array resources are consumed, the array performance data reveals what effect the host and applications have on the array. This helps increase the utilization of storage, server and application assets while improving application service levels, and gives the SAN administrator the ability to answer the following questions:

- How is the array performing? Where are hot spots (disks, volumes, volume members)? What hosts and applications are affected?
- When multiple I/Os are sent, based on read and writes, what contention issues arise? How does this affect capacity management and distribution?
- How has tiering impacted application performance? Are there volumes identified that should be migrated to other tiers? Is there potential tier misalignment based on throughput?
- Can volumes be reclaimed and orphaned arrays identified?

SANscreen serves as a central location for viewing volumes, offering a proactive means to solve or prevent performance and availability problems that are revealed through the storage service data collected by array performance in Application Insight.

In addition, real-time performance data is analyzed, using an extensive collection of critical array metrics that are kept for seven days.

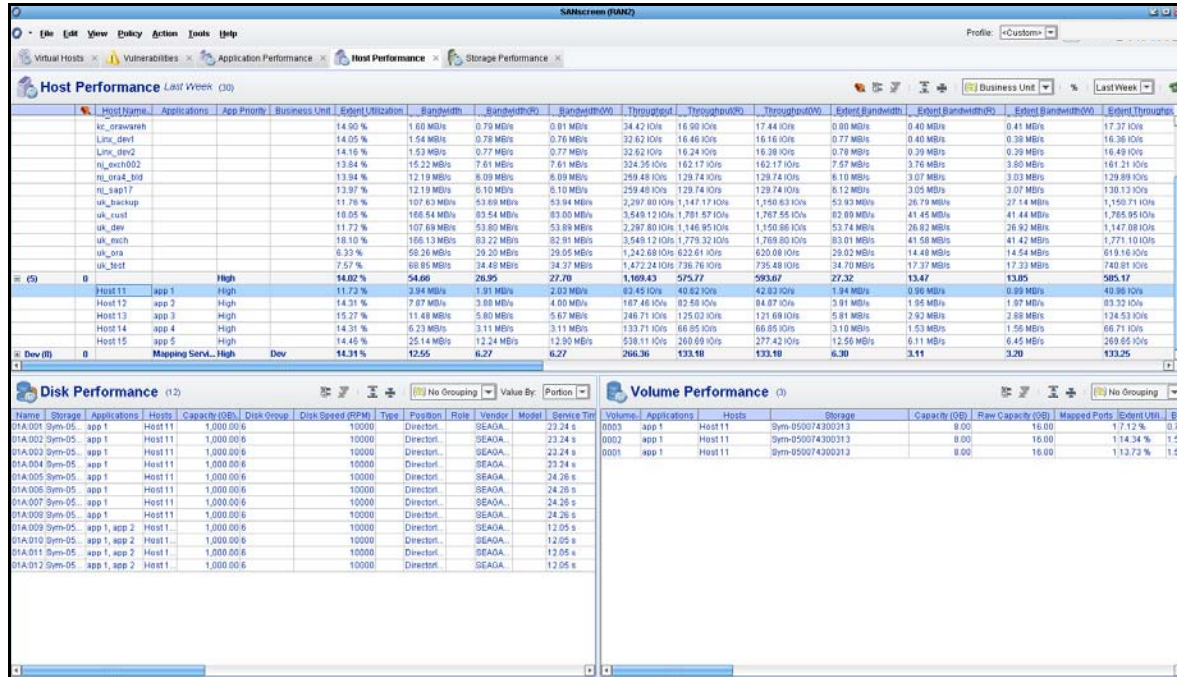
Array performance includes three functional areas: **Host Performance**, **Application Performance** and **Storage Performance**:



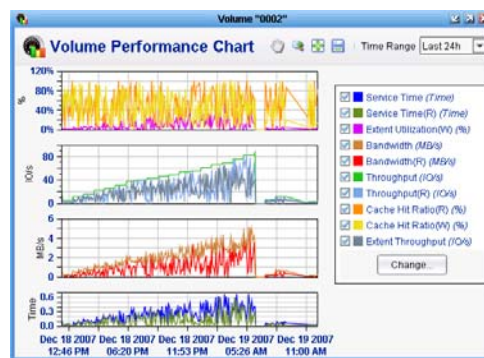
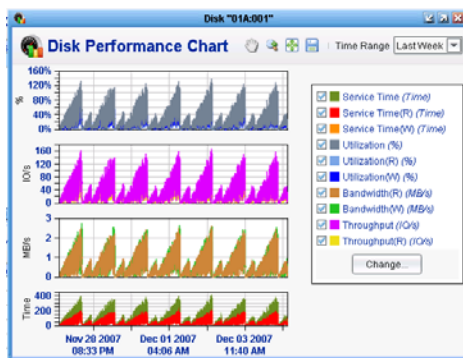
The default view that appears when you open the array performance shows the Host Performance profile, the disks a selected host/application accesses (Disk Performance detail pane), and the associated volumes in use

Overview

(Volume Performance detail pane). These three panes provide three different views of the performance characteristics that apply to the host or application:



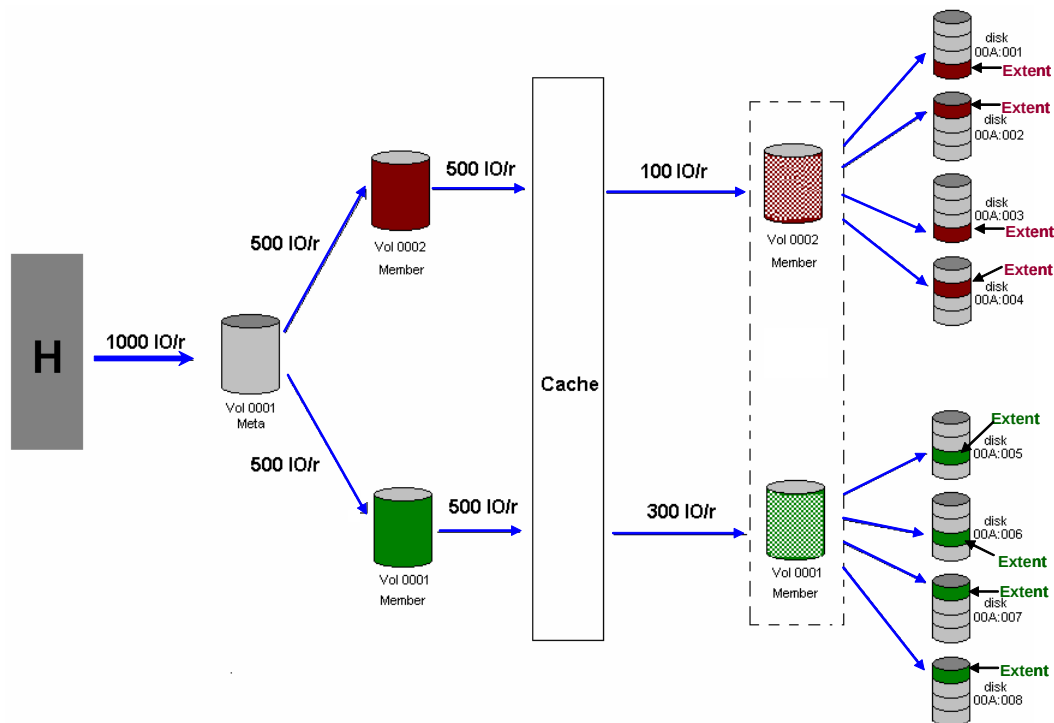
- Each view lets you drill further into the data, which allows you to address a number of uses cases (shown later in this user guide) of possible contention issues at both the disk and volume levels, including volume members.
- Information on trends and patterns are displayed in Performance Charts that allow the correlation of data to show trend and pattern changes:



Viewing the Flow of Data with Array Performance in Application Insight

The diagram illustrates the flow of data across a storage array (Symmetrix).

In the example, the host sends a request that requires 1000 IOs to the metavolume 0001. Of that request, 500 IO is on Volume Member 0002. Of that request, 400 IO operations performed on the cache and 100 IO operations need to perform on the Extents. *The smaller the portion of the IO operations that go to the Extent, the better the performance, because that indicates **faster response time**.*

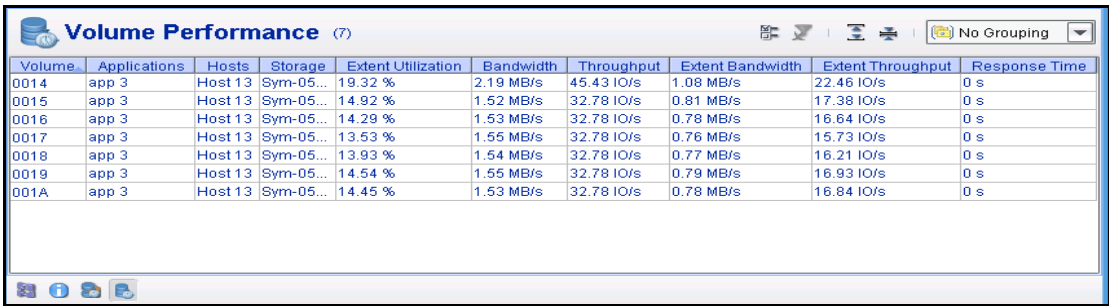


The SANscreen array performance for Application Insight displays specific metrics that help you interpret and understand the flow of data that is modeled in the diagram. These are summarized briefly in the next section.

Types of Metrics

Volume and Extent Metrics

Two different types of metrics are displayed in each of the SANscreen views: Volume and Extent. These are shown in the following snapshot from the Volume Performance detail pane:



Volume	Applications	Hosts	Storage	Extent Utilization	Bandwidth	Throughput	Extent Bandwidth	Extent Throughput	Response Time
0014	app 3	Host 13	Sym-05...	19.32 %	2.19 MB/s	45.43 IO/s	1.08 MB/s	22.46 IO/s	0 s
0015	app 3	Host 13	Sym-05...	14.92 %	1.52 MB/s	32.78 IO/s	0.81 MB/s	17.38 IO/s	0 s
0016	app 3	Host 13	Sym-05...	14.29 %	1.53 MB/s	32.78 IO/s	0.78 MB/s	16.64 IO/s	0 s
0017	app 3	Host 13	Sym-05...	13.53 %	1.55 MB/s	32.78 IO/s	0.76 MB/s	15.73 IO/s	0 s
0018	app 3	Host 13	Sym-05...	13.93 %	1.54 MB/s	32.78 IO/s	0.77 MB/s	16.21 IO/s	0 s
0019	app 3	Host 13	Sym-05...	14.54 %	1.55 MB/s	32.78 IO/s	0.79 MB/s	16.93 IO/s	0 s
001A	app 3	Host 13	Sym-05...	14.45 %	1.53 MB/s	32.78 IO/s	0.78 MB/s	16.84 IO/s	0 s

- Volume metrics refer to pre-cache measurements.
- “Extent” refers to post-cache measurements related to the volumes. This is explained in more detail in the tables in upcoming chapters (see links on next page).

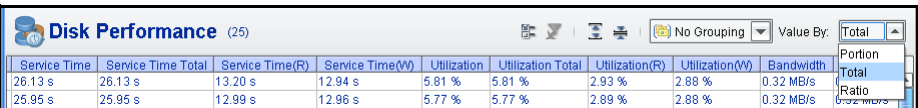
Portion, Total and Ratio in the Disk Performance Detail Pane

The Disk Performance detail pane includes a method of viewing the disk data by “Portion,” “Total” and “Ratio.”

When viewing the Disk Performance data with “Portion” selected, the data shown reflects the portion of the disk’s performance that is due to the Host or Application selected in the view above. “Total” reflects the Service Time for all hosts. “Ratio” is the percentage of the Service Time of a specific host or application compared to the Service Time generated for all hosts or applications.

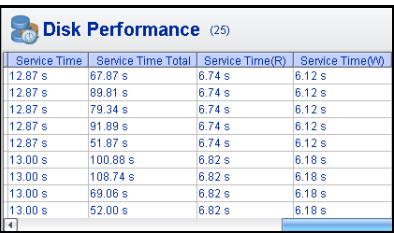
As an example, we can look at Service Time:

The view shows the “Total” Service Time that the disk was accessed (in seconds):



Service Time	Service Time Total	Service Time(R)	Service Time(W)	Utilization	Utilization Total	Utilization(R)	Utilization(W)	Bandwidth
26.13 s	26.13 s	13.20 s	12.94 s	5.81 %	5.81 %	2.93 %	2.88 %	0.32 MB/s
25.95 s	25.95 s	12.99 s	12.96 s	5.77 %	5.77 %	2.89 %	2.88 %	0.32 MB/s

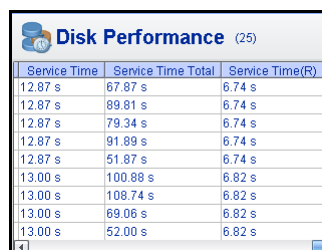
Selecting “Portion” in the combo box provides you with only that Service Time the Host or Application used to



Service Time	Service Time Total	Service Time(R)	Service Time(W)
12.87 s	67.87 s	6.74 s	6.12 s
12.87 s	89.81 s	6.74 s	6.12 s
12.87 s	79.34 s	6.74 s	6.12 s
12.87 s	91.89 s	6.74 s	6.12 s
12.87 s	51.87 s	6.74 s	6.12 s
13.00 s	100.88 s	6.82 s	6.18 s
13.00 s	108.74 s	6.82 s	6.18 s
13.00 s	69.06 s	6.82 s	6.18 s
13.00 s	52.00 s	6.82 s	6.18 s

access the disk.

Selecting “Ratio” lets you know what percentage of the total Service Time was appropriated by the specific device. Increases represent a significantly greater use of the disk, which has the potential for causing bottlenecks and disk access problems for other applications.



Service Time	Service Time Total	Service Time(R)
12.87 s	67.87 s	6.74 s
12.87 s	89.81 s	6.74 s
12.87 s	79.34 s	6.74 s
12.87 s	91.89 s	6.74 s
12.87 s	51.87 s	6.74 s
13.00 s	100.88 s	6.82 s
13.00 s	108.74 s	6.82 s
13.00 s	69.06 s	6.82 s
13.00 s	52.00 s	6.82 s

The following table gives page links to definitions of all metrics provided in this user guide:

Host Performance Metrics	Application Performance Metrics	Storage Performance Metrics
Host Performance Column Descriptions--page 43	Application Performance Column Descriptions--page 74	Storage Performance Column Descriptions--page 96
Disk Performance Column Descriptions--page 49	Disk Performance Column Descriptions--page 77	Disk Performance Column Description--page 106
Volume Performance Column Descriptions--page 52	Volume Performance Column Descriptions--page 80	Volume Performance Column Descriptions--page 102
All Volume Members on Selected Disk--page 61	All Volume Members on Selected Disk--page 84	All Volume Members on Selected Disk--page 109

Array Performance in This User Guide

The next chapter describes contention/performance applications using array performance in SANscreen. The following three chapters show detailed screenshot views for Host Performance, Application Performance and Storage Performance, including their associated column properties, the options for grouping the data and a description of the functionality of each view. Refer to these chapters for specific definitions of parameters and to see all possible views that are available in array performance for Application Insight.

Two subsequent chapters provide examples of how to use array performance and its associated metrics optimally in the SAN. Various screenshots are displayed to illustrate the different use cases, including:

- Identifying Orphaned Volumes
- Identifying Misaligned Tier Volumes

Finally, the Vulnerabilities attached to array performance are explained and illustrated.

These chapters assume a working knowledge of the basic system features described in the *Service Insight User Guide* or the *Service Assurance User Guide*, as well as the *SANscreen Installation and Administration User Guide*. Please refer to those user guides for information, as necessary.

As with the basic SANscreen Service Insight product, the array performance component in Application Insight is a completely non-intrusive solution. It incorporates with virtually all SAN devices, does not require any host agents, does not affect the SAN data paths, and never changes the state anywhere in the SAN. SANscreen complements other storage management tools (such as SRM), and can be interpreted with any enterprise solution, including event-management and change solutions.

Setting Up Array Performance in Application Insight

Overview

This chapter lists the steps required to set up array performance in Application Insight:

- ♦ [Setting Up Data Sources](#)
- ♦ [Enabling Application Data Collection for All Switch Data Sources](#)
- ♦ [Verifying Data Sources Operations](#)

Setting Up Data Sources

Data sources are required for SANscreen to collect application data.

The description below assumes that SANscreen Service Insight is fully deployed. Otherwise, please follow the procedures in the *SANscreen Installation and Administration User Guide* to deploy Service Insight before continuing this chapter.

To configure array performance in Application Insight, edit storage Data Sources and enable Application Insight for each of them as described below.

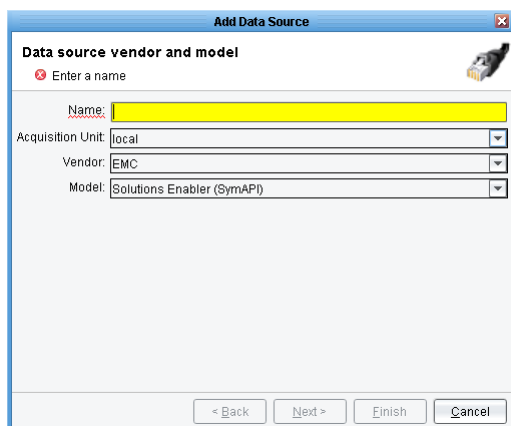
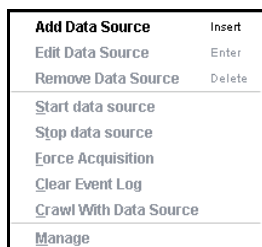
Note

See the Data Support Matrix in the Help/About/Server menu in SANscreen to determine which storage arrays are supported for array performance in Application Insight.

Enabling Application Data Collection for Storage Data Sources

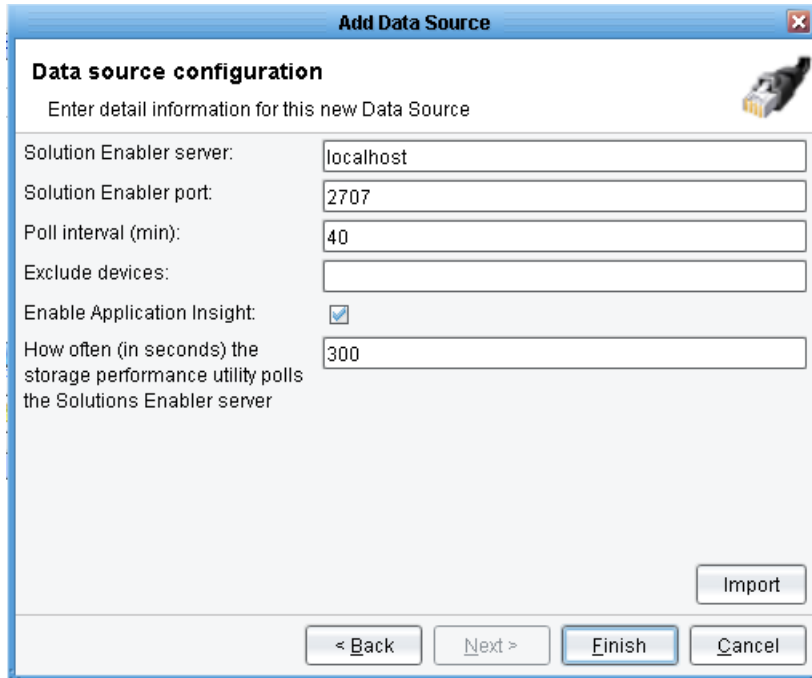
Use the following steps to setup and configure new Data Sources.

1. Under Admin in the navigation tree, select Data Sources.
2. Right-click anywhere in the Data Source table and select Add Data Source.

The 'Add Data Source' dialog box is shown. It has a title bar 'Add Data Source' and a close button. The main section is titled 'Data source vendor and model' and includes a red 'X' icon and the text 'Enter a name'. Below this is a 'Name:' label followed by a yellow text input field. There are three dropdown menus: 'Acquisition Unit' (set to 'local'), 'Vendor' (set to 'EMC'), and 'Model' (set to 'Solutions Enabler (SymAPI)'). At the bottom are four buttons: '< Back', 'Next >', 'Finish', and 'Cancel'.

3. Enter a name for the Data Source that is unique across all Acquisition Units. Choose a name that will make it easy for you to identify the Data Source. The name comprises alphanumeric characters (a-z, A-Z, 0-9). No symbols can be used; it will change to red if the name is not correct.
4. Choose the Acquisition Unit where the Data Source will run (local specifies the Local Acquisition Unit on the SANscreen server).
5. Choose the vendor and model of the device where the management agent is installed. This is the agent from which the Data Source will acquire SAN information. It might be the SAN device itself, or separate hardware, such as a management station.

- Click Next when you're through, to open the Data Source Configuration screen. This screen is specific to the type of device specified above, and is illustrated here:



Add Data Source

Data source configuration

Enter detail information for this new Data Source

Solution Enabler server: localhost

Solution Enabler port: 2707

Poll interval (min): 40

Exclude devices:

Enable Application Insight: ☒

How often (in seconds) the storage performance utility polls the Solutions Enabler server: 300

Import

< Back Next > Finish Cancel

- Fill in the information requested by the configuration screen. Invalid field values are highlighted, including required fields that are not yet specified, such as the IP address above (Solution Enabler server field).
- Check the Enable Application Insight checkbox to start the collection of array statistics from the Data Source.

Note

If the array is not supported, the checkbox and the last field (showing the default of 300 seconds) will not appear.

The number of Data Sources you enable is dependent on your SAN server architecture. (See the *Data Support Matrix* referred to earlier.)

- After all fields are filled in with valid data, the Finish button will be enabled. *All fields highlighted in yellow are required fields. Red fields indicate invalid values.*
- Click the Finish button.
- Refer to "Appendix A: Available Data Source" in the *SANscreen® Installation & Administration User Guide* for device-specific details about each parameter.

Note

The Import button should only be used upon request by the NetApp Support team.

12. After you complete the configuration (above), a new row displays in the main table of the Data Sources screen. Proceed as follows to verify the new Data Source:
 - ◆ Allow a reasonable amount of time for the acquisition to complete. Several seconds is generally enough, but some devices may be slow or highly populated and may take several minutes to acquire.
 - ◆ Select the new Data Source in the main table.
 - ◆ Examine either the main Data Source table or the acquisition event log for successful acquisitions. If the Status field is Acquiring Devices, the acquisition has not yet finished.

Verifying Data Sources Operations

This section shows you how to validate that application data has been collected successfully.

Proceed as follows to verify the Data Sources have collected application data:

1. Wait a few minutes for Data Sources to complete a few collection cycles and open the Data Sources view.
2. Verify the Recent status column shows success for the status of storage Data Sources. See the figure on the next page.
3. In case of errors, examine the main Data Source table and the acquisition event log detailed panes for details.

Note

*If your data sources have not acquired correctly, see “Troubleshooting Data Source Activity” in the **SANscreen Installation and Administration User Guide**.*

Setting Up Data Sources

The screenshot shows the SANscreen (RAN2) application window. The 'Data Sources' tab is active, displaying a table with three data sources. A red box highlights the 'Acquisition Unit' column, and a red arrow points to it with the text 'Status of Data Acquisition'.

Name	IP	Poll Interval	Vendor	Model	State	Recent Status	Acquisition Unit	Acquisition Unit
CarasinLOC	localhost	40	EMC	Solutions E...	Acquisition ...	Replication Assuran...	local	ok
Primary_SE	localhost	40	EMC	Solutions E...	Acquisition ...	Replication Assuran...	local	ok
Region77	localhost	40	EMC	Solutions E...	Acquisition ...	Replication Assuran...	local	ok

The 'Event Log' tab is also visible, showing a table with event details.

Package	From	To	Times	Status
Replication Ass...	1/15/08 5:33 PM	1/15/08 5:33 PM	1	Stand-by
Replication Assura...	1/15/08 5:33 PM	1/15/08 5:33 PM	1	Stand-by
Service Insight (1)	1/15/08 5:33 PM	1/15/08 5:33 PM	1	Stand-by
Service Insight	1/15/08 5:33 PM	1/15/08 5:33 PM	1	Stand-by

The status bar at the bottom shows 'admin' and 'Last Update: 5:33:58 PM 1/15/08'.

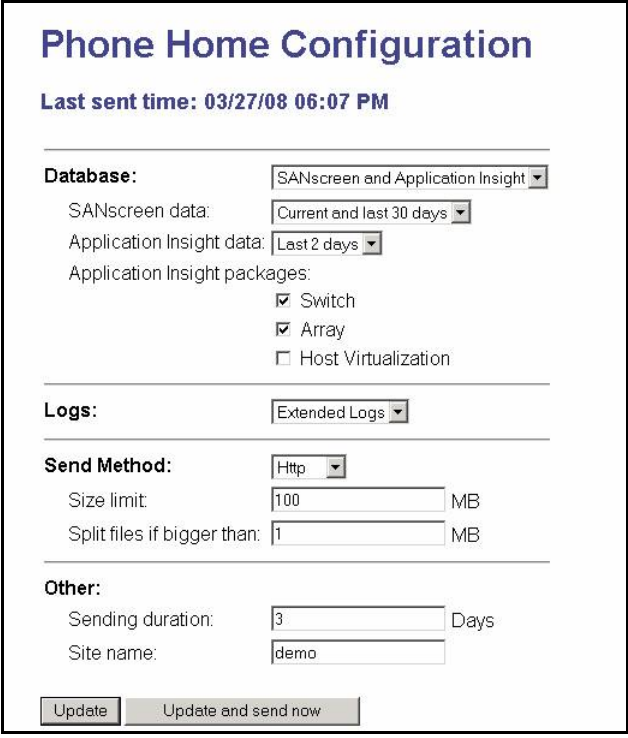
Note

As necessary, press <F5> to refresh the display.

Configuring Phone Home

Phone home is an optional configuration that enables data and logs to be sent to NetApp headquarters on a daily basis to be used for proactive support, helping to identify and resolve issues with Application insight before they affect operations. To configure your Phone Home setup, use the following instructions.

1. Launch an Internet browser, and open the SANscreen Administration web portal by going to (<http://localhost/> or <http://<sanscreen server IP address>/>).
2. Select **Troubleshoot**, the second bullet in the lower left.
3. You may be asked to login to SANscreen. Once logged in, select **Phone Home** from the Troubleshooting menu.



The screenshot shows the 'Phone Home Configuration' web page. At the top, it says 'Last sent time: 03/27/08 06:07 PM'. Below this, there are several sections: 'Database:' with a dropdown menu set to 'SANscreen and Application Insight'; 'SANscreen data:' with a dropdown set to 'Current and last 30 days'; 'Application Insight data:' with a dropdown set to 'Last 2 days'; 'Application Insight packages:' with three checkboxes: 'Switch' (checked), 'Array' (checked), and 'Host Virtualization' (unchecked). Below this is the 'Logs:' section with a dropdown set to 'Extended Logs'. The 'Send Method:' section has a dropdown set to 'Http', a 'Size limit:' input field set to '100' MB, and a 'Split files if bigger than:' input field set to '1' MB. The 'Other:' section has a 'Sending duration:' input field set to '3' Days and a 'Site name:' input field set to 'demo'. At the bottom, there are two buttons: 'Update' and 'Update and send now'.

4. The **Phone Home Configuration** screen appears. Select the database and preferred durations for data collection. Check the boxes to activate the desired **Application Insight** package(s).
5. Select the **Logs**: Base Logs or Extended Logs. Select the desired **Send Method** (ftp, https, e-mail) and set the size limit of the data sample to be sent. The recommended data sample size is 100 MB and the recommended split file size is 1 MB. The preferred method of sending the data is, in order, ftp, https, e-mail.
6. Choose a Sending duration and Site name in the **Other** section.
7. Click **Update** or **Update** and **Send Now**.

Balancing Array Resources

Overview

A key goal for the SAN administrator is to utilize capacity in a proactive way to avoid problems like contention for resources at the disk and volume levels can be predicted and prevented.

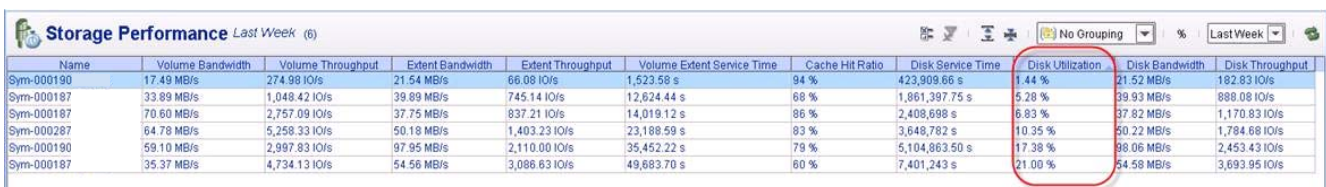
This chapter discusses two possible examples of how this can be achieved using the array performance to identify the ideal volume to mask map and zone to a host or application based on performance metrics:

- Allocate capacity to a new host
- Allocate capacity to an existing host by adding more capacity to that host from storage that is already connected

Allocating Capacity to a New Host

In order to implement the allocation of capacity to a new host, the administrator needs to go to the array view and select an array that best fits the request:

1. Using filters, the SAN administrator can view all of the arrays that exist in the data center (using Annotations) and then select an array with the lowest disk utilization.
2. The first step is to open Storage Performance in the array performance and view the Disk Utilization (a measure of disk Service Time) column to see which disks show low utilization. The candidates are shown in the column outlined in red:



Name	Volume Bandwidth	Volume Throughput	Extent Bandwidth	Extent Throughput	Volume Extent Service Time	Cache Hit Ratio	Disk Service Time	Disk Utilization	Disk Bandwidth	Disk Throughput
Sym-000190	17.49 MB/s	274.98 IO/s	21.54 MB/s	66.08 IO/s	1,523.58 s	94 %	423,909.66 s	1.44 %	21.52 MB/s	182.83 IO/s
Sym-000187	33.89 MB/s	1,048.42 IO/s	39.89 MB/s	745.14 IO/s	12,624.44 s	68 %	1,861,397.75 s	5.28 %	39.93 MB/s	888.08 IO/s
Sym-000187	70.60 MB/s	2,757.09 IO/s	37.75 MB/s	837.21 IO/s	14,019.12 s	86 %	2,408,698 s	6.83 %	37.82 MB/s	1,170.83 IO/s
Sym-000287	64.78 MB/s	5,258.33 IO/s	50.18 MB/s	1,403.23 IO/s	23,188.59 s	83 %	3,648,782 s	10.35 %	50.22 MB/s	1,784.68 IO/s
Sym-000190	59.10 MB/s	2,997.83 IO/s	97.95 MB/s	2,110.00 IO/s	35,452.22 s	79 %	5,104,863.50 s	17.38 %	98.06 MB/s	2,453.43 IO/s
Sym-000187	35.37 MB/s	4,734.13 IO/s	54.58 MB/s	3,086.63 IO/s	49,683.70 s	60 %	7,401,243 s	21.00 %	54.58 MB/s	3,693.95 IO/s

3. The SAN administrator needs to select the disk with the lowest amount of utilization. The Disk Performance detail pane displays a list to choose from:

Disk Performance (120)

Name	Storage	Hosts	Vendor	Model	Service Time	Utilization	Bandwidth	Throughput	Throughput(R)
01B:De	Sym-00...			SX350...	0 s	0 %	0 MB/s	0 IO/s	0 IO/s
02A:De	Sym-00...			SX350...	0 s	0 %	0 MB/s	0 IO/s	0 IO/s
02B:Ce	Sym-00...			SX350...	0 s	0 %	0 MB/s	0 IO/s	0 IO/s
15B:De	Sym-00...			SX350...	0 s	0 %	0 MB/s	0 IO/s	0 IO/s
16A:De	Sym-00...			SX350...	0 s	0 %	0 MB/s	0 IO/s	0 IO/s
16B:Ce	Sym-00...			SX350...	0 s	0 %	0 MB/s	0 IO/s	0 IO/s
15A:Ce	Sym-00...			SX350...	74.76 s	0.03 %	0 MB/s	0.04 IO/s	0.004 IO/s
01A:Ce	Sym-00...			SX350...	113.47 s	0.05 %	0 MB/s	0.06 IO/s	0 IO/s
16A:C3	Sym-00...			SX350...	3,646.92 s	1.49 %	0.19 MB/s	1.57 IO/s	1.31 IO/s
16A:C5	Sym-00... sanad...			SX350...	3,655.18 s	1.49 %	0.19 MB/s	1.57 IO/s	1.31 IO/s
15B:C5	Sym-00...			SX350...	3,664.31 s	1.50 %	0.19 MB/s	1.57 IO/s	1.31 IO/s
16A:C9	Sym-00...			SX350...	3,668.30 s	1.50 %	0.19 MB/s	1.58 IO/s	1.30 IO/s
02B:C6	Sym-00...			SX350...	3,689.14 s	1.51 %	0.19 MB/s	1.59 IO/s	1.32 IO/s

4. After selecting the disk, the SAN administrator opens the Analyze Performance view by right-clicking on the disk. The next view includes the Disk Contention tab (only the chosen disk will appear in that view). The detail pane for All Volume Members on a Selected Disk reveal what volumes reside on the highlighted disk. This detail pane is quickly sorted using the grouping data for “Storage then Head”:

Analyzing Performance for Disk 15A:Ce Last Week

Disk Contention | Performance Pattern | Analyze Congestion | Topology

Disk Disk Performance (1)

Name	Storage	Hosts	Vendor	Model	Service Time	Utilization	Bandwidth	Throughput	Throughput(R)	IO	IO(R)	IO(W)	MBytes
15A:Ce	Sym-000...			SX3500...	74.76 s	0.03 %	0 MB/s	0.04 IO/s	0.004 IO/s	9,122	912	8,210	142 MB

All Volume Members on Selected Disk (2)

Storage then Head

Name	Head	Storage	Hosts	Extent Utilization	Bandwidth	Throughput	Extent Throughput	Response	Exten
Sym-000190	(2)	Sym-000...		0.01 %	0	0	0.03	0	0.13
0020 (1)	0020	Sym-000...		0.03 %	0	0	0.03	0	0.13
0384 (1)	0384	Sym-000...		0.00 %	0	0	0	0	0

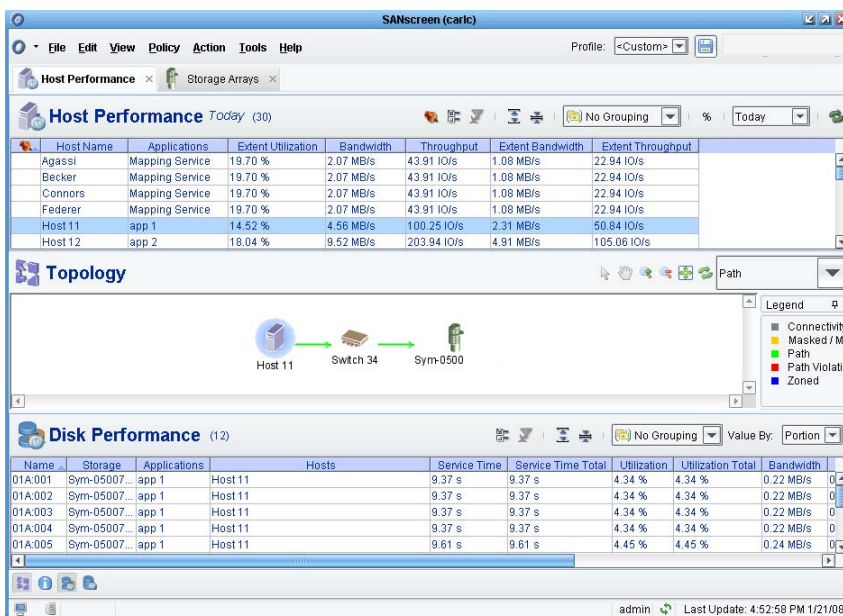
For this example, the SAN administrator selects volume 0384 as the target new volume for the capacity requirement.

Allocate Capacity to an Existing Host

Usually when a host is connected to an array, the SAN administrator will try to allocate the next volume for that host from the same array, *unless the array is hot* (that is, devices are already in heavy use on a regular basis or at a critical threshold).

To perform the allocation, the SAN administrator must first locate the arrays that are connected to the required host.

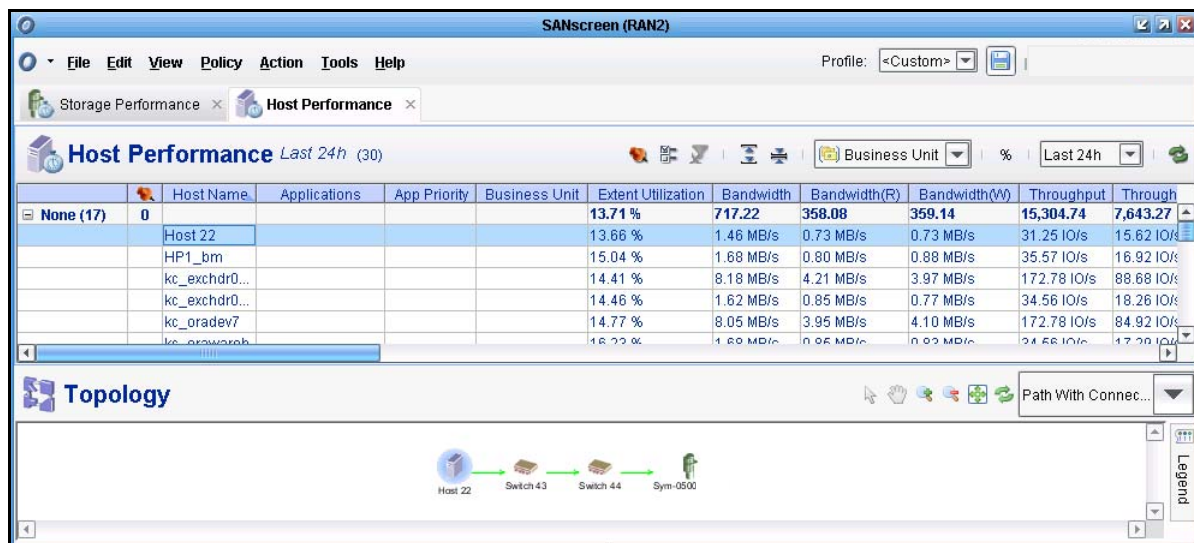
1. The SAN administrator opens the Host Performance view to locate the host (highlighted in the view below).
2. In the topology of that view, the user can see what arrays are connected to the selected host:



3. By clicking on the array in the topology, the SAN administrator is able to see the detail pane for Disk Performance for the selected array.
4. The SAN administrator then selects the disk with the lowest utilization.
5. After selecting the disk, the SAN administrator opens the Analyze Performance view by right-clicking on the disk. The next view includes the Disk Contention tab (only the chosen disk will appear in that view). The detail pane for All Volume members on a Selected Disk reveal what volumes reside on the highlighted disk. This detail pane is quickly sorted using the grouping data for "Storage then Head."
6. Next, the SAN administrator selects a volume from the list of volumes. That volume becomes the target new volume for the capacity requirement.

Topology and Allocation

When the SAN administrator selects a new volume to allocate on an existing host, he or she can also use the Topology view to see the storage the host is already using:



This pane uses icons and graphical elements to visualize the SAN data (see Chapter 3 in the *Service Insight User Guide* or the chapter in this book on *Host Performance* for more information on the Topology pane).

Note

Every SAN device is shown as an icon that represents its device type, while physical connections appear as lines connecting the icons. When a device icon selected, the detailed device, port, adapter/controller, and link properties are available at a glance, by letting the cursor hover over objects and connections.

Contention and Performance

Overview

Contention for disk resources can dramatically affect host and application performance. Contention and performance bottlenecks can increase both capital and operational expenditures, result in over-provisioning and degrade application performance. Array performance in Application Insight shows you where contention exists and what is causing it to occur, enabling identification of:

- hot arrays
- hot disks, volumes, volume members
- impacted hosts and application

The following example demonstrates one way to analyze storage array performance problems by exploring the SANscreen views.

Note

Note: The views are only briefly described here as an introduction to using array performance in Application Insight. For extensive detail on the charts and tables shown, and for navigation through the product, see the reference chapters for Host, Storage and Application Performance that appear later in this user guide.

Example 1: Impacted Hosts or Applications

The manager in a Business Unit has called the SAN administrator to complain that the application they are running is performing poorly that day.

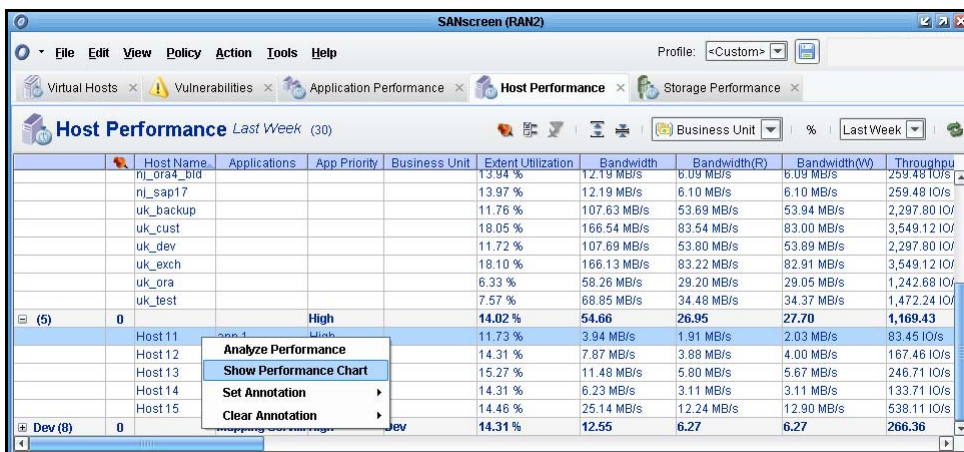
Summary of the Process

A SAN administrator uses the SANscreen array performance for Application Insight to analyze and address the problem. The steps below summarize the process that will provide a SAN administrator with knowledge about where the source of the problem can be, especially whether the problem is caused by the application itself. These steps are then illustrated specifically by array performance for Application Insight views on subsequent pages.

Performing the Steps

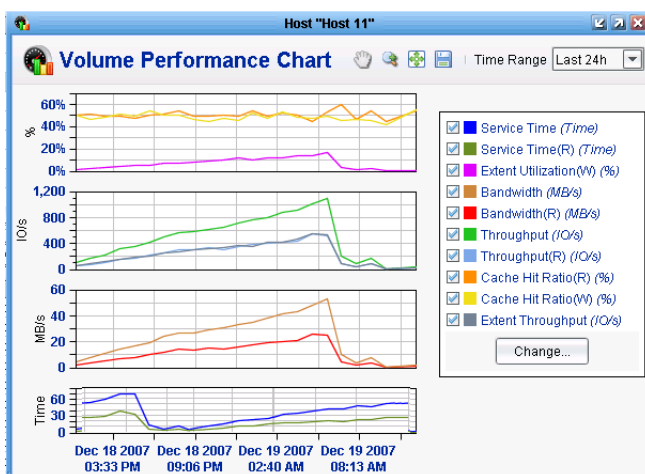
Using the Array Performance Views

1. The Host Performance view lists all hosts. Look at a server in Host Performance (in this case Host 11), and right-click on the view to access the associated Performance Chart:



The chart can indicate whether something has changed in the SAN that might have caused the degradation.

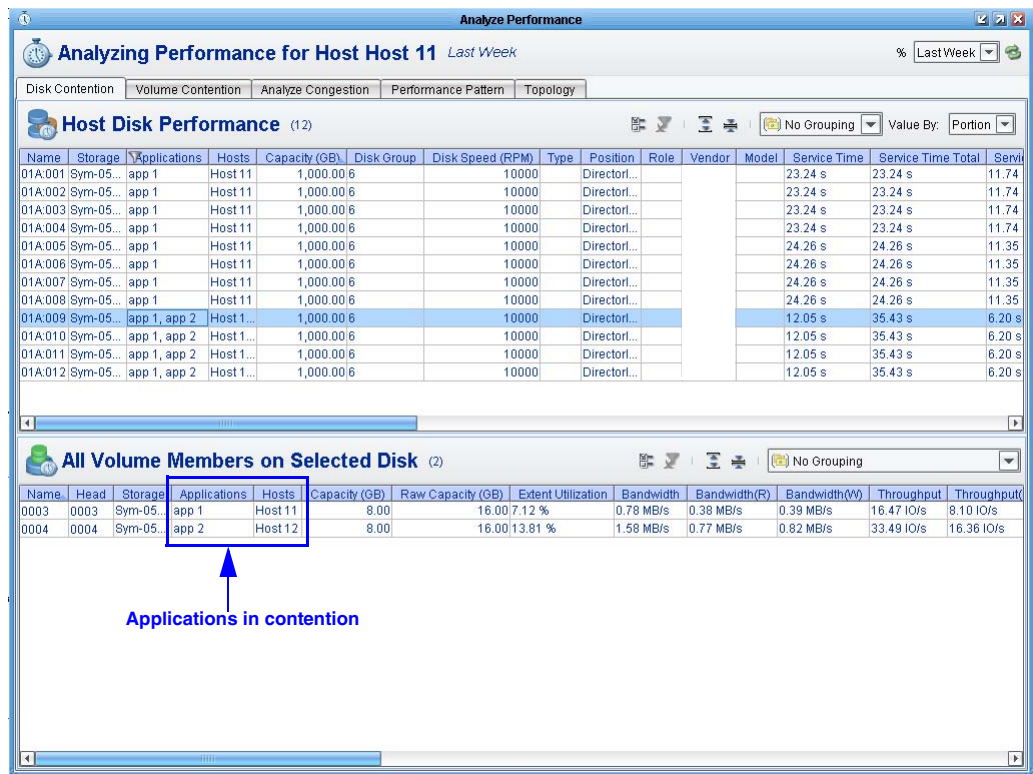
Is there a pattern change visible in the chart for **Host 11**, a sudden shift in the metrics? If so, it means that some event on the application or host needs to be studied.



2. Go into Analyze Performance and discover a change at the application level that is causing the poor performance. That performance criteria can be analyzed using the Host Performance main table, the Disk Contention tab and All Volume Members on a Selected Disk detail pane:

Example 1: Impacted Hosts or Applications

3. By right-clicking on Analyze Performance in the Host Performance main table, you can look at additional information using the **Disk Contention** tab for the same host and the **All Volume Members on a Selected Disk** detail pane:



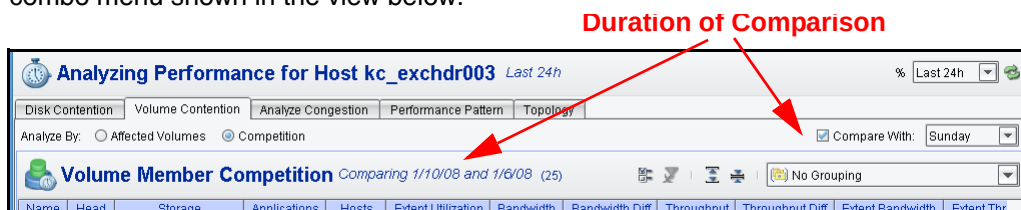
The volume members for a single volume should all reside on different disks, and that is the case in the view shown. But what is also shown is that applications on Host 11 and Host 12 are in possible contention for the same disk resources. A change that has occurred at the application level is causing the poor performance.

Note

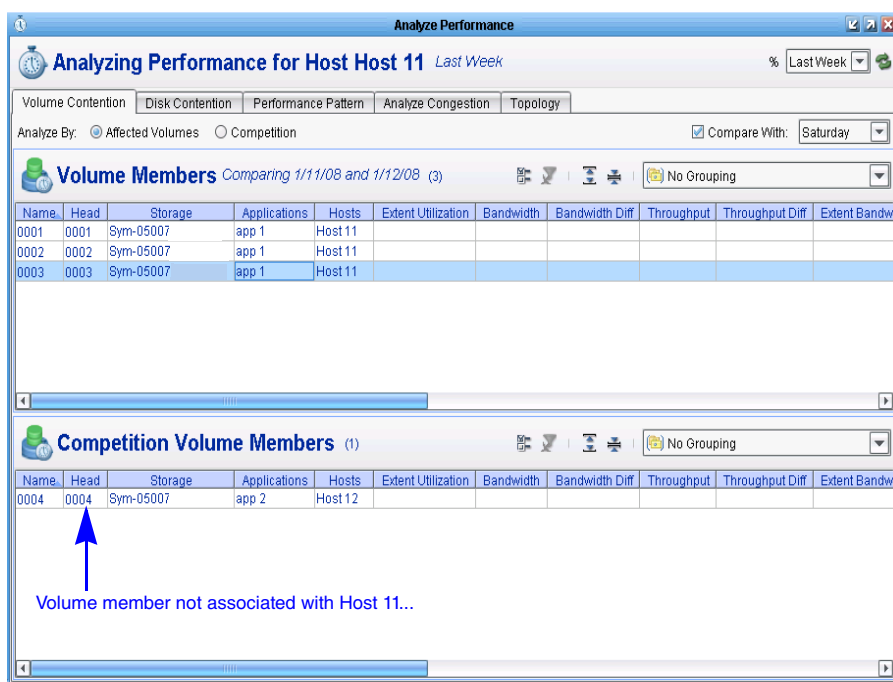
At this point, IT must explore the actual application problem--but array performance in Application Insight has isolated its location and eliminated hosts as sources for the performance degradation.

Volume Contention View--Competing Members

Performance must also be further analyzed by viewing the *Volume Contention* tab, showing Volume Members and Competing Volume Members (**volume members that are not associated with the host**) on the same disk. The data can be compared between two dates in time to see what has changed in the interval--which assists in revealing a potential problem by using the comparison combo menu shown in the view below:



In this view, the highlighted app1 on Volume Member 0003 (Host 11) is shown to be in competition for disk space with app2 on Volume Member 0004/Host 12:



What does this measure? *It shows lost resource time if volumes are competing where host volumes reside.* The SAN administrator can see all volumes that are affected.

Volume Contention View--Comparison

Much more information is available to analyze performance characteristics and establish possible causes for contention. If there are increases and differences in bandwidth for the volumes, that information is also provided in the Volume Contention view.

In the example below, Extent Utilization for Volume Member 0003 has increased by 15.38% over the time period selected. Bandwidth and throughput show the percentage difference over the same period of time for the volume, though the information is relative to general usage, which in both cases represents a small output.

Volume Contention					Disk Contention					Performance Pattern					Analyze Congestion					Topology				
Analyze By: ☒ Affected Volumes ☐ Competition																				☒ Compare With: Wednesday				
 Volume Members Comparing 1/17/08 and 1/16/08 (3)     No Grouping																								
Name		Head		Storage		Applications		Hosts		Extent Utilization		Bandwidth		Bandwidth Diff		Throughput		Throughput Diff		Extent Bandwidth		Extent Throu		
0001		0001		Sym-05007		app 1		Host 11		15.38%		-7.07%		-0.11 MB/s		-3.33%		-1.09 IO/s		12.21%		15.62%		
0002		0002		Sym-05007		app 1		Host 11		-8.11%		-2.28%		-0.03 MB/s		-3.33%		-1.09 IO/s		-7.17%		-8.18%		
0003		0003		Sym-05007		app 1		Host 11		-17.35%		-6.12%		-0.05 MB/s		-5.78%		-0.91 IO/s		-18.35%		-17.27%		

The view also displays a differential in Service Time for Volume 0003:

Extent Service Time	Extent Service Time Diff
20.40%	8.78 s
-4.12%	-1.99 s
-13.76%	-3.37 s

The 8.73% increase represents greater use of the disk, which has the potential for causing bottle-necks and disk access problems for other applications.

Note

Depending on the column data selected and the days/hours that are compared, there can also be negative percentages showing for any of the parameters, indicating a reduction in activity. Service Time shows a sharp decrease in this example. This would display also on the associated Performance Chart:

Extent Service Time	Extent Service Time Diff
-42.90%	-39.88 s
-43.84%	-42.54 s
-44.95%	-21.67 s

Example: Impacted Hosts or Applications

The manager in a Business Unit has called the SAN administrator to complain that the application they are running is performing poorly that day, 4/20. The primary goal is to find out what is responsible for the performance degradation. It could be that an application's use of storage resources has increased significantly. It could also mean that an application has begun running very slowly because another application is consuming more shared resources than before.

As SAN administrator uses array performance to analyze a potential contention problem in a fast and convenient way by isolating the location and source of the delay, using the following steps:

1. Open Application Performance and right-click on an application to get the Analyze Performance view.
2. In that view, check the Compare with box in the upper right and select a day that is 24 or 48 hours earlier. SANscreen will compare the results for each day to see if any contention can be detected. For example, a Volume Member 0003 on an application named "app 1" has the current date of 4/20--this is compared with two days previous, 4/18:

This comparison could show changes in performance for Volume Member 0003 because another Volume Member using a different application is consuming resources at a faster rate. For example, the throughput for Volume Member 0003 fell by 86.84% between the selected days, which should be the source of the performance issue on the application. By examining the Competition Volume Members view, you find there is another volume member competing with 0003 and that volume member increased its throughput dramatically.

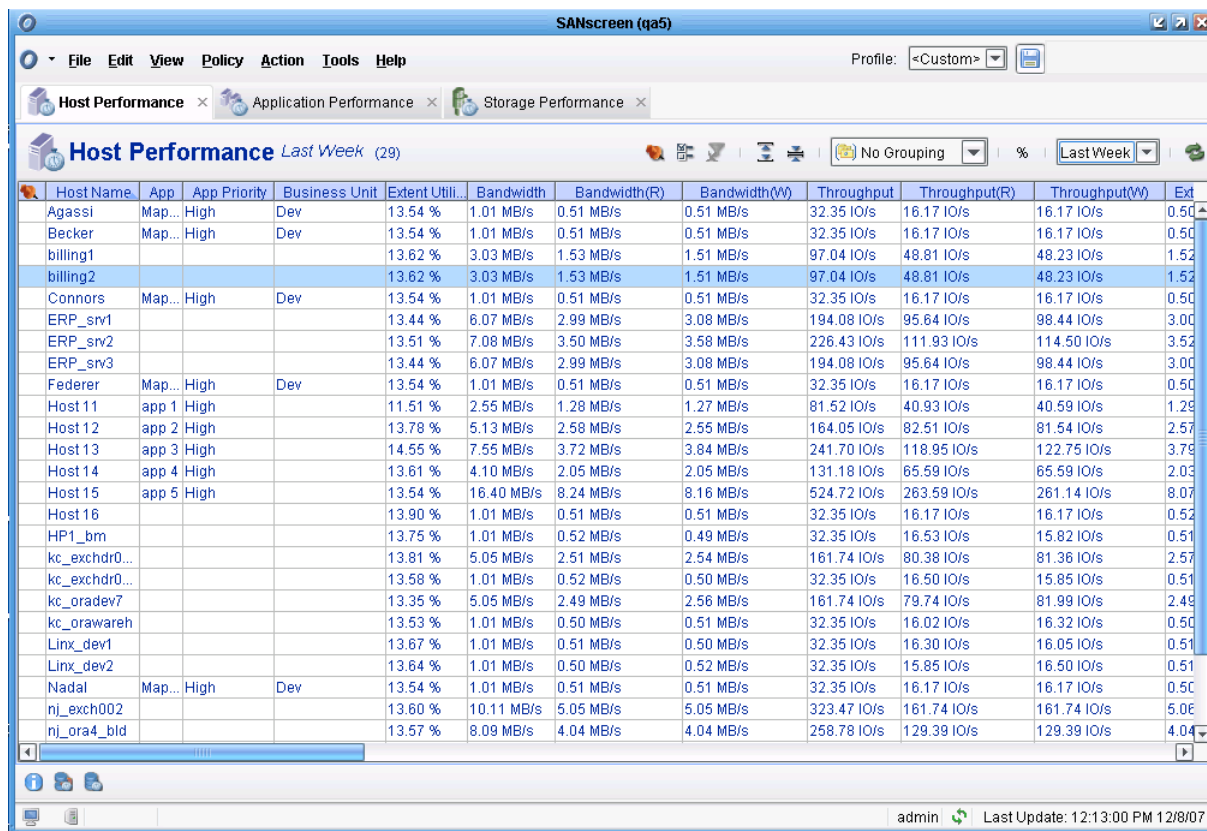
Why compare? If the SAN administrator knows the normal behavior for an application, he or she can quickly detect variations and performance degradation over specified periods of time. ***At a glance, using array performance views, you can see how much of the available resources your application is using and whether the impact of this usage is positive or negative.***

Once array performance has supplied this critical information, the SAN administrator can keep the list of Competing Volume Members and then investigate why the values have changed so much. SANscreen enables this investigation through its Capacity Manager feature (see the Capacity Manager User Guide), which collects data on the size and space requirements for all arrays. Using Capacity Manager, the administrator can move applications that are in contention to disks that have more room and allow expansion without sacrificing performance.

Host Performance

Host Performance Main Table

The Host Performance main table in the array performance identifies all hosts that are consuming array resources. Using this table, you can view and analyze performance characteristics using the extensive columns of metrics provided. The metrics also allow you to sort and identify the hosts that generate the most IO/s, to assist proactive distribution of capacity.



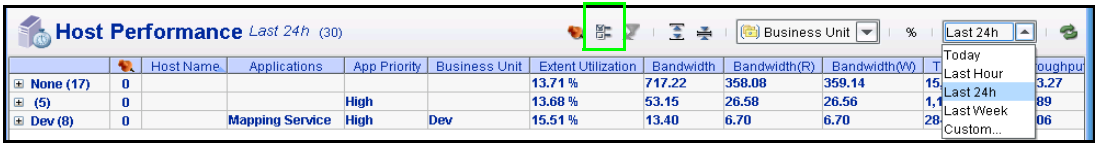
The screenshot shows the SANscreen (qa5) application window with the 'Host Performance' tab selected. The table displays performance metrics for 29 hosts over the last week. The columns include Host Name, App, App Priority, Business Unit, Extent Util., Bandwidth, Bandwidth(R), Bandwidth(W), Throughput, Throughput(R), Throughput(W), and Ext. The data is sorted by Extent Util. in descending order.

Host Name	App	App Priority	Business Unit	Extent Util.	Bandwidth	Bandwidth(R)	Bandwidth(W)	Throughput	Throughput(R)	Throughput(W)	Ext
Agassi	Map...	High	Dev	13.54 %	1.01 MB/s	0.51 MB/s	0.51 MB/s	32.35 IO/s	16.17 IO/s	16.17 IO/s	0.50
Becker	Map...	High	Dev	13.54 %	1.01 MB/s	0.51 MB/s	0.51 MB/s	32.35 IO/s	16.17 IO/s	16.17 IO/s	0.50
billing1				13.62 %	3.03 MB/s	1.53 MB/s	1.51 MB/s	97.04 IO/s	48.81 IO/s	48.23 IO/s	1.52
billing2				13.62 %	3.03 MB/s	1.53 MB/s	1.51 MB/s	97.04 IO/s	48.81 IO/s	48.23 IO/s	1.52
Connors	Map...	High	Dev	13.54 %	1.01 MB/s	0.51 MB/s	0.51 MB/s	32.35 IO/s	16.17 IO/s	16.17 IO/s	0.50
ERP_srv1				13.44 %	6.07 MB/s	2.99 MB/s	3.08 MB/s	194.08 IO/s	95.64 IO/s	98.44 IO/s	3.00
ERP_srv2				13.51 %	7.08 MB/s	3.50 MB/s	3.58 MB/s	226.43 IO/s	111.93 IO/s	114.50 IO/s	3.52
ERP_srv3				13.44 %	6.07 MB/s	2.99 MB/s	3.08 MB/s	194.08 IO/s	95.64 IO/s	98.44 IO/s	3.00
Federer	Map...	High	Dev	13.54 %	1.01 MB/s	0.51 MB/s	0.51 MB/s	32.35 IO/s	16.17 IO/s	16.17 IO/s	0.50
Host 11	app 1	High		11.51 %	2.55 MB/s	1.28 MB/s	1.27 MB/s	81.52 IO/s	40.93 IO/s	40.59 IO/s	1.28
Host 12	app 2	High		13.78 %	5.13 MB/s	2.58 MB/s	2.55 MB/s	164.05 IO/s	82.51 IO/s	81.54 IO/s	2.57
Host 13	app 3	High		14.55 %	7.55 MB/s	3.72 MB/s	3.84 MB/s	241.70 IO/s	118.95 IO/s	122.75 IO/s	3.78
Host 14	app 4	High		13.61 %	4.10 MB/s	2.05 MB/s	2.05 MB/s	131.18 IO/s	65.59 IO/s	65.59 IO/s	2.03
Host 15	app 5	High		13.54 %	16.40 MB/s	8.24 MB/s	8.16 MB/s	524.72 IO/s	263.59 IO/s	261.14 IO/s	8.07
Host 16				13.90 %	1.01 MB/s	0.51 MB/s	0.51 MB/s	32.35 IO/s	16.17 IO/s	16.17 IO/s	0.52
HP1_bm				13.75 %	1.01 MB/s	0.52 MB/s	0.49 MB/s	32.35 IO/s	16.53 IO/s	15.82 IO/s	0.51
kc_exchdr0...				13.81 %	5.05 MB/s	2.51 MB/s	2.54 MB/s	161.74 IO/s	80.38 IO/s	81.36 IO/s	2.57
kc_exchdr0...				13.58 %	1.01 MB/s	0.52 MB/s	0.50 MB/s	32.35 IO/s	16.50 IO/s	15.85 IO/s	0.51
kc_oradev7				13.35 %	5.05 MB/s	2.49 MB/s	2.56 MB/s	161.74 IO/s	79.74 IO/s	81.99 IO/s	2.48
kc_orawareh				13.53 %	1.01 MB/s	0.50 MB/s	0.51 MB/s	32.35 IO/s	16.02 IO/s	16.32 IO/s	0.50
Linx_dev1				13.67 %	1.01 MB/s	0.51 MB/s	0.50 MB/s	32.35 IO/s	16.30 IO/s	16.05 IO/s	0.51
Linx_dev2				13.64 %	1.01 MB/s	0.50 MB/s	0.52 MB/s	32.35 IO/s	15.85 IO/s	16.50 IO/s	0.51
Nadal	Map...	High	Dev	13.54 %	1.01 MB/s	0.51 MB/s	0.51 MB/s	32.35 IO/s	16.17 IO/s	16.17 IO/s	0.50
nj_exch002				13.60 %	10.11 MB/s	5.05 MB/s	5.05 MB/s	323.47 IO/s	161.74 IO/s	161.74 IO/s	5.06
nj_ora4_bld				13.57 %	8.09 MB/s	4.04 MB/s	4.04 MB/s	258.78 IO/s	129.39 IO/s	129.39 IO/s	4.04

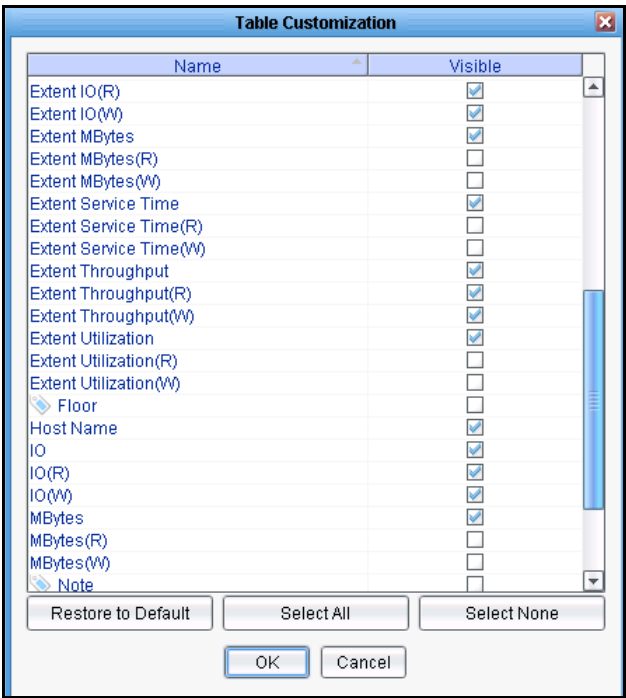
Hiding Columns in Host Performance Table Display

You can hide any combination of columns that are available for display in a table. To do this:

- 1. First click the Customize icon  (outlined below in green) to open the Table Customization pane:



Host Performance <i>Last 24h (30)</i>									
	Host Name	Applications	App Priority	Business Unit	Extent Utilization	Bandwidth	Bandwidth(R)	Bandwidth(W)	
None (17)	0				13.71 %	717.22	358.08	359.14	15
(5)	0		High		13.68 %	53.15	26.58	26.56	1.1
Dev (8)	0	Mapping Service	High	Dev	15.51 %	13.40	6.70	6.70	28



Name	Visible
Extent IO(R)	☒
Extent IO(W)	☒
Extent MBytes	☒
Extent MBytes(R)	☐
Extent MBytes(W)	☐
Extent Service Time	☒
Extent Service Time(R)	☐
Extent Service Time(W)	☐
Extent Throughput	☒
Extent Throughput(R)	☒
Extent Throughput(W)	☒
Extent Utilization	☒
Extent Utilization(R)	☐
Extent Utilization(W)	☐
Floor	☐
Host Name	☒
IO	☒
IO(R)	☒
IO(W)	☒
MBytes	☒
MBytes(R)	☐
MBytes(W)	☐
Note	☐

Restore to Default

Select All

Select None

OK

Cancel

- 2. Click in the Visible cell for each field to mark/unmark the box. Checked fields will display in the table.

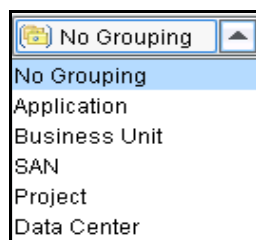
Adjusting and Restoring Column Order

You can drag and drop columns to view the data you want. To restore the default column order, use the Table Customization pane shown above. Click the **Restore to Default** link at the bottom.

Grouping Table Data

The Host Performance view can be toggled to show percentages for the data. It also lets you establish a time duration and sort the arrays using several grouping patterns to classify the detailed data presented:

	Host Name	Applications	App Priority	Business Unit	Extent Utilization	Bandwidth	Bandwidth(R)	Bandwidth(W)	
None (17)	0				13.71 %	717.22	358.08	359.14	100%
(5)	0		High		13.68 %	53.15	26.58	26.56	100%
Dev (8)	0	Mapping Service	High	Dev	15.51 %	13.40	6.70	6.70	20%



With **No Grouping**, the detailed data is presented one row per item. If you choose anything other than No Grouping, SANscreen adds a column to the left of the table that organizes the data according to the selected grouping format. (The number in parentheses after each grouping level indicates the number of detailed items reported in that grouped row).

Host Performance Column Descriptions

Host Name	Name of Host on the Network
App	Type of application
App Priority	How important the application or service is that resides on the Host
Business Unit	Business unit which owns the application or service that resides on the Host
Extent Utilization	The total percentage of post-cache Service Time used for Read and Write requests out of the available Sample Time
Extent Utilization (R)	The percentage of post-cache Service Time used for Read requests out of the available Sample Time
Extent Utilization (W)	The percentage of post-cache Service Time used for Write requests out of the available Sample Time
Bandwidth Total	Amount of data that is being transmitted in a fixed amount of time in response to IO service requests (measured in MB per sec)
Bandwidth (R)	Amount of Read data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)

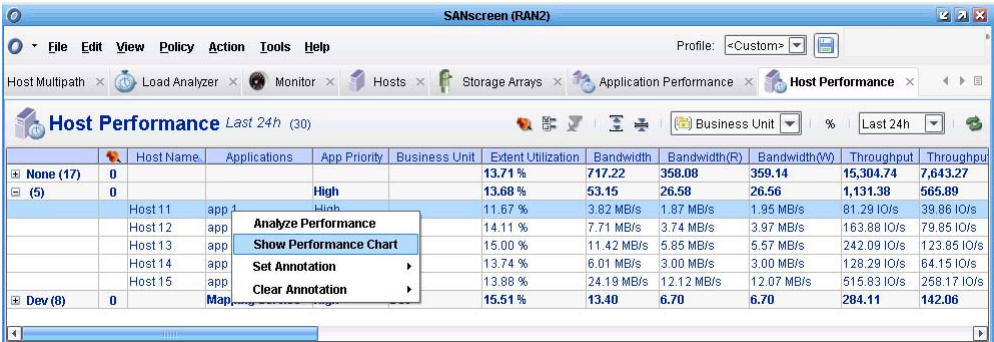
Bandwidth (W)	Amount of Write data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)
Throughput	Measures the total number of Read/Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Throughput (R)	Measures the number of Read IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Throughput (W)	Measures the number of Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Extent Bandwidth	Amount of post-cache data that is being transmitted in a fixed amount of time in response to IO service requests (measured in MB per sec)
Extent Bandwidth (R)	Amount of post-cache Read data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)
Extent Bandwidth (W)	Amount of post-cache Write data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)
Extent Throughput	Measures the total number of post-cache Read/Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Extent Throughput (R)	Measures the number of post-cache Read IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Extent Throughput (W)	Measures the number of post-cache Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Extent Service Time	The post-cache total amount of time a device uses to service a request. This is automatically calculated using the seek time, latency and Read/Write data
Extent Service Time (R)	The post-cache amount of time a device uses to service a Read request. This is automatically calculated using the seek time, latency and Read data
Extent Service Time (W)	The post-cache amount of time a device uses to service a Write request. This is automatically calculated using the seek time, latency and Write data
IO	Total number of IO operations
IO (R)	Total number of Read IO operations
IO (W)	Total number of Write IO operations
MBytes	Number of megabytes read and written since last sample collected
MBytes (R)	Number of megabytes read since last sample collected
MBytes (W)	Number of megabytes written since last sample collected

Response Time	The average time it takes for the volume to respond to an IO request, in milliseconds
Response Time (R)	The average time it takes for the volume to respond to a Read IO request, in milliseconds
Response Time (W)	The average time it takes for the volume to respond to a Write IO request, in milliseconds
Extent IO	Total post-cache number of IO operations
Extent IO (R)	Post-cache number of Read IO operations
Extent IO (W)	Post-cache number of Write IO operations
Extent MBytes	Total number of post-cache megabytes read and written since last sample collected
Extent MBytes (R)	Number of post-cache megabytes read since last sample collected
Extent MBytes (W)	Number of post-cache megabytes written since last sample collected
Cache Hit	Total number of times the cache is accessed
Cache Hit (R)	Number of times cache receives Read requests
Cache Hit (W)	Number of times cache receives Write requests
Cache Hit Ratio	Percentage of Read/Write requests that result in cache hits. The higher the number of hits versus accesses to the volume, the better the performance.

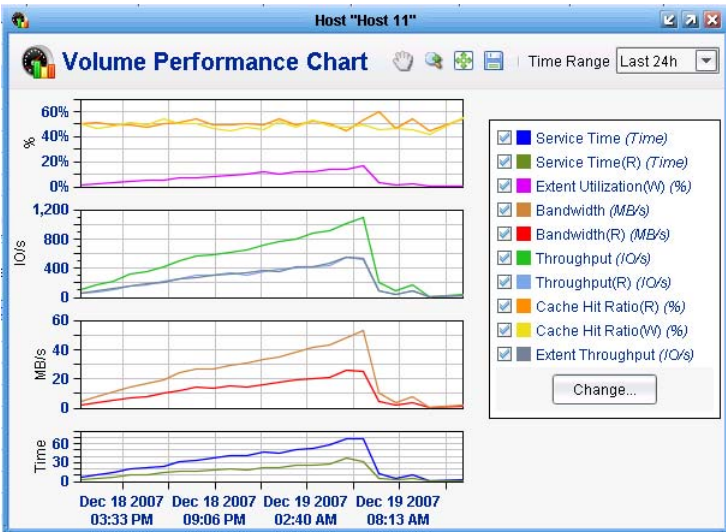
Performance Chart

By accessing a Performance Chart, you can discover possible changes in performance patterns of an array, or see whether there are consistent trends.

You can access the Performance Chart in the Host Performance main table and the Disk Performance and Volume Performance detail panes by right-clicking on the selected host, array or application:



The Performance Chart displays a chart of various performance metrics over a time period 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 performance over time. In the chart above, you can see that the IO/s, MB/s and Time metrics are rising fairly steadily until there is a rapid drop-off. The Extent Utilization also goes down at the same time. The cache hit ratios are relatively constant around 50%.

What do these statistics mean? *The answer varies according to what is configured as normal for your storage operations.* Looking just at the chart for utilization, for example, if you were looking at an exchange server operation, you might see low utilization at night, then see it spike at 8:00 am as everyone logged into

their email. Since that is the pattern, anything diverting from it becomes a signal of a potential problem. Two problems might be that the utilization has been increasing steadily without hitting a flat steady state and also that there was a sudden drop, which could indicate that the application went down at that time.

You can change the time period using the drop-down box in the upper right corner of the Performance Chart pane. The next paragraphs explain several ways to use the chart for optimum benefit.

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 the array performance component:



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



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.

Disk Performance Detail Pane

The Disk Performance detail pane shows all the arrays and corresponding disks that the hosts are using and the metrics necessary to analyze performance:

This information enables you to identify any hosts that are competing for array resources. This can be critical because it helps you know potential contention issues that could arise.

Using Disk Performance, you have visibility at the disk and volume level to determine whether the host represents a non-critical resource. Decisions on tiering and capacity management are both affected by what the metrics reveal.

Disk Performance (291)

No Grouping

Name	Storage	Applications	Hosts	Service Time	Service Time Total	Utilization	Utilization Total	Bandwidth	Bandwidth
01A:000	Sym-05007...		uk_exch	14,094.06 s	14,094.06 s	32.63 %	32.63 %	1.87 MB/s	1.87 MB/s
01A:001	Sym-05007...		uk_backup, uk_cust, uk_ora	15,133.43 s	15,133.43 s	35.03 %	35.03 %	1.88 MB/s	1.88 MB/s
01A:002	Sym-05007...		uk_backup, uk_exch, uk_ora	14,410.84 s	14,410.84 s	33.36 %	33.36 %	1.90 MB/s	1.90 MB/s
01A:003	Sym-05007...		uk_backup, uk_cust, uk_ora	13,641.95 s	13,641.95 s	31.58 %	31.58 %	1.83 MB/s	1.83 MB/s
01A:004	Sym-05007...		uk_cust, uk_exch	15,364.05 s	15,364.05 s	35.56 %	35.56 %	1.76 MB/s	1.76 MB/s
01A:005	Sym-05007...		uk_backup, uk_cust, uk_ora	13,003.85 s	13,003.85 s	30.10 %	30.10 %	1.85 MB/s	1.85 MB/s
01A:006	Sym-05007...		uk_cust, uk_exch	14,561.21 s	14,561.21 s	33.71 %	33.71 %	1.77 MB/s	1.77 MB/s
01A:007	Sym-05007...		uk_backup, uk_exch, uk_ora	13,470.82 s	13,470.82 s	31.18 %	31.18 %	1.83 MB/s	1.83 MB/s
01A:008	Sym-05007...		uk_cust, uk_exch, uk_ora	14,065.31 s	14,065.31 s	32.56 %	32.56 %	1.90 MB/s	1.90 MB/s
01A:009	Sym-05007...		uk_backup, uk_ora	14,686.68 s	14,686.68 s	34.00 %	34.00 %	1.85 MB/s	1.85 MB/s
01A:010	Sym-05007...		uk_backup, uk_cust, uk_exch, uk_ora	13,911.13 s	13,911.13 s	32.20 %	32.20 %	1.80 MB/s	1.80 MB/s
01A:011	Sym-05007...		uk_backup, uk_cust, uk_ora	14,971.30 s	14,971.30 s	34.66 %	34.66 %	1.86 MB/s	1.86 MB/s

Grouping Table Data

The Disk Performance Detail Pane provides the following ways to group the data:



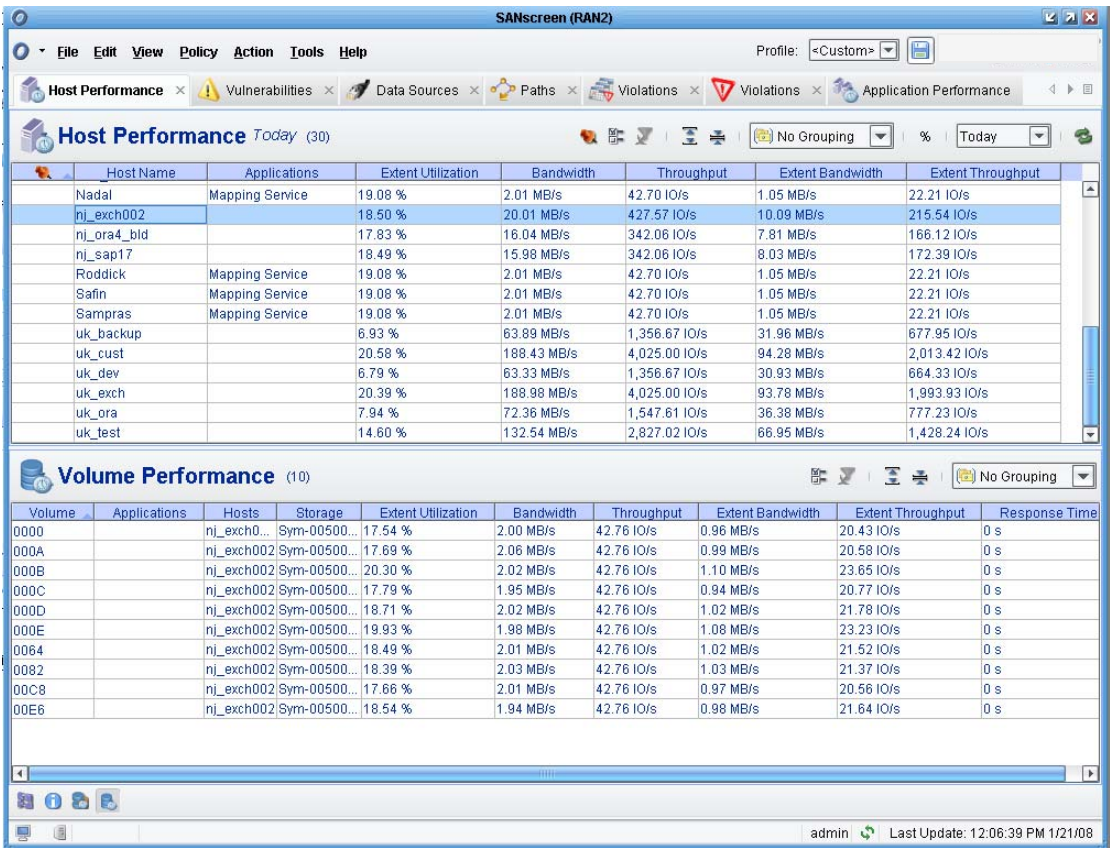
Disk Performance Column Descriptions

Name	Name of the Disk in the array.
Storage	Name of the storage array.
Applications	Name of applications on the array.
Hosts	Name of the Host. There might be more than one Host for a specific volume; in that event, all host names would be comma separated and alphabetically sorted.
Capacity (GB)	Size of the disk that is accessible to host applications, in gigabytes.
Raw Capacity (GB)	Actual raw disk capacity used by the volume. For example, a RAID-5 volume uses extra capacity to prevent failure in case of a single disk failure.
Disk Group	Name of the set of disks that share a common configuration. A disk group contains volumes that must use disks within that disk group.
Disk Speed (RPM)	How quickly the disk can access Read/Write information, in RPMs
Type	Type of Disk
Position	Where the disk is located, e.g. as in Symmetrix: DirectorID-075, Slot 38
Role	Role of Disk
Vendor	Name of Disk vendor
Model	Name of Disk model
Service Time	The portion (or ratio) of the total amount of time a selected host or application uses to service a request
Service Time	The total amount of time a device uses to service a request. This is automatically calculated using the seek time, latency and Read/Write data
Service Time (R)	The amount of time a device uses to service a Read request. This is automatically calculated using the seek time, latency and Read data
Service Time (W)	The amount of time a device uses to service a Write request. This is automatically calculated using the seek time, latency and Write data
Utilization	The portion of the total percentage of pre-cache Service Time used for Read and Write requests out of the available Sample Time.
Utilization Total	The total percentage of pre-cache Service Time used for Read and Write requests out of the available Sample Time
Utilization (R)	The percentage of pre-cache Service Time used for Read requests out of the available Sample Time

Utilization (W)	The percentage of pre-cache Service Time used for Write requests out of the available Sample Time
Bandwidth	Portion of data that is being transmitted in a fixed amount of time in response to IO service requests (measured in MB per sec)
Bandwidth Total	Amount of data that is being transmitted in a fixed amount of time in response to IO service requests (measured in MB per sec)
Bandwidth (R)	Amount of Read data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)
Bandwidth (W)	Amount of Write data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)
Throughput	Measures the portion or ratio of IO service requests by the selected host or application passing through the IO channel per unit of time (measured in IO per sec)
Throughput Total	Measures the total number of Read/Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Throughput (R)	Measures the number of Read IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Throughput (W)	Measures the number of Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Potential Throughput	The maximum throughput value possible from the physical hardware.
IO	Total number of IO operations
IO (R)	Total number of Read IO operations
IO (W)	Total number of Write IO operations
MBytes	Total number of megabytes for R/W since last sample collected
MBytes (R)	Number of megabytes read since last sample collected
MBytes (W)	Number of megabytes written since last sample collected

Volume Performance Detail Pane

The Volume Performance detail pane shows all the volumes that the hosts are using and the metrics necessary to analyze volume performance. This data helps you better utilize capacity and assists in proactive analysis of how the storage resources are being used.



Grouping Table Data

The Volume Performance Detail Pane provides the following ways to group the data:



Volume Performance Column Descriptions

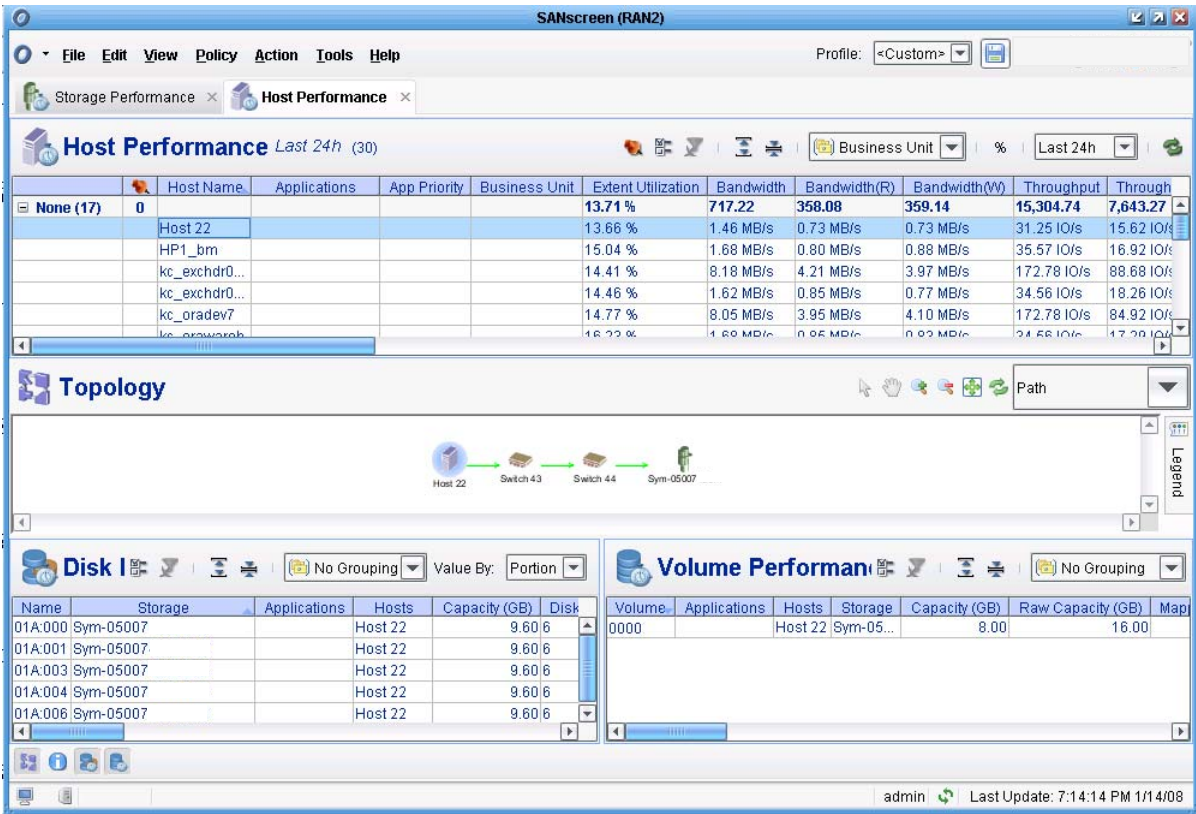
Volume	Name of volume.
Applications	Type of application.
Hosts	Name of the Host. There might be more than one Host for a specific volume; in that event, all host names would be comma separated and alphabetically sorted.
Storage	Name of storage array.
Capacity (GB)	Size of the volume that's accessible to host applications, in gigabytes.
Raw Capacity (GB)	Actual raw disk capacity used by the volume. For example, a RAID-5 volume uses extra capacity to prevent failure in case of a single disk failure.
Mapped Ports	Number of storage ports through which this volume is accessible
Extent Utilization	The total percentage of post-cache Service Time used for Read and Write requests out of the available Sample Time
Extent Utilization (R)	The percentage of post-cache Service Time used for Read requests out of the available Sample Time
Extent Utilization (W)	The percentage of post-cache Service Time used for Write requests out of the available Sample Time
Bandwidth	Amount of data that is being transmitted in a fixed amount of time in response to IO service requests (measured in MB per sec)
Bandwidth (R)	Amount of Read data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)
Bandwidth (W)	Amount of Write data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)
Throughput	Measures the total number of Read/Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Throughput (R)	Measures the number of Read IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Throughput (W)	Measures the number of Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Extent Bandwidth	Amount of post-cache data that is being transmitted in a fixed amount of time in response to IO service requests (measured in MB per sec)
Extent Bandwidth (R)	Amount of post-cache Read data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)
Extent Bandwidth (W)	Amount of post-cache Write data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)

Extent Throughput	Measures the total number of post-cache Read/Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Extent Throughput (R)	Measures the number of post-cache Read IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Extent Throughput (W)	Measures the number of post-cache Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Extent Service Time	The post-cache total amount of time a device uses to service a request. This is automatically calculated using the seek time, latency and Read/Write data
Extent Service Time (R)	The post-cache amount of time a device uses to service a Read request. This is automatically calculated using the seek time, latency and Read data
Extent Service Time (W)	The post-cache amount of time a device uses to service a Write request. This is automatically calculated using the seek time, latency and Write data
IO	Total number of IO operations
IO (R)	Total number of Read IO operations
IO (W)	Total number of Write IO operations
MBytes	Total number of megabytes for R/W since last sample collected
MBytes (R)	Number of megabytes read since last sample collected
MBytes (W)	Number of megabytes written since last sample collected
Extent IO	Total post-cache number of IO operations
Extent IO (R)	Post-cache number of Read IO operations
Extent IO (W)	Post-cache number of Write IO operations
Extent MBytes	Total number of post-cache megabytes read and written since last sample collected
Extent MBytes (R)	Number of post-cache megabytes read since last sample collected
Extent MBytes (W)	Number of post-cache megabytes written since last sample collected
Cache Hit	Number of times cache accessed since the last sample collected
Cache Hit (R)	Number of cache Read requests since the last sample collected
Cache Hit (W)	Number of cache Write requests since the last sample collected

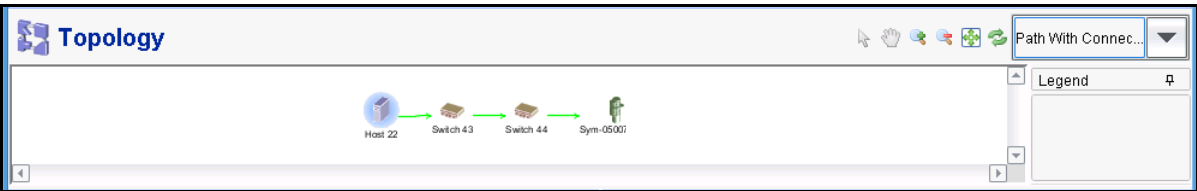
Cache Hit Ratio	Percentage of Read/Write requests that result in cache hits. The higher the number of hits versus accesses to the volume, the better the performance.
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Topology

The Topology pane appears below the Host Performance pane and displays the topology of the Host selected:



The figure below shows a close-up of the topology of a path that connects the host shown on the left, extending the view into the storage array on the right:



With the topology view displayed, the drop-down menu in the upper right corner allows for three options: Closure, Path and Path With Connectivity (see the *Service Insight User Guide* for more detail on these options).

This pane uses icons and graphical elements to visualize the SAN data and analysis. Every SAN device is represented by an icon that represents its device type, while physical connections appear as lines connecting

the icons. When a device icon selected, the detailed device, port, adapter/controller, and link properties are available at a glance, by letting the cursor hover over objects and connections.

Use the other buttons to display details about the component that is currently selected in the topology view.

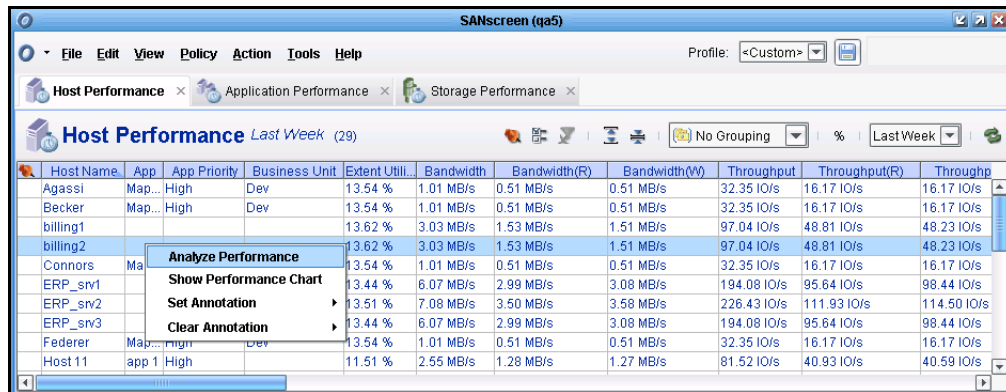
Note

See Chapter 3 in the Service Insight User Guide for more detailed information about the Topology pane in SANscreen.

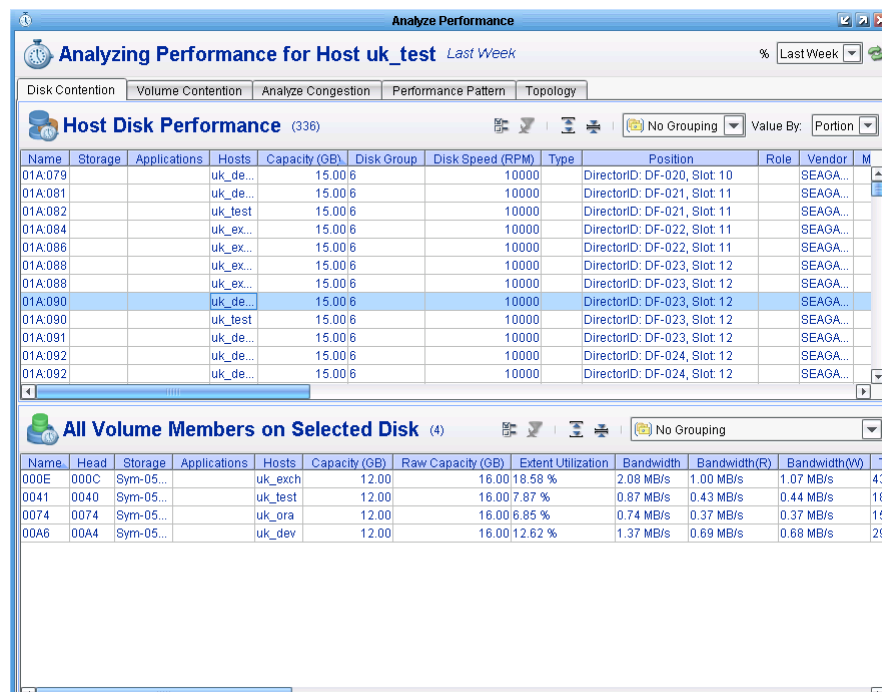
Drilling into the Host Main Table

You can address performance data in greater detail using the Analyze Performance menu option.

1. Right-click on the view to get the popup menu. Select **Analyze Performance**:

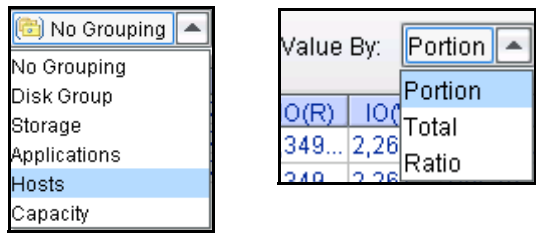


The view that opens contains three tabs: **Disk Contention**, **Volume Contention** and **Performance Pattern**:



Grouping Table Data

The Host Disk Performance main table provides the following ways to group and sort the data (see the “Overview” in this user guide for more detail on these grouping parameters):



Disk Contention Tab

The Disk Contention view helps analyze the reasons for poor performance and where that performance has degraded. Using this view, you can determine if applications are causing performance problems or if it is something else. For example, the view will show whether hosts and applications are in contention for space on the disk, a factor that can cause poor performance.

Host Performance Main Table

The view, together with the default All Volume Members on Selected Disks detail pane, also shows whether the volume members for a single volume all reside on different disks (as they should).

The screenshot shows the 'Analyze Performance' window for 'Host billing2' over the 'Last Week'. The 'Host Disk Performance' section displays a table with columns: Name, Storage, Applications, Hosts, Capacity (GB), Disk Group, Disk Speed (RPM), Type, Position, Role, Vendor, and Model. It lists three disks: 01A-000, 01A-001, and 01A-002, all with a capacity of 1,000.00 GB and a speed of 10,000 RPM.

The 'All Volume Members on Selected Disks' section displays a table with columns: Name, Head, Storage, Applications, Hosts, Capacity (GB), Raw Capacity (GB), Extent Utilization, Bandwidth, and Bandwidth(R). It lists 14 volume members (0002 to 0021) with various capacities and utilization percentages.

Name	Storage	Applications	Hosts	Capacity (GB)	Disk Group	Disk Speed (RPM)	Type	Position	Role	Vendor	Model
01A-000	Sym-00...	ERP...	ERP...	1,000.00	6	10000		Directorl...		SEAGA...	
01A-001	Sym-00...	ERP...	ERP...	1,000.00	6	10000		Directorl...		SEAGA...	
01A-002	Sym-00...	ERP...	ERP...	1,000.00	6	10000		Directorl...		SEAGA...	

Name	Head	Storage	Applications	Hosts	Capacity (GB)	Raw Capacity (GB)	Extent Utilization	Bandwidth	Bandwidth(R)
0002	0002	Sym-00...	ERP...	ERP...	80.00	160.00	13.97 %	1.01 MB/s	0.51 MB/s
000C	000C	Sym-00...	ERP...	ERP...	320.00	640.00	13.29 %	1.01 MB/s	0.48 MB/s
0010	0010	Sym-00...	ERP...	ERP...	80.00	160.00	13.07 %	1.01 MB/s	0.52 MB/s
0014	0014	Sym-00...	ERP...	ERP...	160.00	320.00	13.39 %	1.01 MB/s	0.50 MB/s
0018	0018	Sym-00...	ERP...	ERP...	160.00	320.00	13.88 %	1.01 MB/s	0.50 MB/s
0019	0019	Sym-00...	billing...	billing...	160.00	320.00	13.77 %	1.01 MB/s	0.51 MB/s
001C	001C	Sym-00...	ERP...	ERP...	320.00	640.00	13.57 %	1.01 MB/s	0.48 MB/s
001D	001D	Sym-00...	billing...	billing...	640.00	1,280.00	13.44 %	1.01 MB/s	0.52 MB/s
0020	0020	Sym-00...	ERP...	ERP...	80.00	160.00	13.50 %	1.01 MB/s	0.51 MB/s
0021	0021	Sym-00...	billing...	billing...	80.00	160.00	13.59 %	1.01 MB/s	0.49 MB/s

All Volume Members on Selected Disks

A volume is made up of one or more volume members:

This screenshot shows a detailed view of the 'All Volume Members on Selected Disks' table. It lists 14 volume members (0002 to 0021) with columns for Name, Head, Storage, Applications, Hosts, Capacity (GB), Raw Capacity (GB), Extent Utilization, Bandwidth, and Bandwidth(R). The data is consistent with the table in the previous screenshot.

Name	Head	Storage	Applications	Hosts	Capacity (GB)	Raw Capacity (GB)	Extent Utilization	Bandwidth	Bandwidth(R)
0002	0002	Sym-00...	ERP...	ERP...	80.00	160.00	13.97 %	1.01 MB/s	0.51 MB/s
000C	000C	Sym-00...	ERP...	ERP...	320.00	640.00	13.29 %	1.01 MB/s	0.48 MB/s
0010	0010	Sym-00...	ERP...	ERP...	80.00	160.00	13.07 %	1.01 MB/s	0.52 MB/s
0014	0014	Sym-00...	ERP...	ERP...	160.00	320.00	13.39 %	1.01 MB/s	0.50 MB/s
0018	0018	Sym-00...	ERP...	ERP...	160.00	320.00	13.88 %	1.01 MB/s	0.50 MB/s
0019	0019	Sym-00...	billing...	billing...	160.00	320.00	13.77 %	1.01 MB/s	0.51 MB/s
001C	001C	Sym-00...	ERP...	ERP...	320.00	640.00	13.57 %	1.01 MB/s	0.48 MB/s
001D	001D	Sym-00...	billing...	billing...	640.00	1,280.00	13.44 %	1.01 MB/s	0.52 MB/s
0020	0020	Sym-00...	ERP...	ERP...	80.00	160.00	13.50 %	1.01 MB/s	0.51 MB/s
0021	0021	Sym-00...	billing...	billing...	80.00	160.00	13.59 %	1.01 MB/s	0.49 MB/s

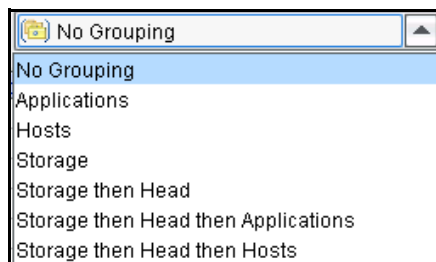
The Head volume member is the one that is shown as the volume in all other views. For example, you could have volume members A, B, C and D. They all have “A” as the Head volume member. Then Volume A will show up elsewhere, but B, C and D will not.

You are able to investigate what volume members comprise Volume A and the performance characteristics of each individual member (such as the bandwidth increasing). Volume members should reside on different disks and so therefore should have different performance characteristics.

This means that a volume’s performance is a “summary” of the performance of the individual volume members that comprise it.

Grouping Table Data

The All Volume Members on Selected Disk Detail Pane provides the following ways to group the data:



All Volume Members on Selected Disk

Name	Name of Volume Member
Head	The lead volume that is the only one exposed to the view; the volumes linked to it are consolidated into one meta volume.
Storage	Name of storage array.
Applications	Type of applications
Hosts	Name of the Host. There might be more than one Host for a specific volume; in that event, all host names would be comma separated and alphabetically sorted.
Capacity (GB)	Size of the volume that's accessible to host applications, in gigabytes.
Raw Capacity (GB)	Actual raw disk capacity used by the volume. For example, a RAID-5 volume uses extra capacity to prevent failure in case of a single disk failure.
Extent Utilization	The total percentage of post-cache Service Time used for Read and Write requests out of the available Sample Time
Extent Utilization (R)	The percentage of post-cache Service Time used for Read requests out of the available Sample Time
Extent Utilization (W)	The percentage of post-cache Service Time used for Write requests out of the available Sample Time
Bandwidth Total	Amount of data that is being transmitted in a fixed amount of time in response to IO service requests (measured in MB per sec)
Bandwidth (R)	Amount of Read data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)
Bandwidth (W)	Amount of Write data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)
Extent Throughput	Measures the total number of post-cache Read/Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Extent Throughput (R)	Measures the number of post-cache Read IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Extent Throughput (W)	Measures the number of post-cache Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Extent Service Time	The post-cache total amount of time a device uses to service a request. This is automatically calculated using the seek time, latency and Read/Write data
Extent Service Time (R)	The post-cache amount of time a device uses to service a Read request. This is automatically calculated using the seek time, latency and Read data

Extent Service Time (W)	The post-cache amount of time a device uses to service a Write request. This is automatically calculated using the seek time, latency and Write data
IO	Total number of IO operations
IO (R)	Total number of Read IO operations
IO (W)	Total number of Write IO operations
MBytes	Total number of megabytes for R/W since last sample collected
MBytes (R)	Number of megabytes read since last sample collected
MBytes (W)	Number of megabytes written since last sample collected
Response Time	The average time it takes for the volume to respond to an IO request, in milliseconds
Response Time (R)	The average time it takes for the volume to respond to a Read IO request, in milliseconds
Response Time (W)	The average time it takes for the volume to respond to a Write IO request, in milliseconds
Extent IO	Total post-cache number of IO operations
Extent IO (R)	Post-cache number of Read IO operations
Extent IO (W)	Post-cache number of Write IO operations
Extent MBytes	Total number of post-cache megabytes read and written since last sample collected
Extent MBytes (R)	Number of post-cache megabytes read since last sample collected
Extent MBytes (W)	Number of post-cache megabytes written since last sample collected
Cache Hit	Number of times cache accessed since the last sample collected
Cache Hit (R)	Number of cache Read requests since the last sample collected
Cache Hit (W)	Number of cache Write requests since the last sample collected
Cache Hit Ratio	Percentage of Read/Write requests that result in cache hits. The higher the number of hits versus accesses to the volume, the better the performance.

Note

*The table for **All Volume Members on Selected Disks** is also used for two other views: **Volume Members** and **Competition Volume Members**.*

Volume Contention Tab

The Volume Contention view lets you see what volumes are associated with a host that is sharing disk space with other hosts. You can identify which volume members for an application have lost resources or gone down and determine why--by analyzing competing volume members and seeing how resources are being consumed or removed from access.

In this view the data can be compared between two dates in time to see what has changed in the interval--which assists in revealing a potential problem by using the comparison combo menu shown below:

Analyzing Performance for Host uk_test Today

Volume Contention | Disk Contention | Performance Pattern | Analyze Congestion | Topology

Analyze By: ☒ Affected Volumes ☐ Competition

☒ Compare With: Friday

Volume Members Comparing 1/16/08 and 1/18/08 (84)

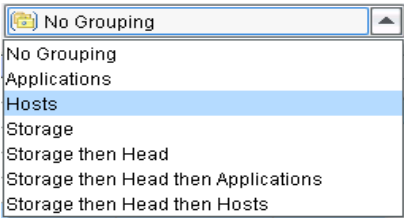
Name	Head	Storage	Applications	Hosts	Extent Utilization	Bandwidth	Bandwidth Diff	Throughput	Throughput Diff	Extent Bandwidth	Extent Throughput
0040	0040	Sym-05007...		uk_test	-4.44%	-9.71%	-0.08 MB/s	-10.63%	-1.81 IO/s	-4.29%	-4.46%
0040	0040	Sym-05007...		uk_test	-21.99%	-20.07%	-0.16 MB/s	-21.21%	-3.63 IO/s	-20.43%	-22.11%
0040	0040	Sym-05007...		uk_test	-6.75%	1.59%	0.01 MB/s	-1.93%	-0.36 IO/s	-4.53%	-6.91%
0041	0040	Sym-05007...		uk_test	-23.23%	-26.43%	-0.22 MB/s	-25.42%	-4.46 IO/s	-24.99%	-23.10%
0041	0040	Sym-05007...		uk_test	-21.23%	-21.75%	-0.18 MB/s	-18.90%	-3.20 IO/s	-23.97%	-21.03%
0041	0040	Sym-05007...		uk_test	4.39%	2.19%	0.02 MB/s	2.36%	0.44 IO/s	3.53%	4.45%
0042	0040	Sym-05007...		uk_test	-19.91%	-16.90%	-0.14 MB/s	-16.55%	-2.87 IO/s	-21.81%	-19.77%
0042	0040	Sym-05007...		uk_test	-28.95%	-26.22%	-0.22 MB/s	-28.30%	-5.11 IO/s	-26.20%	-29.15%
0042	0040	Sym-05007...		uk_test	-6.99%	-2.64%	-0.02 MB/s	-5.70%	-1.04 IO/s	-5.40%	-7.10%
0043	0040	Sym-05007...		uk_test	-6.32%	-11.67%	-0.10 MB/s	-11.30%	-1.98 IO/s	-7.09%	-6.27%
0043	0040	Sym-05007...		uk_test	-20.40%	-12.05%	-0.11 MB/s	-14.98%	-2.84 IO/s	-18.10%	-20.57%
0043	0040	Sym-05007...		uk_test	-7.31%	-5.95%	-0.05 MB/s	-7.20%	-1.35 IO/s	-6.20%	-7.39%
0044	0044	Sym-05007...		uk_test	-7.59%	-7.16%	-0.06 MB/s	-7.49%	-1.29 IO/s	-8.78%	-7.50%

Competition Volume Members (5)

Name	Head	Storage	Applications	Hosts	Extent Utilization	Bandwidth	Bandwidth Diff	Throughput	Throughput Diff	Extent Bandwidth	Extent Throughput	R
000E	000C	Sym-05007...		uk_exch	5.06%	9.03%	0.19 MB/s	6.85%	3.04 IO/s	7.19%	4.90%	0%
0074	0074	Sym-05007...		uk_ora	15.35%	14.22%	0.11 MB/s	14.94%	2.42 IO/s	14.82%	15.39%	0%
0075	0074	Sym-05007...		uk_ora	7.04%	3.74%	0.03 MB/s	8.08%	1.33 IO/s	2.94%	7.34%	0%
00A7	00A4	Sym-05007...		uk_dev	24.50%	21.99%	0.31 MB/s	19.63%	5.90 IO/s	26.17%	24.37%	0%
00A8	00A8	Sym-05007...		uk_dev	17.16%	18.93%	0.27 MB/s	19.63%	5.90 IO/s	16.30%	17.23%	0%

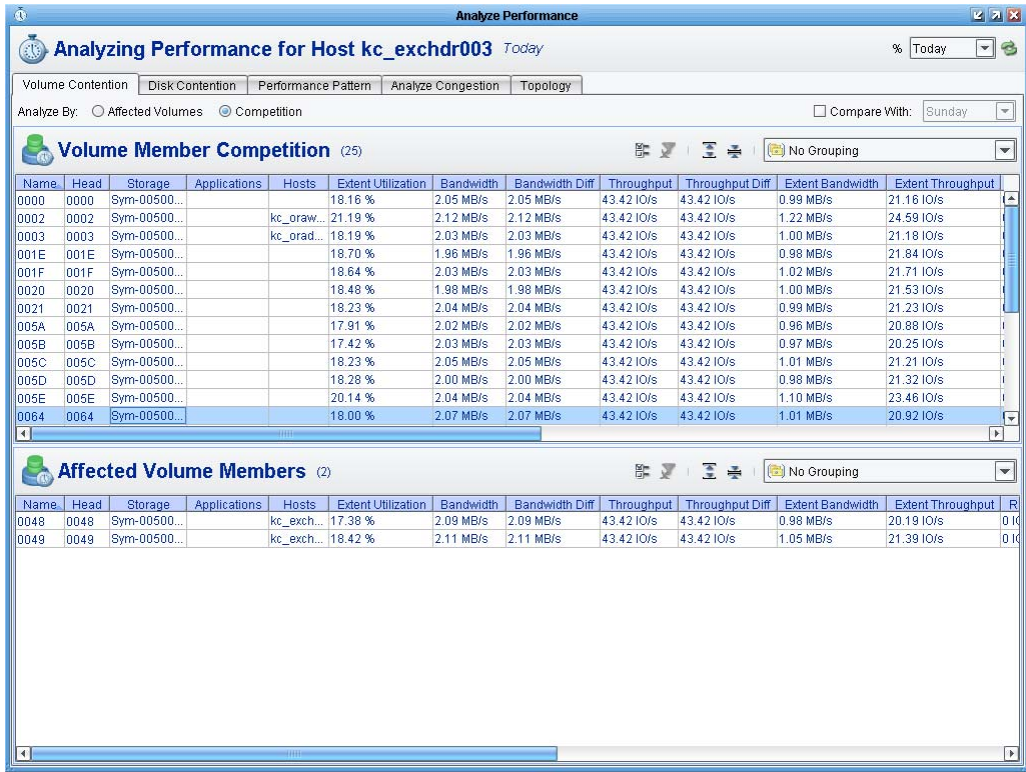
Grouping Table Data

Both the Volume Members main table and Competition Volume Members Detail Pane provide the following ways to group the data:



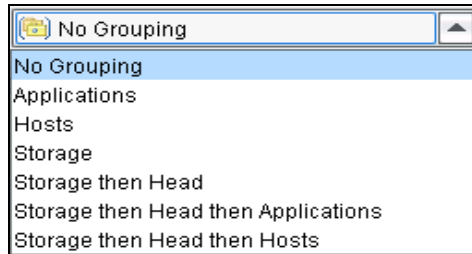
Volume Member Competition

The Volume Member Competition view appears when you have right-clicked on Analyze Performance in the Volume Members view shown on the previous page. This view identifies all volume members in competition that are not associated with the selected host:

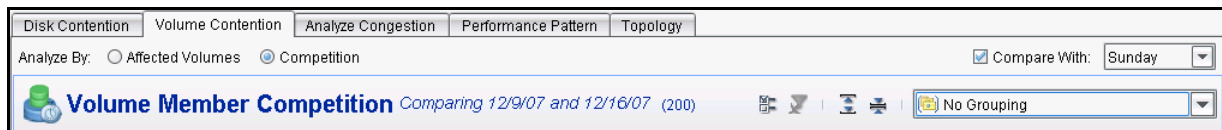


The Affected Volume Members detail pane shows any volume members that are associated with that particular host or application.

Both the Volume Member Competition and Affected Volume Members provide the following ways to group the data:

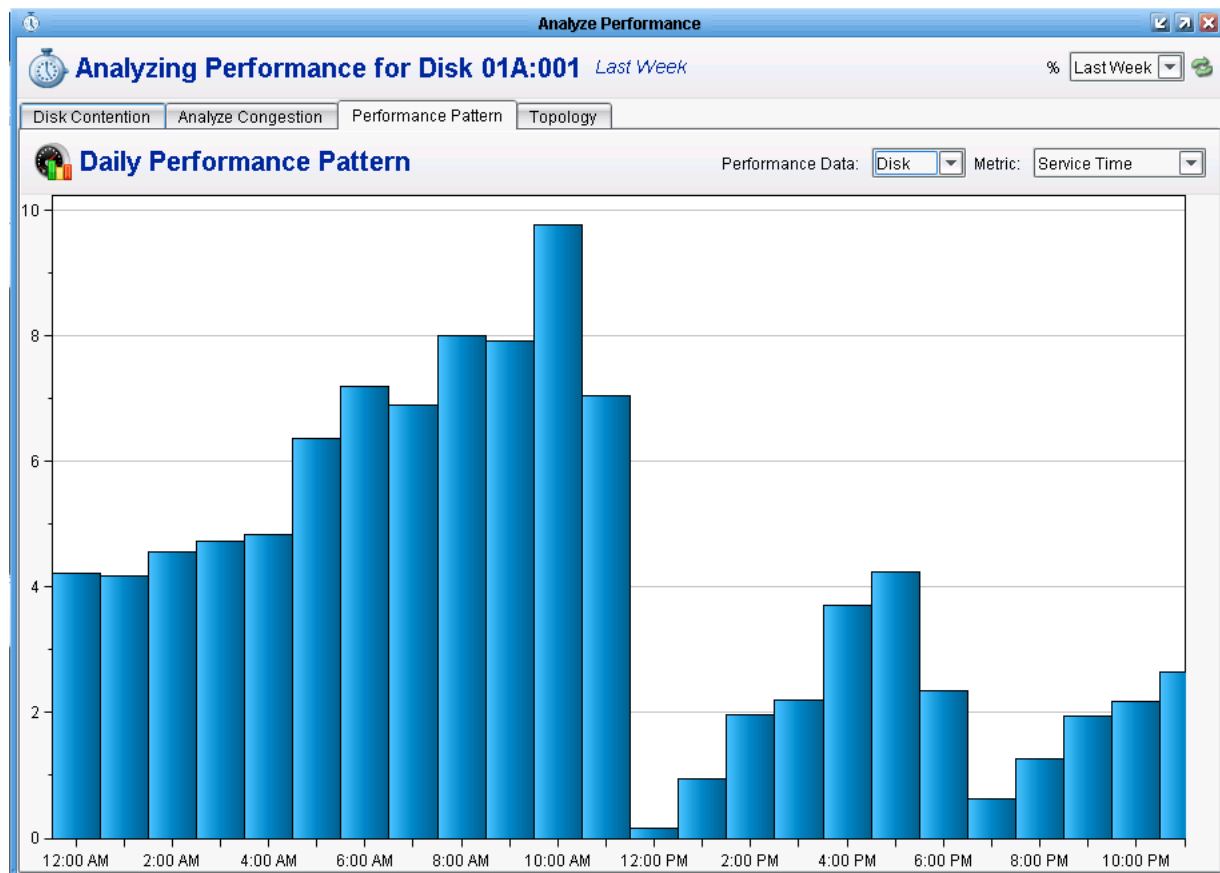


Using Volume Member Competition, as with the Volume Members view, you are also able to view and analyze two different time periods to determine whether problems exist or could potentially exist during the selected intervals:



Daily Performance Pattern Graph

The Daily Performance Pattern graph provides you with the ability to identify the utilization or Service Time for a disk or volume by hour, day, week or by a custom calendar setting. The graph identifies when there are pattern spikes or troughs during a single day and identifies the average hourly results for a given set of days (up to a week).



The Daily Performance Pattern graph shows you in one glance what the utilization percentages are. With this information, you can better make changes to storage allocations based on current usage and determine potential problems because of recurring pattern data.

Grouping Table Data

The Daily Performance Pattern provides the following ways to group the data:

Metric:	Service Time
	Service Time
	Service Time Total
	Service Time(R)
	Service Time(W)
	Utilization
	Utilization Total
	Utilization(R)
	Utilization(W)

Performance Data:	Disk
	Disk
	Volume

Setting and Clearing Annotations

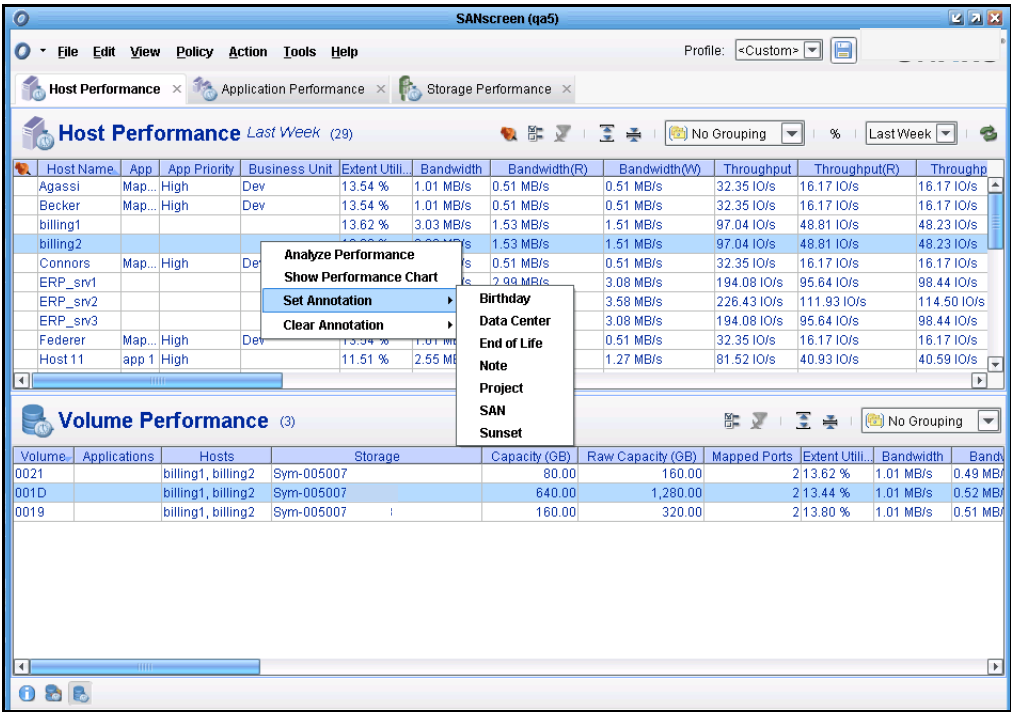
From the Host Performance Main Table, Storage Performance Main Table and the Volume Detail Pane you can set and clear Annotations using the right-click menu:

The screenshot displays the SANScreen (qa5) application interface. The top menu bar includes File, Edit, View, Policy, Action, Tools, and Help. The Profile is set to <Custom>. The Host Performance tab is active, showing a table with columns: Host Name, App, App Priority, Business Unit, Extent Util., Bandwidth, Bandwidth(R), Bandwidth(W), Throughput, Throughput(R), and Throughput(W). The table lists various hosts and their performance metrics for the last week.

Below the Host Performance table is the Volume Performance section, which shows a table with columns: Volume, Applications, Hosts, Storage, Capacity (GB), Raw Capacity (GB), Mapped Ports, Extent Util., Bandwidth, and Bandwidth(W). A right-click context menu is open over the Volume Performance table, displaying the following options:

- Analyze Performance
- Show Performance Chart
- Set Annotation
- Clear Annotation

Available Annotations with the Array Performance Component



Application Performance

Overview

Application Performance lets you analyze performance and availability of applications. You can view the issues in disk and volume access that cause delay, slow response times and the degradation of essential performance metrics.

Applications can suddenly--or slowly over time--change usage patterns. The views in Application Performance can show whether disks have become busier and to what degree, letting the SAN administrator know where analysis is needed to determine what is interfering with performance.

The views can also determine whether another application has affected the performance of one that is being analyzed, thus creating a contention issue that may reveal volumes sharing the same disk and competing for space. The performance of the competing application impacts the performance of the one being analyzed. Application Performance can display which volume members are part of an application *and show all other volumes on the disk at the same time*. Associated performance tools then compare the data for competing applications and can determine if there has been a significant increase in how applications are utilizing storage resources.

This functionality helps the SAN administrator identify where to allocate the next volume for an application to maintain or improve application performance.

Note

*This chapter only provides the views and tables for Application Performance. Array performance in Application Insight uses the same basic procedures in SANscreen for all three components. See the **Host Performance** chapter for a more detailed explanation of those procedures.*

Application Performance Main Table

SANscreen (regina)

FileEditViewPolicyActionToolsHelp

Profile: <Custom>

ApplicationsSwitchesHostsStorage ArraysPathsHost PerformanceApplication Performance

Application PerformanceLast Week (6)

Name	Business Unit	Priority	Extent Utilization	Bandwidth	Throughput	Extent Bandwidth	Extent Throughput	Extent Service Time	IO	MBytes	Extent IO
Mappi...	Dev	High	14.01 %	1.54 MB/s	32.60 IO/s	0.78 MB/s	16.30 IO/s	378.40	17...	833,99...	8,804,488
app 5		High	14.46 %	25.14 MB/s	538.11 IO/s	12.56 MB/s	269.65 IO/s	999.74	46...	2,172,0...	23,297,7
app 4		High	14.31 %	6.23 MB/s	133.71 IO/s	3.10 MB/s	66.71 IO/s	247.28	11...	537,86...	5,763,808
app 3		High	15.27 %	11.48 MB/s	246.71 IO/s	5.81 MB/s	124.53 IO/s	723.39	41...	1,942,2...	21,070,2
app 2		High	14.31 %	7.87 MB/s	167.46 IO/s	3.91 MB/s	83.32 IO/s	484.22	28...	1,331,8...	14,097,6
app 1		High	11.73 %	3.94 MB/s	83.45 IO/s	1.94 MB/s	40.96 IO/s	238.19	14...	666,57...	6,930,008

admin

Last Update: 1:30:21 AM 12/14/07

Grouping Table Data

The Application Performance main table provides the following ways to group the data:

- Last Week
- Today

Last Hour

Last 24h

Last Week

Custom...

Hiding Columns in Application Performance Table Display

You can hide any combination of columns that are available for display in a table. To do this:

- 1. First click the Customize icon  (outlined below in green) to open the Table Customization pane:

Application Performance *Last Week* (6)

%

Last Week

Today

Last Hour

Last 24h

Last Week

Custom...

Name	Business Unit	Priority	Extent Utilization	Bandwidth	Throughput	Extent Bandwidth	Extent Throughput	Extent Service Time	IO	MB	Extent
Mappi...	Dev	High	14.62 %	1.61 MB/s	34.50 IO/s	0.80 MB/s	17.03 IO/s	442.06 s	20...	975...	80,904
app 5		High	13.88 %	24.19 MB/s	515.83 IO/s	12.14 MB/s	258.70 IO/s	959.64 s	44...	2,09...	,049,0
app 4		High	13.74 %	6.01 MB/s	128.29 IO/s	2.99 MB/s	64.01 IO/s	237.35 s	11...	519...	58,374
app 3		High	14.70 %	11.25 MB/s	228.91 IO/s	5.66 MB/s	119.79 IO/s	698.40 s	40	1.00	65,994

Table Customization

Name	Visible
Bandwidth	☒
Bandwidth(R)	☐
Bandwidth(W)	☐
Business Unit	☒
Cache Hit	☒
Cache Hit Ratio	☒
Cache Hit Ratio(R)	☐
Cache Hit Ratio(W)	☐
Cache Hit(R)	☐
Cache Hit(W)	☐
Extent Bandwidth	☒
Extent Bandwidth(R)	☐
Extent Bandwidth(W)	☐
Extent IO	☒
Extent IO(R)	☐
Extent IO(W)	☐
Extent MBytes	☒
Extent MBytes(R)	☐
Extent MBytes(W)	☐
Extent Service Time	☒
Extent Service Time(R)	☐
Extent Service Time(W)	☐
Extent Throughput	☒

Restore to Default

Select All

Select None

OK

Cancel

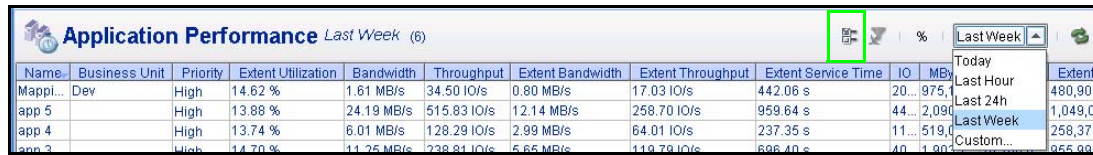
- 2. Click in the Visible cell for each field to mark/unmark the box. Checked fields will display in the table.

Adjusting and Restoring Column Order

You can drag and drop columns to view the data you want. To restore the default column order, use the Table Customization pane shown above. Click the **Restore to Default** link at the bottom.

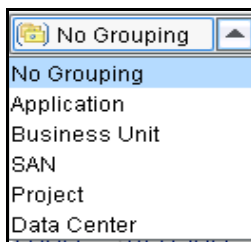
Grouping Table Data

The Application Performance view can be toggled to show percentages for the data. It also lets you establish a time duration and sort the arrays using several grouping patterns to classify the detailed data presented:



Name	Business Unit	Priority	Extent Utilization	Bandwidth	Throughput	Extent Bandwidth	Extent Throughput	Extent Service Time	IO	MB/s	Extent
Mappi...	Dev	High	14.62 %	1.61 MB/s	34.50 IO/s	0.80 MB/s	17.03 IO/s	442.06 s	20...	975.1	480,906
app 5		High	13.88 %	24.19 MB/s	515.83 IO/s	12.14 MB/s	258.70 IO/s	959.64 s	44...	2,090	1,049,000
app 4		High	13.74 %	6.01 MB/s	128.29 IO/s	2.99 MB/s	64.01 IO/s	237.35 s	11...	519.0	258,370
app 3		High	14.70 %	11.25 MB/s	238.81 IO/s	5.65 MB/s	119.79 IO/s	696.40 s	40...	1,901	955,900

:



With **No Grouping**, the detailed data is presented one row per item. If you choose anything other than No Grouping, SANscreen adds a column to the left of the table that organizes the data according to the selected grouping format. (The number in parentheses after each grouping level indicates the number of detailed items reported in that grouped row).

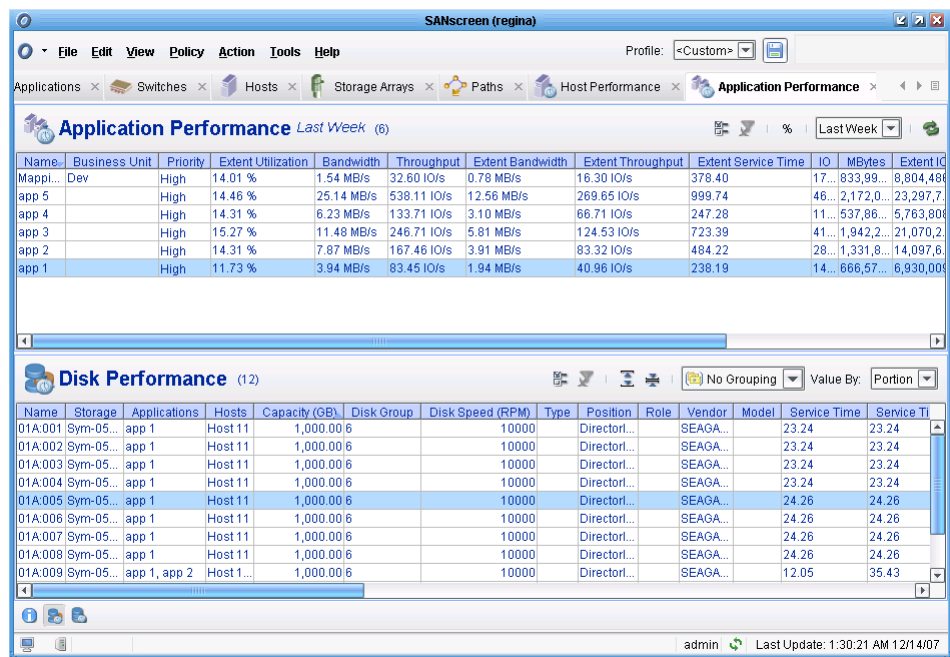
Application Performance Column Descriptions

Host Name	Name of Host on the Network.
App	Type of application.
App Priority	How important the application or service is that resides on the Host.
Business Unit	Business unit which owns the application or service that resides on the Host.
Extent Utilization	The percentage of post-cache Service Time used for Read/Write requests out of the available Sample Time
Extent Utilization (R)	The percentage of post-cache Service Time used for Read requests out of the available Sample Time
Extent Utilization (W)	The percentage of post-cache Service Time used for Write requests out of the available Sample Time
Bandwidth	Amount of data that is being transmitted in a fixed amount of time in response to IO service requests (measured in MB per sec)

Bandwidth (R)	Amount of Read data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)
Bandwidth (W)	Amount of Write data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)
Throughput	Measures the total number of Read/Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Throughput (R)	Measures the number of Read IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Throughput (W)	Measures the number of Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Extent Bandwidth	Amount of post-cache data that is being transmitted in a fixed amount of time in response to IO service requests (measured in MB per sec)
Extent Bandwidth (R)	Amount of post-cache Read data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)
Extent Bandwidth (W)	Amount of post-cache Write data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)
Extent Throughput	Measures the total number of post-cache Read/Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Extent Throughput (R)	Measures the number of post-cache Read IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Extent Throughput (W)	Measures the number of post-cache Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Extent Service Time	The post-cache total amount of time a device uses to service a request. This is automatically calculated using the seek time, latency and Read/Write data
Extent Service Time (R)	The post-cache amount of time a device uses to service a Read request. This is automatically calculated using the seek time, latency and Read data
Extent Service Time (W)	The post-cache amount of time a device uses to service a Write request. This is automatically calculated using the seek time, latency and Write data
IO	Total number of IO operations
IO (R)	Total number of Read IO operations
IO (W)	Total number of Write IO operations
MBytes	Total number of megabytes for R/W since last sample collected
MBytes (R)	Number of megabytes read since last sample collected

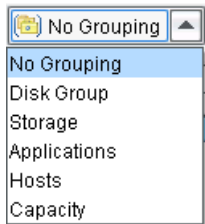
MBytes (W)	Number of megabytes written since last sample collected
Extent IO	Total post-cache number of IO operations
Extent IO (R)	Post-cache number of Read IO operations
Extent IO (W)	Post-cache number of Write IO operations
Extent MBytes	Total number of post-cache megabytes read and written since last sample collected
Extent MBytes (R)	Number of post-cache megabytes read since last sample collected
Extent MBytes (W)	Number of post-cache megabytes written since last sample collected
Cache Hit	Number of times cache accessed since the last sample collected
Cache Hit (R)	Number of cache Read requests since the last sample collected
Cache Hit (W)	Number of cache Write requests since the last sample collected
Cache Hit Ratio	Percentage of Read/Write requests that result in cache hits. The higher the number of hits versus accesses to the volume, the better the performance.

Application Performance and Disk Performance



Grouping Table Data

The Host Performance main table provides the following ways to group the data:



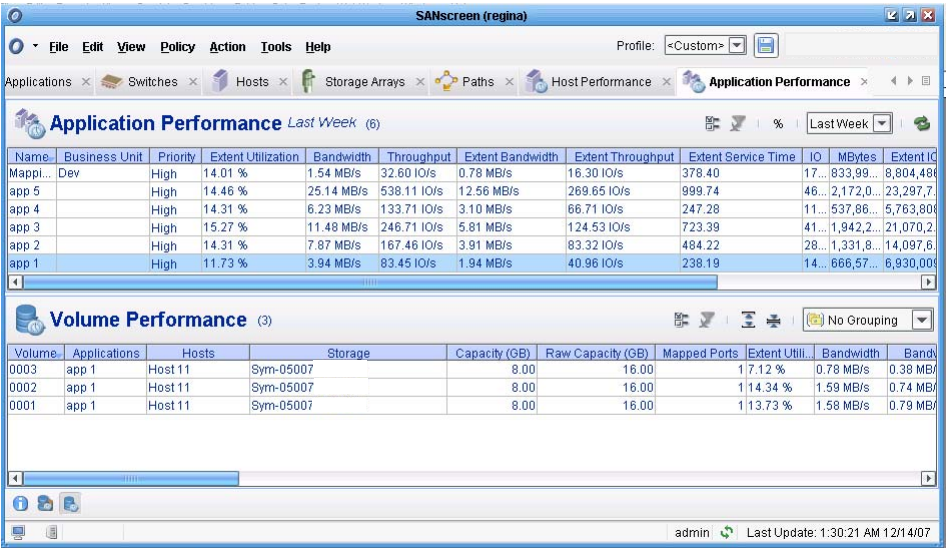
Disk Performance Column Descriptions

Name	Name of the Disk in the array.
Storage	Name of the storage array.
Applications	Name of applications on the array.
Hosts	Name of the Host. There might be more then one Host for a specific volume; in that event, all host names would be comma separated and alphabetically sorted.

Capacity (GB)	Size of the disk that is accessible to host applications, in gigabytes.
Disk Group	Name of the set of disks that share a common configuration. A disk group contains volumes that must use disks within that disk group.
Disk Speed (RPM)	How quickly the disk can access Read/Write information, in RPMs
Type	Type of Disk
Position	Where the disk is located, e.g., as in Symmetrix: DirectorID-075, Slot 38
Role	Role of Disk
Vendor	Name of Disk vendor
Model	Name of Disk model
Service Time	The portion (or ratio) of the total amount of time a selected host or application uses to service a request
Service Time	The total amount of time a device uses to service a request. This is automatically calculated using the seek time, latency and Read/Write data
Service Time (R)	The amount of time a device uses to service a Read request. This is automatically calculated using the seek time, latency and Read data
Service Time (W)	The amount of time a device uses to service a Write request. This is automatically calculated using the seek time, latency and Write data
Utilization	The portion of the total percentage of pre-cache Service Time used for Read and Write requests out of the available Sample Time.
Utilization Total	The total percentage of pre-cache Service Time used for Read and Write out of the available Sample Time
Utilization (R)	The percentage of pre-cache Service Time used for Read requests out of the available Sample Time
Utilization (W)	The percentage of pre-cache Service Time used for Write requests out of the available Sample Time
Bandwidth	Portion of data that is being transmitted in a fixed amount of time in response to a service request
Bandwidth Total	Amount of data that is being transmitted in a fixed amount of time in response to IO service requests (measured in MB per sec)
Bandwidth (R)	Amount of Read data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)
Bandwidth (W)	Amount of Write data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)
Throughput	Measures the portion or ratio of IO service requests by the selected host or application passing through the IO channel per unit of time (measured in IO per sec)

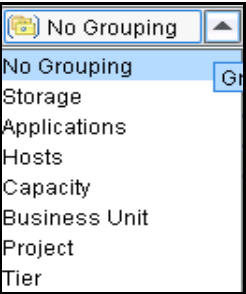
Throughput Total	Measures the total number of Read/Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Throughput (R)	Measures the number of Read IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Throughput (W)	Measures the number of Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
IO	Total number of IO operations
IO (R)	Total number of Read IO operations
IO (W)	Total number of Write IO operations
Potential Throughput	The maximum throughput value possible from the physical hardware.
MBytes	Total number of megabytes for R/W since last sample collected
MBytes (R)	Number of megabytes read since last sample collected
MBytes (W)	Number of megabytes written since last sample collected

Application Performance and Volume Performance



Grouping Table Data

The Volume Performance Detail Pane provides the following ways to group the data:



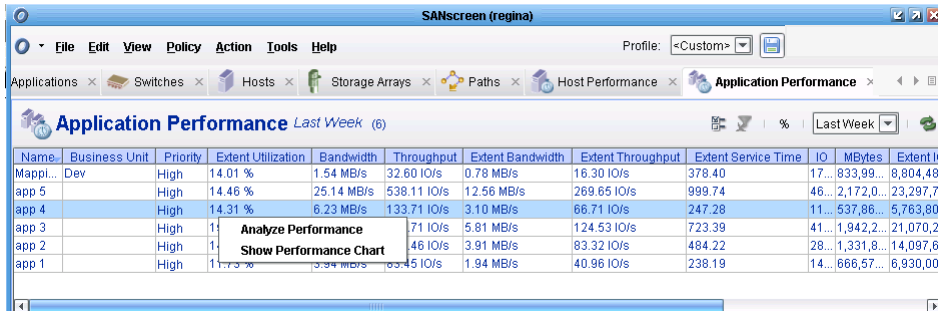
Volume Performance Column Descriptions

Volume	Name of volume
Applications	Type of application
Hosts	Name of the Host. There might be more then one Host for a specific volume; in that event, all host names would be comma separated and alphabetically sorted.
Storage	Name of storage array
Capacity (GB)	Size of the volume that's accessible to host applications, in gigabytes

Raw Capacity (GB)	Actual raw disk capacity used by the volume. For example, a RAID-5 volume uses extra capacity to prevent failure in case of a single disk failure
Mapped Ports	Number of storage ports through which this volume is accessible
Extent Utilization	The total percentage of post-cache Service Time used for Read and Write requests out of the available Sample Time
Extent Utilization (R)	The percentage of post-cache Service Time used for Read requests out of the available Sample Time
Extent Utilization (W)	The percentage of post-cache Service Time used for Write requests out of the available Sample Time
Bandwidth	Amount of data that is being transmitted in a fixed amount of time in response to IO service requests (measured in MB per sec)
Bandwidth (R)	Amount of Read data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)
Bandwidth (W)	Amount of Write data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)
Throughput	Measures the total number of Read/Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Throughput (R)	Measures the number of Read IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Throughput (W)	Measures the number of Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Extent Bandwidth	Amount of post-cache data that is being transmitted in a fixed amount of time in response to IO service requests (measured in MB per sec)
Extent Bandwidth (R)	Amount of post-cache Read data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)
Extent Bandwidth (W)	Amount of post-cache Write data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)
Extent Throughput	Measures the total number of post-cache Read/Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Extent Throughput (R)	Measures the number of post-cache Read IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Extent Throughput (W)	Measures the number of post-cache Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Extent Service Time	The post-cache total amount of time a device uses to service a request. This is automatically calculated using the seek time, latency and Read/Write data

Extent Service Time (R)	The post-cache amount of time a device uses to service a Read request. This is automatically calculated using the seek time, latency and Read data
Extent Service Time (W)	The post-cache amount of time a device uses to service a Write request. This is automatically calculated using the seek time, latency and Write data
IO	Total number of IO operations
IO (R)	Total number of Read IO operations
IO (W)	Total number of Write IO operations
MBytes	Total number of megabytes for R/W since last sample collected
MBytes (R)	Number of megabytes read since last sample collected
MBytes (W)	Number of megabytes written since last sample collected
Extent IO	Total post-cache number of IO operations
Extent IO (R)	Post-cache number of Read IO operations
Extent IO (W)	Post-cache number of Write IO operations
Extent MBytes	Total number of post-cache megabytes read and written since last sample collected
Extent MBytes (R)	Number of post-cache megabytes read since last sample collected
Extent MBytes (W)	Number of post-cache megabytes written since last sample collected
Cache Hit	Number of times cache accessed since the last sample collected
Cache Hit (R)	Number of cache Read requests since the last sample collected
Cache Hit (W)	Number of cache Write requests since the last sample collected
Cache Hit Ratio	Percentage of Read/Write requests that result in cache hits. The higher the number of hits versus accesses to the volume, the better the performance.

Disk Contention Views--Using Analyze Performance



SANscreen (regina) Profile: <Custom>

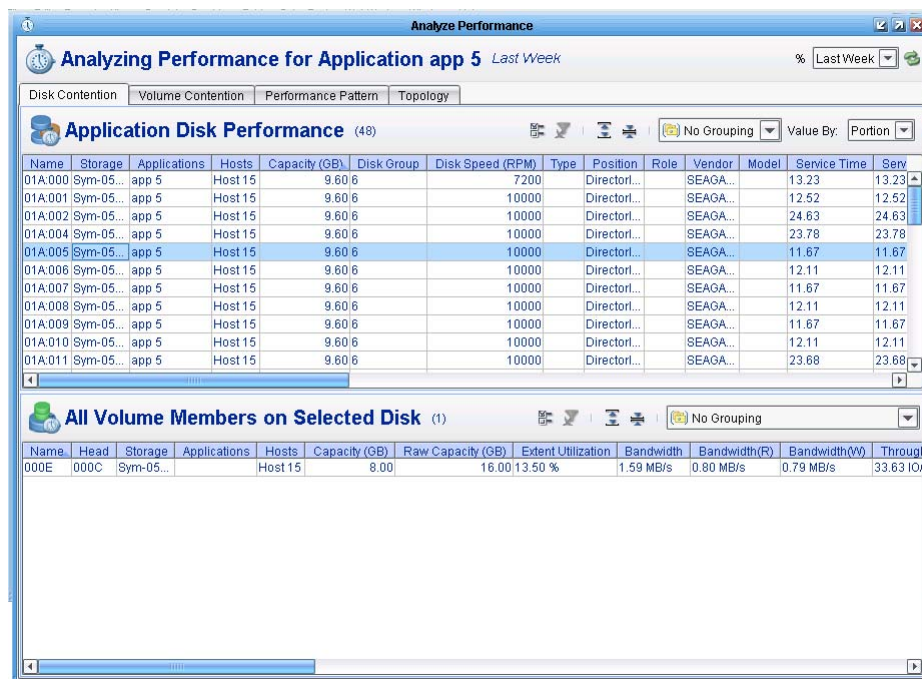
Applications x Switches x Hosts x Storage Arrays x Paths x Host Performance x **Application Performance**

Application Performance Last Week (6)

Name	Business Unit	Priority	Extent Utilization	Bandwidth	Throughput	Extent Bandwidth	Extent Throughput	Extent Service Time	IO	MBytes	Extent IO
Mappl...	Dev	High	14.01 %	1.54 MB/s	32.60 IO/s	0.78 MB/s	16.30 IO/s	378.40	17...	833,99...	8,804,48
app 5		High	14.46 %	25.14 MB/s	538.11 IO/s	12.56 MB/s	269.65 IO/s	999.74	46...	2,172,0...	23,297,7
app 4		High	14.31 %	6.23 MB/s	133.71 IO/s	3.10 MB/s	66.71 IO/s	247.28	11...	537,86...	5,763,80
app 3		High	14.31 %	1.71 MB/s	71 IO/s	5.81 MB/s	124.53 IO/s	723.39	41...	1,942,2...	21,070,2
app 2		High	14.31 %	3.91 MB/s	46 IO/s	3.91 MB/s	83.32 IO/s	484.22	28...	1,331,8...	14,097,6
app 1		High	14.31 %	1.94 MB/s	45 IO/s	1.94 MB/s	40.96 IO/s	238.19	14...	666,57...	6,930,00

Buttons: Analyze Performance, Show Performance Chart

Application Disk Performance



Analyze Performance Analyzing Performance for Application app 5 Last Week % LastWeek

Disk Contention Volume Contention Performance Pattern Topology

Application Disk Performance (48)

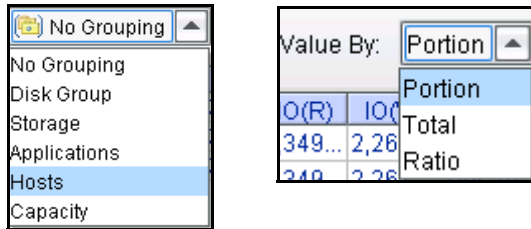
Name	Storage	Applications	Hosts	Capacity (GB)	Disk Group	Disk Speed (RPM)	Type	Position	Role	Vendor	Model	Service Time	Serv
01A:000	Sym-05...	app 5	Host 15	9.60	6	7200	Directorl...			SEAGA...		13.23	13.23
01A:001	Sym-05...	app 5	Host 15	9.60	6	10000	Directorl...			SEAGA...		12.52	12.52
01A:002	Sym-05...	app 5	Host 15	9.60	6	10000	Directorl...			SEAGA...		24.63	24.63
01A:004	Sym-05...	app 5	Host 15	9.60	6	10000	Directorl...			SEAGA...		23.78	23.78
01A:005	Sym-05...	app 5	Host 15	9.60	6	10000	Directorl...			SEAGA...		11.67	11.67
01A:006	Sym-05...	app 5	Host 15	9.60	6	10000	Directorl...			SEAGA...		12.11	12.11
01A:007	Sym-05...	app 5	Host 15	9.60	6	10000	Directorl...			SEAGA...		11.67	11.67
01A:008	Sym-05...	app 5	Host 15	9.60	6	10000	Directorl...			SEAGA...		12.11	12.11
01A:009	Sym-05...	app 5	Host 15	9.60	6	10000	Directorl...			SEAGA...		11.67	11.67
01A:010	Sym-05...	app 5	Host 15	9.60	6	10000	Directorl...			SEAGA...		12.11	12.11
01A:011	Sym-05...	app 5	Host 15	9.60	6	10000	Directorl...			SEAGA...		23.68	23.68

All Volume Members on Selected Disk (1)

Name	Head	Storage	Applications	Hosts	Capacity (GB)	Raw Capacity (GB)	Extent Utilization	Bandwidth	Bandwidth(R)	Bandwidth(W)	Throug
000E	000C	Sym-05...		Host 15	8.00	16.00	13.50 %	1.59 MB/s	0.80 MB/s	0.79 MB/s	33.63 IO

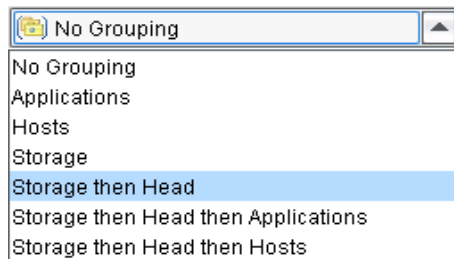
Grouping Table Data

The Application Disk Performance main table provides the following ways to group the data:



Grouping Table Data

The All Volume Members on Selected Disk Detail Pane provides the following ways to group the data:



All Volume Members on a Selected Disk

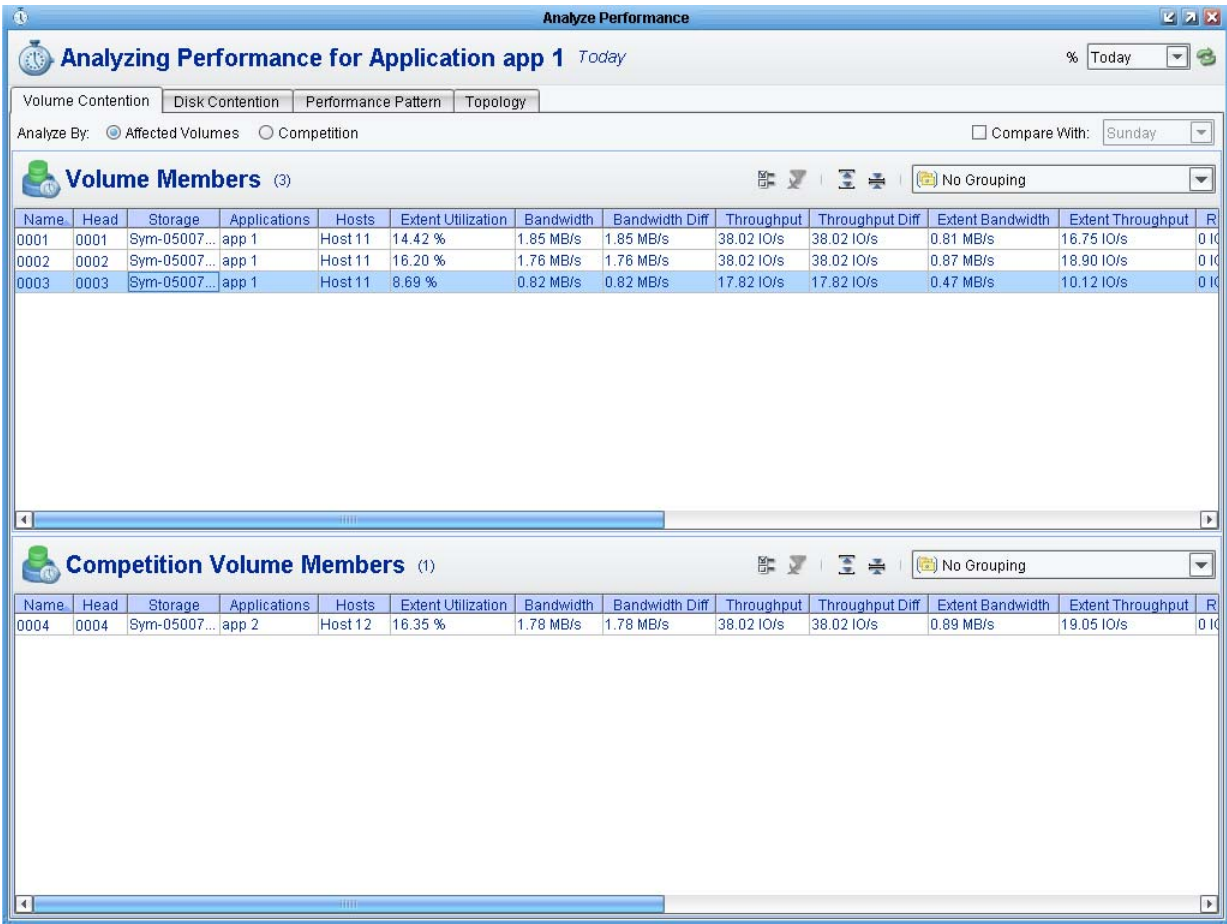
Name	Name of Volume Member
Head	The lead volume that is the only one exposed to the view; the volumes linked to it are consolidated into one meta volume.
Storage	Name of storage array.
Applications	Type of applications
Hosts	Name of the Host. There might be more than one Host for a specific volume; in that event, all host names would be comma separated and alphabetically sorted.
Capacity (GB)	Size of the volume that's accessible to host applications, in gigabytes.
Raw Capacity (GB)	Actual raw disk capacity used by the volume. For example, a RAID-5 volume uses extra capacity to prevent failure in case of a single disk failure.
Extent Utilization	The total percentage of post-cache Service Time used for Read and Write requests out of the available Sample Time
Extent Utilization (R)	The percentage of post-cache Service Time used for Read requests out of the available Sample Time

Extent Utilization (W)	The percentage of post-cache Service Time used for Write requests out of the available Sample Time
Bandwidth Total	Amount of data that is being transmitted in a fixed amount of time in response to IO service requests (measured in MB per sec)
Bandwidth (R)	Amount of Read data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)
Bandwidth (W)	Amount of Write data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)
Extent Throughput	Measures the total number of post-cache Read/Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Extent Throughput (R)	Measures the number of post-cache Read IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Extent Throughput (W)	Measures the number of post-cache Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Extent Service Time	The post-cache total amount of time a device uses to service a request. This is automatically calculated using the seek time, latency and Read/Write data
Extent Service Time (R)	The post-cache amount of time a device uses to service a Read request. This is automatically calculated using the seek time, latency and Read data
Extent Service Time (W)	The post-cache amount of time a device uses to service a Write request. This is automatically calculated using the seek time, latency and Write data
IO	Total number of IO operations
IO (R)	Total number of Read IO operations
IO (W)	Total number of Write IO operations
MBytes	Total number of megabytes for R/W since last sample collected
MBytes (R)	Number of megabytes read since last sample collected
MBytes (W)	Number of megabytes written since last sample collected
Response Time	The average time it takes for the volume to respond to an IO request, in milliseconds
Response Time (R)	The average time it takes for the volume to respond to a Read IO request, in milliseconds
Response Time (W)	The average time it takes for the volume to respond to a Write IO request, in milliseconds

Extent IO	Total post-cache number of IO operations
Extent IO (R)	Post-cache number of Read IO operations
Extent IO (W)	Post-cache number of Write IO operations
Extent MBytes	Total number of post-cache megabytes read and written since last sample collected
Extent MBytes (R)	Number of post-cache megabytes read since last sample collected
Extent MBytes (W)	Number of post-cache megabytes written since last sample collected
Cache Hit	Number of times cache accessed since the last sample collected
Cache Hit (R)	Number of cache Read requests since the last sample collected
Cache Hit (W)	Number of cache Write requests since the last sample collected
Cache Hit Ratio	Percentage of Read/Write requests that result in cache hits. The higher the number of hits versus accesses to the volume, the better the performance.

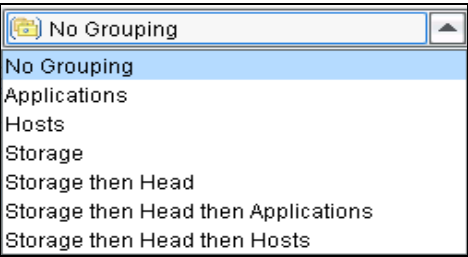
Volume Contention Tab

Volume Member Competition



Grouping Table Data

Both the Volume Member Competition and Affected Volume Members provide the following ways to group the data:



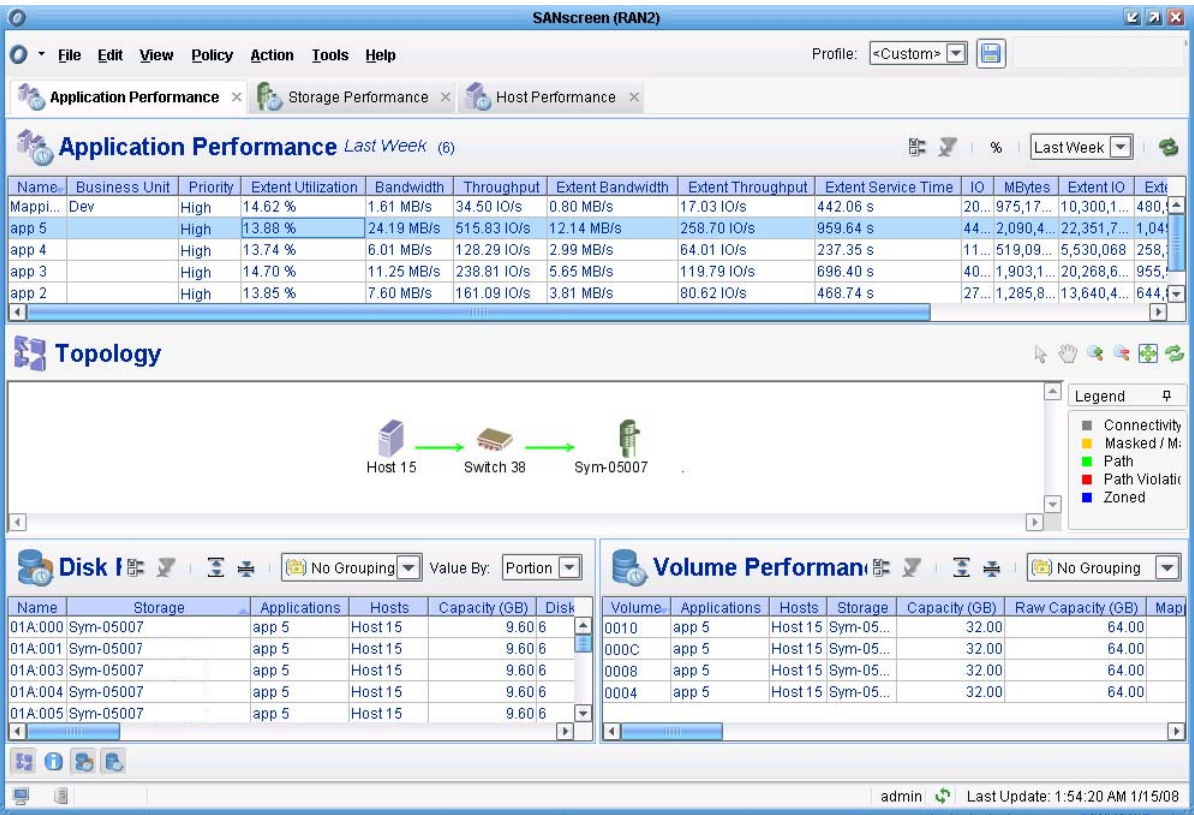
Volume Member Competition

With Volume Member Competition, you are also able to view and analyze two different time periods to determine whether problems exist or could potentially exist during the selected intervals:

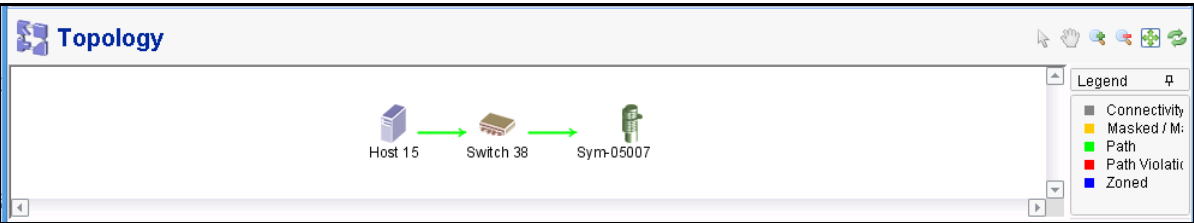


Topology

The Topology pane appears below the Application Performance pane and displays the topology of the selected application:



The figure below shows a close-up of the topology of a path that connects the host shown on the left, extending the view into the storage array on the right:



With the topology view displayed, the drop-down menu in the upper right corner allows for three options: Closure, Path and Path With Connectivity.

This pane uses icons and graphical elements to visualize the SAN data and analysis. Every SAN device is represented by an icon that represents its device type, while physical connections appear as lines connecting

the icons. When a device icon selected, the detailed device, port, adapter/controller, and link properties are available at a glance, by letting the cursor hover over objects and connections.

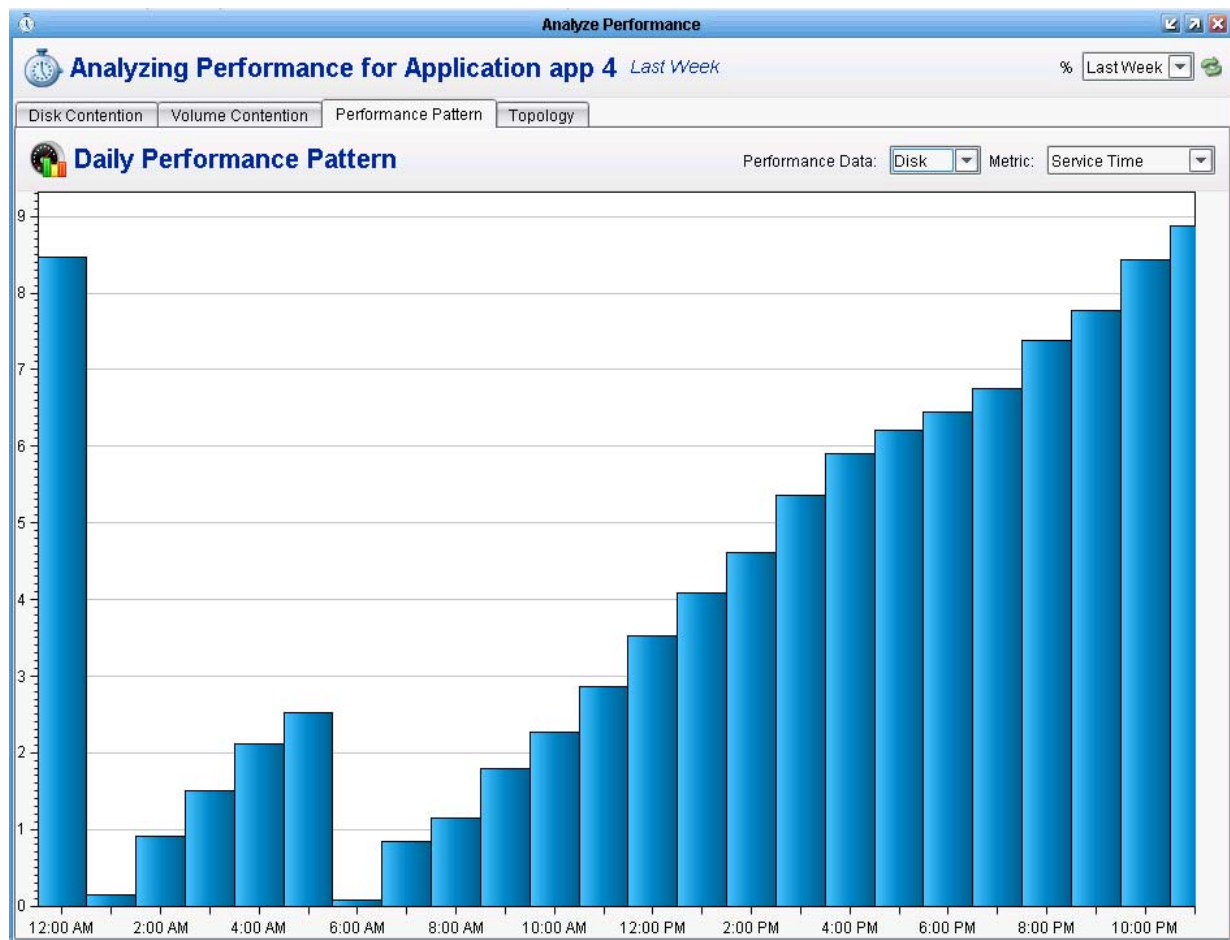
Use the other buttons to display details about the component that is currently selected in the topology view.

Note

See Chapter 3 in the Service Insight User Guide for more detailed information about the Topology pane in SANscreen.

Daily Performance Pattern Graph

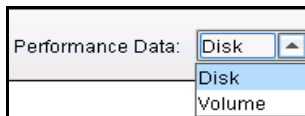
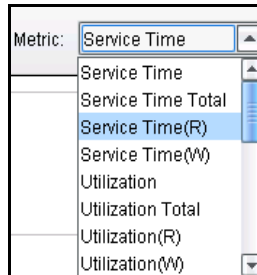
The Daily Performance Pattern graph provides you with the ability to identify the utilization or Service Time for an application by disk, volume, day, week or by a custom calendar setting. The graph identifies when there are pattern spikes or troughs during a single day and identifies the average hourly results for a given set of days (up to a week).



The Daily Performance Pattern graph shows you in one glance what the utilization percentages are. With this information, you can better make changes to storage allocations based on current usage and determine potential problems with applications because of recurring pattern data for delays and congestion.

Grouping Table Data

The Daily Performance Pattern provides the following ways to group the data:



Storage Performance

Overview

Storage Performance statistics drill down deep into the volume and disk utilization. Using this functionality, the SAN administrator can establish throughput issues and:

- ◆ Identify the least or most utilized array devices based on the extensive statistics supplied.

Those statistics include:

- ◆ Extent (post-cache) MBytes, Throughput and Bandwidth
- ◆ Volume Extent (post-cache) Service Time and Utilization
- ◆ Volume IO, MBytes and Throughput
- ◆ Response Time

and others that are shown in the tables supplied in this chapter.

Note

*This chapter only provides the views and tables for Storage Performance. Array performance in Application Insight uses the same basic procedures in SANscreen for all three components. See the **Host Performance** chapter for a more detailed explanation of those procedures.*

Storage Performance Main Table

SANscreen (RAN2)

FileEditViewPolicyActionToolsHelp

Profile: <Custom>

VulnerabilitiesData SourcesPathsViolationsViolationsApplication PerformanceStorage Performance

Storage Performance Today (11)

No Grouping%Today

Name	Volume Extent Utilization	Volume Bandwidth	Volume Throughput	Extent Bandwidth	Extent Throughput	Disk Service Time	Disk Service Time Total	Disk U
Sym-0050...	17.95 %	145.00 MB/s	3,091.74 IO/s	72.55 MB/s	1,546.75 IO/s	710,227.88 s	710,227.88 s	35.87 %
Sym-0050...	17.97 %	63.32 MB/s	1,349.58 IO/s	31.46 MB/s	669.57 IO/s	693,788.12 s	693,788.12 s	36.50 %
Sym-0500...	15.12 %	24.74 MB/s	522.64 IO/s	12.51 MB/s	263.95 IO/s	518,490 s	518,490 s	31.31 %
Sym-0500...	14.98 %	6.63 MB/s	141.52 IO/s	3.25 MB/s	69.83 IO/s	240,578.30 s	240,578.30 s	30.38 %
Sym-0500...	14.62 %	25.90 MB/s	553.82 IO/s	12.74 MB/s	272.40 IO/s	536,211.38 s	536,211.38 s	29.44 %
Sym-0500...	11.11 %	204.53 MB/s	4,357.75 IO/s	101.98 MB/s	2,174.46 IO/s	2,588,865.25 s	2,588,865.25 s	25.15 %
Sym-0500...	12.02 %	222.61 MB/s	4,754.90 IO/s	110.25 MB/s	2,352.94 IO/s	2,847,894.50 s	2,847,894.50 s	27.59 %
Sym-0500...	11.36 %	208.20 MB/s	4,439.35 IO/s	104.27 MB/s	2,223.22 IO/s	2,648,802.25 s	2,648,802.25 s	25.32 %
Sym-0500...	17.66 %	1.93 MB/s	40.09 IO/s	0.99 MB/s	20.54 IO/s	61,925.42 s	61,925.42 s	34.40 %
Sym-0500...	13.86 %	1.48 MB/s	31.32 IO/s	0.76 MB/s	16.14 IO/s	48,395.49 s	48,395.49 s	26.89 %
Sym-0500...	15.50 %	5.35 MB/s	111.55 IO/s	2.58 MB/s	54.10 IO/s	139,689.86 s	139,689.86 s	32.34 %

adminLast Update: 10:24:01 AM 1/21/08

Grouping Table Data

The Storage Performance main table provides the following ways to group the data:

No Grouping

No GroupingModelVendorSANBusiness UnitProjectData CenterTier

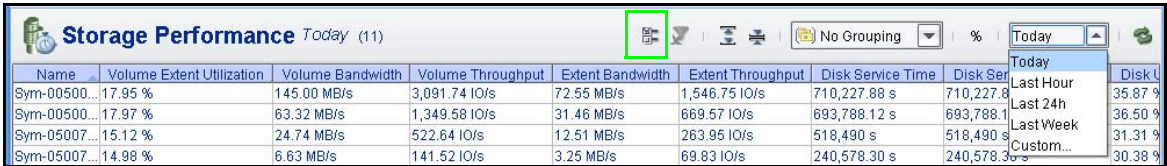
%Last Week

TodayLast HourLast 24hLast WeekCustom...

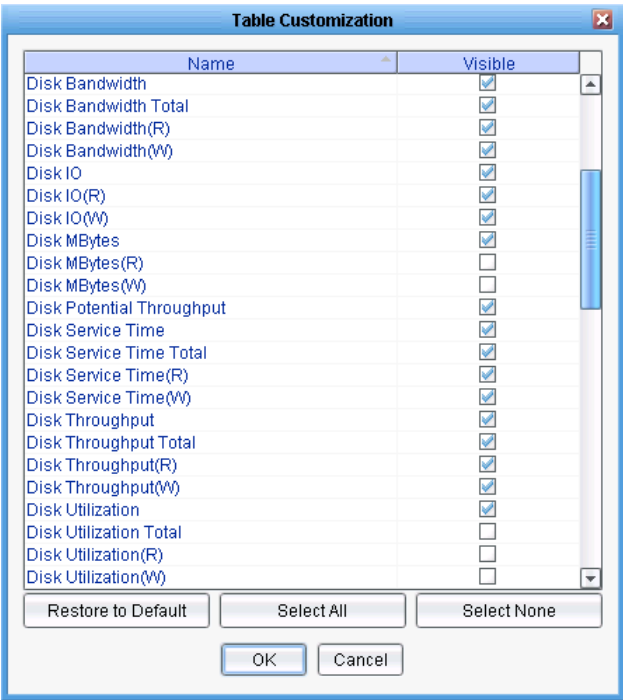
Hiding Columns in Storage Performance Table Display

You can hide any combination of columns that are available for display in a table. To do this:

- 1. First click the Customize icon  (outlined below in green) to open the Table Customization pane:



Name	Volume Extent Utilization	Volume Bandwidth	Volume Throughput	Extent Bandwidth	Extent Throughput	Disk Service Time	Disk Ser
Sym-00500...	17.95 %	145.00 MB/s	3,091.74 IO/s	72.55 MB/s	1,546.75 IO/s	710,227.88 s	710,227.8
Sym-00500...	17.97 %	63.32 MB/s	1,349.58 IO/s	31.46 MB/s	669.57 IO/s	693,788.12 s	693,788.1
Sym-05007...	15.12 %	24.74 MB/s	522.64 IO/s	12.51 MB/s	263.95 IO/s	518,490 s	518,490 s
Sym-05007...	14.98 %	6.63 MB/s	141.52 IO/s	3.25 MB/s	69.83 IO/s	240,578.30 s	240,578.3



Name	Visible
Disk Bandwidth	☒
Disk Bandwidth Total	☒
Disk Bandwidth(R)	☒
Disk Bandwidth(W)	☒
Disk IO	☒
Disk IO(R)	☒
Disk IO(W)	☒
Disk MBytes	☒
Disk MBytes(R)	☐
Disk MBytes(W)	☐
Disk Potential Throughput	☒
Disk Service Time	☒
Disk Service Time Total	☒
Disk Service Time(R)	☒
Disk Service Time(W)	☒
Disk Throughput	☒
Disk Throughput Total	☒
Disk Throughput(R)	☒
Disk Throughput(W)	☒
Disk Utilization	☒
Disk Utilization Total	☐
Disk Utilization(R)	☐
Disk Utilization(W)	☐

Restore to Default

Select All

Select None

OK

Cancel

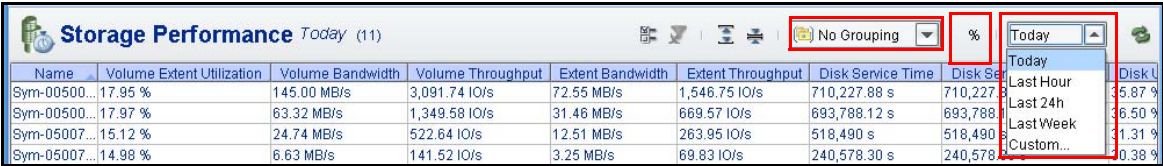
- 2. Click in the Visible cell for each field to mark/unmark the box. Checked fields will display in the table.

Adjusting and Restoring Column Order

You can drag and drop columns to view the data you want. To restore the default column order, use the Table Customization pane shown above. Click the **Restore to Default** link at the bottom.

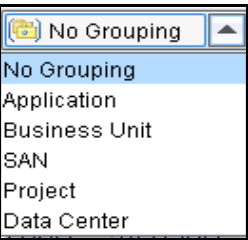
Grouping Table Data

The Storage Performance view can be toggled to show percentages for the data. It also lets you establish a time duration and sort the arrays using several grouping patterns to classify the detailed data presented:



Name	Volume Extent Utilization	Volume Bandwidth	Volume Throughput	Extent Bandwidth	Extent Throughput	Disk Service Time	Disk Service Time
Sym-00500...	17.95 %	145.00 MB/s	3,091.74 IO/s	72.55 MB/s	1,546.75 IO/s	710,227.88 s	710,227.88 s
Sym-00500...	17.97 %	63.32 MB/s	1,349.58 IO/s	31.46 MB/s	669.57 IO/s	693,788.12 s	693,788.12 s
Sym-05007...	15.12 %	24.74 MB/s	522.64 IO/s	12.51 MB/s	263.95 IO/s	518,490 s	518,490 s
Sym-05007...	14.98 %	6.63 MB/s	141.52 IO/s	3.25 MB/s	69.83 IO/s	240,578.30 s	240,578.30 s

:



No Grouping
No Grouping
Application
Business Unit
SAN
Project
Data Center

With **No Grouping**, the detailed data is presented one row per item. If you choose anything other than No Grouping, SANscreen adds a column to the left of the table that organizes the data according to the selected grouping format. (The number in parentheses after each grouping level indicates the number of detailed items reported in that grouped row).

Storage Performance Column Descriptions

Name	Name of Host
Capacity (GB)	Size of the disk that is accessible to host applications, in gigabytes.
Raw Capacity (GB)	Actual raw disk capacity used by the volume. For example, a RAID-5 volume uses extra capacity to prevent failure in case of a single disk failure.
Vendor	Name of Disk Vendor
Model	Name of Disk Model
Extent Utilization	The percentage of post-cache Service Time used for Read/Write requests out of the available Sample Time
Extent Utilization (R)	The percentage of post-cache Service Time used for Read requests out of the available Sample Time
Extent Utilization (W)	The percentage of post-cache Service Time used for Write requests out of the available Sample Time

Disk Bandwidth	Portion of data that is sent/received in response to IO service requests to the disk (measured in MB per sec)
Disk Bandwidth Total	Amount of data that is being transmitted in a fixed amount of time in response to IO service requests to the disk (measured in MB per sec)
Disk Bandwidth (R)	Amount of Read data that is being received in a fixed amount of time in response to IO service requests to the disk (measured in MB per sec)
Disk Bandwidth (W)	Amount of Write data that is being received in a fixed amount of time in response to IO service requests to the disk (measured in MB per sec)
Volume Bandwidth	Portion of data that is sent/received in response to IO service requests to the volume (measured in MB per sec)
Volume Bandwidth Total	Amount of data that is being transmitted in a fixed amount of time in response to IO service requests to the volume (measured in MB per sec)
Volume Bandwidth (R)	Amount of Read data that is being received in a fixed amount of time in response to IO service requests to the volume (measured in MB per sec)
Volume Bandwidth (W)	Amount of Write data that is being received in a fixed amount of time in response to IO service requests to the volume (measured in MB per sec)
Disk Throughput	Measures the total number of Read/Write IO service requests to the disk passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Disk Throughput (R)	Measures the number of Read IO service requests to the disk passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Disk Throughput (W)	Measures the number of Write IO service requests to the disk passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Volume Throughput	Measures the total number of Read/Write IO service requests to the volume passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Volume Throughput (R)	Measures the number of Read IO service requests to the volume passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Volume Throughput (W)	Measures the number of Write IO service requests to the volume passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Disk Service Time	The portion (or ratio) of the total amount of time a selected host or application uses to service a request to the disk
Disk Service Time Total	The total amount of time a device uses to service a request to the disk. This is automatically calculated using the seek time, latency and Read/Write data

Disk Service Time (R)	The amount of time a device uses to service a Read request to the disk. This is automatically calculated using the seek time, latency and Read data
Disk Service Time (W)	The amount of time a device uses to service a Write request to the disk. This is automatically calculated using the seek time, latency and Write data
Volume Extent Service Time	The portion (or ratio) of the total amount of time a selected host or application uses to service a request to the volume
Volume Extent Service Time Total	The total amount of time a device uses to service a request to the volume. This is automatically calculated using the seek time, latency and Read/Write data
Volume Extent Service Time (R)	The amount of time a device uses to service a Read request to the volume. This is automatically calculated using the seek time, latency and Read data
Volume Extent Service Time (W)	The amount of time a device uses to service a Write request to the volume. This is automatically calculated using the seek time, latency and Write data
Volume Extent Utilization	The total percentage of post-cache Service Time used for Read and Write requests to the volume out of the available Sample Time
Volume Extent Utilization (R)	The percentage of post-cache Service Time used for Read requests to the volume out of the available Sample Time
Volume Extent Utilization (W)	The percentage of post-cache Service Time used for Write requests to the volume out of the available Sample Time
Extent Bandwidth	Amount of post-cache data that is being transmitted in a fixed amount of time in response to IO service requests (measured in MB per sec)
Extent Bandwidth (R)	Amount of post-cache Read data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)
Extent Bandwidth (W)	Amount of post-cache Write data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)
Extent Throughput	Measures the total number of post-cache Read/Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Extent Throughput (R)	Measures the number of post-cache Read IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Extent Throughput (W)	Measures the number of post-cache Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Extent Service Time	The post-cache total amount of time a device uses to service a request. This is automatically calculated using the seek time, latency and Read/Write data

Extent Service Time (R)	The post-cache amount of time a device uses to service a Read request. This is automatically calculated using the seek time, latency and Read data
Extent Service Time (W)	The post-cache amount of time a device uses to service a Write request. This is automatically calculated using the seek time, latency and Write data
Disk IO	Total number of IO operations on the disk
Disk IO (R)	Total number of Read IO operations on the disk
Disk IO (W)	Total number of Write IO operations on the disk
Volume IO	Total number of IO operations on the volume
Volume IO (R)	Total number of Read IO operations on the volume
Volume IO (W)	Total number of Write IO operations on the volume
Disk MBytes	Total number of megabytes read and written to the disk since last sample collected
Disk MBytes (R)	Number of megabytes read to the disk since last sample collected
Disk MBytes (W)	Number of megabytes written to the disk since last sample collected
Volume MBytes	Total number of megabytes read and written to the volume since last sample collected
Volume MBytes (R)	Number of megabytes read to the volume since last sample collected
Volume MBytes (W)	Number of megabytes written to the volume since last sample collected
Extent IO	Total post-cache number of IO operations
Extent IO (R)	Post-cache number of Read IO operations
Extent IO (W)	Post-cache number of Write IO operations
Extent MBytes	Total number of post-cache megabytes read and written since last sample collected
Extent MBytes (R)	Number of post-cache megabytes read since last sample collected
Extent MBytes (W)	Number of post-cache megabytes written since last sample collected
Cache Hit	Number of times cache accessed since the last sample collected
Cache Hit (R)	Number of cache Read requests since the last sample collected

Cache Hit (W)	Number of cache Write requests since the last sample collected
Cache Hit Ratio	Percentage of Read/Write requests that result in cache hits. The higher the number of hits versus accesses to the volume, the better the performance.
Cache Hit Ratio (R)	Percentage of Read requests that result in cache hits. The higher the number of hits versus accesses to the volume, the better the performance.
Cache Hit Ratio (W)	Percentage of Write requests that result in cache hits. The higher the number of hits versus accesses to the volume, the better the performance.

Storage Performance and Volume Performance

SANSscreen (RAN2)

FileEditViewPolicyActionToolsHelp

Profile: <Custom>

VulnerabilitiesData SourcesPathsViolationsViolationsApplication PerformanceStorage Performance

Storage Performance Today (11)

No Grouping%Today

Name	Volume Extent Utilization	Volume Bandwidth	Volume Throughput	Extent Bandwidth	Extent Throughput	Disk Service Time	Disk Service Time Total	Disk I
Sym-00500...	17.95 %	145.00 MB/s	3,091.74 IO/s	72.55 MB/s	1,546.75 IO/s	710,227.88 s	710,227.88 s	35.87 %
Sym-00500...	17.97 %	63.32 MB/s	1,349.58 IO/s	31.46 MB/s	669.57 IO/s	693,788.12 s	693,788.12 s	36.50 %
Sym-05007...	15.12 %	24.74 MB/s	522.64 IO/s	12.51 MB/s	263.95 IO/s	518,490 s	518,490 s	31.31 %
Sym-05007...	14.98 %	6.63 MB/s	141.52 IO/s	3.25 MB/s	69.83 IO/s	240,578.30 s	240,578.30 s	30.38 %
Sym-05007...	14.62 %	25.90 MB/s	553.82 IO/s	12.74 MB/s	272.40 IO/s	536,211.38 s	536,211.38 s	29.44 %
Sym-05007...	11.11 %	204.53 MB/s	4,357.75 IO/s	101.98 MB/s	2,174.46 IO/s	2,588,865.25 s	2,588,865.25 s	25.15 %
Sym-05007...	12.02 %	222.61 MB/s	4,754.90 IO/s	110.25 MB/s	2,352.94 IO/s	2,847,894.50 s	2,847,894.50 s	27.59 %
Sym-05007...	11.36 %	208.20 MB/s	4,439.35 IO/s	104.27 MB/s	2,223.22 IO/s	2,648,802.25 s	2,648,802.25 s	25.32 %
Sym-05007...	17.66 %	1.93 MB/s	40.09 IO/s	0.99 MB/s	20.54 IO/s	61,925.42 s	61,925.42 s	34.40 %
Sym-05007...	13.86 %	1.48 MB/s	31.32 IO/s	0.76 MB/s	16.14 IO/s	48,395.49 s	48,395.49 s	26.89 %
Sym-05007...	15.50 %	5.35 MB/s	111.55 IO/s	2.58 MB/s	54.10 IO/s	139,689.86 s	139,689.86 s	32.34 %

Volume Performance (15)

No Grouping

Volume	Applications	Hosts	Storage	Extent Utilization	Bandwidth	Throughput	Extent Bandwidth	Extent Throughput	Response Tir
0001	app 1	Host 11	Sym-05007...	13.46 %	1.73 MB/s	35.61 IO/s	0.76 MB/s	15.64 IO/s	0 s
0002	app 1	Host 11	Sym-05007...	15.39 %	1.64 MB/s	35.61 IO/s	0.82 MB/s	17.96 IO/s	0 s
0003	app 1	Host 11	Sym-05007...	8.10 %	0.77 MB/s	16.40 IO/s	0.45 MB/s	9.41 IO/s	0 s
0004	app 2	Host 12	Sym-05007...	15.47 %	1.70 MB/s	35.61 IO/s	0.86 MB/s	18.00 IO/s	0 s
0005	app 2	Host 12	Sym-05007...	14.09 %	1.71 MB/s	35.61 IO/s	0.78 MB/s	16.39 IO/s	0 s
0006	app 2	Host 12	Sym-05007...	16.93 %	1.68 MB/s	35.61 IO/s	0.94 MB/s	19.69 IO/s	0 s
0007	app 2	Host 12	Sym-05007...	15.72 %	1.72 MB/s	35.61 IO/s	0.88 MB/s	18.27 IO/s	0 s
0008	app 2	Host 12	Sym-05007...	13.85 %	1.65 MB/s	35.61 IO/s	0.74 MB/s	16.16 IO/s	0 s
0014	app 3	Host 13	Sym-05007...	18.49 %	2.12 MB/s	43.33 IO/s	1.06 MB/s	21.46 IO/s	0 s
0015	app 3	Host 13	Sym-05007...	17.86 %	1.63 MB/s	35.61 IO/s	0.96 MB/s	20.82 IO/s	0 s
0016	app 3	Host 13	Sym-05007...	15.42 %	1.65 MB/s	35.61 IO/s	0.83 MB/s	17.97 IO/s	0 s
0017	app 3	Host 13	Sym-05007...	14.62 %	1.70 MB/s	35.61 IO/s	0.83 MB/s	16.98 IO/s	0 s

Grouping Table Data

The Volume Detail Pane provides the following ways to group the data:

No Grouping

No Grouping

Storage

Applications

Hosts

Capacity

Business Unit

Project

Tier

Volume Performance Column Descriptions

Volume	Name of volume
Applications	Type of application
Hosts	Name of the Host. There might be more than one Host for a specific volume; in that event, all host names would be comma separated and alphabetically sorted.
Storage	Name of storage array
Capacity (GB)	Size of the volume that's accessible to host applications, in gigabytes
Raw Capacity (GB)	Actual raw disk capacity used by the volume. For example, a RAID-5 volume uses extra capacity to prevent failure in case of a single disk failure
Mapped Ports	Number of storage ports through which this volume is accessible
Extent Utilization	The total percentage of post-cache Service Time used for Read and Write requests out of the available Sample Time
Extent Utilization (R)	The percentage of post-cache Service Time used for Read requests out of the available Sample Time
Extent Utilization (W)	The percentage of post-cache Service Time used for Write requests out of the available Sample Time
Bandwidth Total	Amount of data that is being transmitted in a fixed amount of time in response to IO service requests (measured in MB per sec)
Bandwidth (R)	Amount of Read data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)
Bandwidth (W)	Amount of Write data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)
Throughput	Measures the total number of Read/Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Throughput (R)	Measures the number of Read IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Throughput (W)	Measures the number of Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Extent Bandwidth	Amount of post-cache data that is being transmitted in a fixed amount of time in response to IO service requests (measured in MB per sec)
Extent Bandwidth (R)	Amount of post-cache Read data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)
Extent Bandwidth (W)	Amount of post-cache Write data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)

Extent Throughput	Measures the total number of post-cache Read/Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Extent Throughput (R)	Measures the number of post-cache Read IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Extent Throughput (W)	Measures the number of post-cache Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Extent Service Time	The post-cache total amount of time a device uses to service a request. This is automatically calculated using the seek time, latency and Read/Write data
Extent Service Time (R)	The post-cache amount of time a device uses to service a Read request. This is automatically calculated using the seek time, latency and Read data
Extent Service Time (W)	The post-cache amount of time a device uses to service a Write request. This is automatically calculated using the seek time, latency and Write data
IO	Total number of IO operations
IO (R)	Total number of Read IO operations
IO (W)	Total number of Write IO operations
MBytes	Total number of megabytes for R/W since last sample collected
MBytes (R)	Number of megabytes read since last sample collected
MBytes (W)	Number of megabytes written since last sample collected
Extent IO	Total post-cache number of IO operations
Extent IO (R)	Post-cache number of Read IO operations
Extent IO (W)	Post-cache number of Write IO operations
Extent MBytes	Total number of post-cache megabytes read and written since last sample collected
Extent MBytes (R)	Number of post-cache megabytes read since last sample collected
Extent MBytes (W)	Number of post-cache megabytes written since last sample collected
Cache Hit	Number of times cache accessed since the last sample collected
Cache Hit (R)	Number of cache Read requests since the last sample collected
Cache Hit (W)	Number of cache Write requests since the last sample collected

Cache Hit Ratio	Percentage of Read/Write requests that result in cache hits. The higher the number of hits versus accesses to the volume, the better the performance.
------------------------	---

Storage Performance and Disk Performance

SANScreen (RAN2)

FileEditViewPolicyActionToolsHelp

Profile: <Custom>

VulnerabilitiesData SourcesPathsViolationsViolationsApplication PerformanceStorage Performance

Storage Performance Today (11)

No Grouping%Today

Name	Volume Extent Utilization	Volume Bandwidth	Volume Throughput	Extent Bandwidth	Extent Throughput	Disk Service Time	Disk Service Time Total	Disk L
Sym-00500...	17.95 %	145.00 MB/s	3,091.74 IO/s	72.55 MB/s	1,546.75 IO/s	710,227.88 s	710,227.88 s	35.87 %
Sym-00500...	17.97 %	63.32 MB/s	1,349.58 IO/s	31.46 MB/s	669.57 IO/s	693,788.12 s	693,788.12 s	36.50 %
Sym-05007...	15.12 %	24.74 MB/s	522.64 IO/s	12.51 MB/s	263.95 IO/s	518,490 s	518,490 s	31.31 %
Sym-05007...	14.98 %	6.63 MB/s	141.52 IO/s	3.25 MB/s	69.83 IO/s	240,578.30 s	240,578.30 s	30.38 %
Sym-05007...	14.82 %	25.90 MB/s	553.82 IO/s	12.74 MB/s	272.40 IO/s	536,211.38 s	536,211.38 s	29.44 %
Sym-05007...	11.11 %	204.53 MB/s	4,357.75 IO/s	101.98 MB/s	2,174.46 IO/s	2,588,865.25 s	2,588,865.25 s	25.15 %
Sym-05007...	12.02 %	222.61 MB/s	4,754.90 IO/s	110.25 MB/s	2,352.94 IO/s	2,847,894.50 s	2,847,894.50 s	27.59 %
Sym-05007...	11.36 %	208.20 MB/s	4,439.35 IO/s	104.27 MB/s	2,223.22 IO/s	2,648,802.25 s	2,648,802.25 s	25.32 %
Sym-05007...	17.66 %	1.93 MB/s	40.09 IO/s	0.99 MB/s	20.54 IO/s	61,925.42 s	61,925.42 s	34.40 %
Sym-05007...	13.86 %	1.48 MB/s	31.32 IO/s	0.76 MB/s	16.14 IO/s	48,395.49 s	48,395.49 s	26.89 %
Sym-05007...	15.50 %	5.35 MB/s	111.55 IO/s	2.58 MB/s	54.10 IO/s	139,689.86 s	139,689.86 s	32.34 %

Disk Performance (46)

No Grouping

Name	Storage	Applications	Hosts	Service Time	Service Time Total	Utilization	Utilization Total	Bandwidth	Bandwidth
01A-001	Sym-05007...	app 1	Host 11	11,639.08 s	11,639.08 s	32.33 %	32.33 %	1.70 MB/s	1.70 MB/s
01A-002	Sym-05007...	app 1	Host 11	10,672.58 s	10,672.58 s	29.65 %	29.65 %	1.67 MB/s	1.67 MB/s
01A-003	Sym-05007...	app 1	Host 11	9,851.65 s	9,851.65 s	27.37 %	27.37 %	1.64 MB/s	1.64 MB/s
01A-004	Sym-05007...	app 1	Host 11	11,053.51 s	11,053.51 s	30.70 %	30.70 %	1.68 MB/s	1.68 MB/s
01A-005	Sym-05007...	app 1	Host 11	11,754.97 s	11,754.97 s	32.65 %	32.65 %	1.61 MB/s	1.61 MB/s
01A-006	Sym-05007...	app 1	Host 11	9,693.23 s	9,693.23 s	26.93 %	26.93 %	1.66 MB/s	1.66 MB/s
01A-007	Sym-05007...	app 1	Host 11	11,022.54 s	11,022.54 s	30.62 %	30.62 %	1.68 MB/s	1.68 MB/s
01A-008	Sym-05007...	app 1	Host 11	10,744.71 s	10,744.71 s	29.85 %	29.85 %	1.63 MB/s	1.63 MB/s
01A-009	Sym-05007...	app 1, app 2	Host 11, Host 12	16,898.12 s	16,898.12 s	46.94 %	46.94 %	2.03 MB/s	2.03 MB/s
01A-010	Sym-05007...	app 1, app 2	Host 11, Host 12	14,825.02 s	14,825.02 s	41.18 %	41.18 %	2.01 MB/s	2.01 MB/s
01A-011	Sym-05007...	app 1, app 2	Host 11, Host 12	14,893.04 s	14,893.04 s	41.37 %	41.37 %	2.06 MB/s	2.06 MB/s
01A-012	Sym-05007...	app 1, app 2	Host 11, Host 12	12,579.90 s	12,579.90 s	34.94 %	34.94 %	2.08 MB/s	2.08 MB/s

admin Last Update: 10:24:01 AM 1/21/08

Grouping Table Data

The Disk Performance main table provides the following ways to group the data:

No Grouping

No GroupingDisk GroupStorageApplicationsHostsCapacity

Disk Performance Column Descriptions

Name	Name of the Disk in the array.
Storage	Name of the storage array.
Applications	Name of applications on the array.
Hosts	Name of the Host. There might be more than one Host for a specific volume; in that event, all host names would be comma separated and alphabetically sorted.
Capacity (GB)	Size of the disk that is accessible to host applications, in gigabytes.
Raw Capacity (GB)	Actual raw disk capacity used by the volume. For example, a RAID-5 volume uses extra capacity to prevent failure in case of a single disk failure.
Disk Group	Name of the set of disks that share a common configuration. A disk group contains volumes that must use disks within that disk group.
Disk Speed (RPM)	How quickly the disk can access Read/Write information, in RPMs
Type	Type of Disk
Position	Where the disk is located, e.g. as in Symmetrix: DirectorID-075, Slot 38
Role	Role of Disk
Vendor	Name of Disk vendor
Model	Name of Disk model
Service Time	The portion (or ratio) of the total amount of time a selected host or application uses to service a request
Service Time	The total amount of time a device uses to service a request. This is automatically calculated using the seek time, latency and Read/Write data
Service Time (R)	The amount of time a device uses to service a Read request. This is automatically calculated using the seek time, latency and Read data
Service Time (W)	The amount of time a device uses to service a Write request. This is automatically calculated using the seek time, latency and Write data
Utilization	The portion of the total percentage of pre-cache Service Time used for Read and Write requests out of the available Sample Time.
Utilization Total	The total percentage of pre-cache Service Time used for Read and Write requests out of the available Sample Time
Utilization (R)	The percentage of pre-cache Service Time used for Read requests out of the available Sample Time

Utilization (W)	The percentage of pre-cache Service Time used for Write requests out of the available Sample Time
Bandwidth	Portion of data that is being transmitted in a fixed amount of time in response to IO service requests (measured in MB per sec)
Bandwidth Total	Amount of data that is being transmitted in a fixed amount of time in response to IO service requests (measured in MB per sec)
Bandwidth (R)	Amount of Read data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)
Bandwidth (W)	Amount of Write data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)
Throughput	Measures the portion or ratio of IO service requests by the selected host or application passing through the IO channel per unit of time (measured in IO per sec)
Throughput Total	Measures the total number of Read/Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Throughput (R)	Measures the number of Read IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Throughput (W)	Measures the number of Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
IO	Total number of IO operations
IO (R)	Total number of Read IO operations
IO (W)	Total number of Write IO operations
Potential Throughput	The maximum throughput value possible from the physical hardware.
MBytes	Total number of megabytes for R/W since last sample collected
MBytes (R)	Number of megabytes read since last sample collected
MBytes (W)	Number of megabytes written since last sample collected

Analyzing Storage Performance

Storage Performance Today (11)

No Grouping

%

Today

Name	Volume Extent Utilization	Volume Bandwidth	Volume Throughput	Extent Bandwidth	Extent Throughput	Disk Service Time	Disk Service Time Total	Disk U
Sym-00500...	17.95 %	145.00 MB/s	3,091.74 IO/s	72.55 MB/s	1,546.75 IO/s	710,227.88 s	710,227.88 s	35.87 %
Sym-00500...	17.97 %	63.32 MB/s	1,349.58 IO/s	31.46 MB/s	669.57 IO/s	693,788.12 s	693,788.12 s	36.50 %
Sym-05007...	15.12 %	24.74 MB/s	533.64 IO/s	12.51 MB/s	263.95 IO/s	518,490 s	518,490 s	31.31 %
Sym-05007...	14.98 %	6.63 MB/s	12.51 MB/s	3.25 MB/s	69.83 IO/s	240,578.30 s	240,578.30 s	30.38 %
Sym-05007...	14.62 %	25.90 MB/s	12.74 MB/s	101.98 MB/s	272.40 IO/s	536,211.38 s	536,211.38 s	29.44 %
Sym-05007...	11.11 %	204.53 MB/s	101.98 MB/s	2,588,865.25 s	2,174.46 IO/s	2,588,865.25 s	2,588,865.25 s	25.15 %
Sym-05007...	12.02 %	222.61 MB/s	4,754.90 IO/s	110.25 MB/s	2,352.94 IO/s	2,847,894.50 s	2,847,894.50 s	27.59 %
Sym-05007...	11.36 %	208.20 MB/s	4,439.35 IO/s	104.27 MB/s	2,223.22 IO/s	2,648,802.25 s	2,648,802.25 s	25.32 %
Sym-05007...	17.66 %	1.93 MB/s	40.09 IO/s	0.99 MB/s	20.54 IO/s	61,925.42 s	61,925.42 s	34.40 %
Sym-05007...	13.86 %	1.48 MB/s	31.32 IO/s	0.76 MB/s	16.14 IO/s	48,395.49 s	48,395.49 s	26.89 %
Sym-05007...	15.50 %	5.35 MB/s	111.55 IO/s	2.58 MB/s	54.10 IO/s	139,689.86 s	139,689.86 s	32.34 %

Storage Disk Contention

Analyzing Performance for Storage Sym-0500 Last Week % Last Week

No Grouping

Disk Contention

Analyze Congestion

Performance Pattern

Topology

Storage Disk Performance (5)

No Grouping

Name	Storage	Applications	Hosts	Capacity (GB)	Disk Group	Disk Speed (RPM)	Type	Position	Role	Vendor	Model	Service Time	Ser
01A.005	Sym-05...	app 4	Host 14	1,000.00	6	10000	Director...			SEAGA...		23,774.82	23,7
01A.006	Sym-05...	app 4	Host 14	1,000.00	6	10000	Director...			SEAGA...		23,774.82	23,7
01A.007	Sym-05...	app 4	Host 14	1,000.00	6	10000	Director...			SEAGA...		23,774.82	23,7
01A.008	Sym-05...	app 4	Host 14	1,000.00	6	10000	Director...			SEAGA...		23,774.82	23,7
01A.009	Sym-05...	app 4	Host 14	1,000.00	6	10000	Director...			SEAGA...		23,774.82	23,7

All Volume Members on Selected Disk (4)

No Grouping

Name	Head	Storage	Applications	Hosts	Capacity (GB)	Raw Capacity (GB)	Extent Utilization	Bandwidth	Bandwidth(R)	Bandwidth(W)	Thr
0001	0001	Sym-05...	app 4	Host 14	8.00	16.00	13.86 %	1.02 MB/s	0.51 MB/s	0.51 MB/s	32.8
0002	0002	Sym-05...	app 4	Host 14	8.00	16.00	13.60 %	1.02 MB/s	0.51 MB/s	0.51 MB/s	32.8
0003	0003	Sym-05...	app 4	Host 14	8.00	16.00	13.58 %	1.02 MB/s	0.51 MB/s	0.51 MB/s	32.8
0004	0004	Sym-05...	app 4	Host 14	8.00	16.00	13.39 %	1.02 MB/s	0.51 MB/s	0.51 MB/s	32.8

Grouping Table Data

The Storage Disk Performance main table provides the following ways to group the data:

No Grouping

No Grouping

Disk Group

Storage

Applications

Hosts

Capacity

All Volume Members on Selected Disk Detail Pane

Name	Head	Storage	Applications	Hosts	Capacity (GB)	Raw Capacity (GB)	Extent Utilization	Bandwidth	Bandwidth (R)
0001	0001	Sym-05...	app 4		8.00	16.00	13.86 %	1.02 MB/s	0.51 M
0002	0002	Sym-05...	app 4		8.00	16.00	13.60 %	1.02 MB/s	0.51 M
0003	0003	Sym-05...	app 4		8.00	16.00	13.58 %	1.02 MB/s	0.51 M
0004	0004	Sym-05...	app 4		8.00	16.00	13.39 %	1.02 MB/s	0.51 M

All Volume Members on Selected Disk

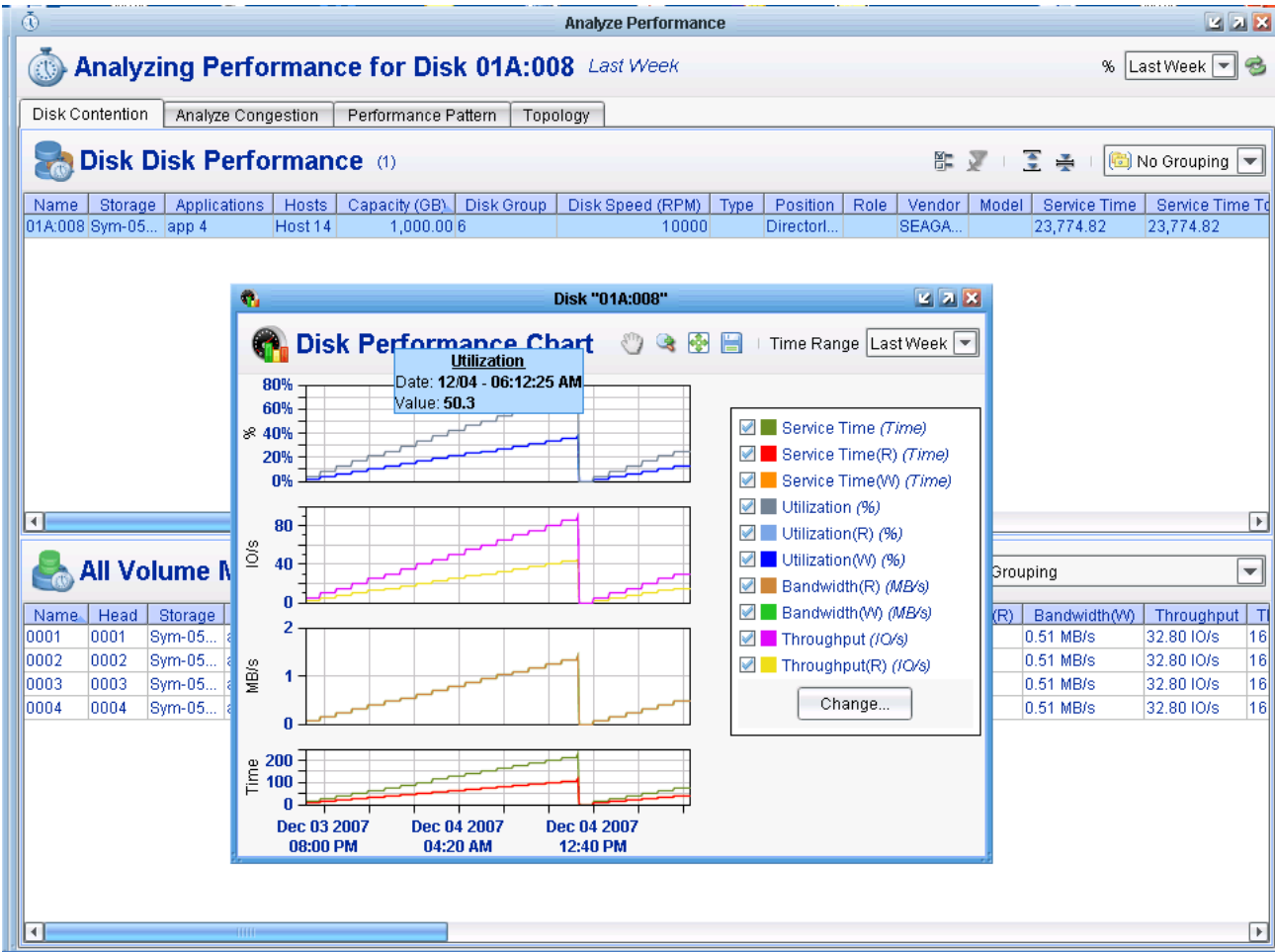
Name	Name of Volume Member
Head	The lead volume that is the only one exposed to the view; the volumes linked to it are consolidated into one meta volume.
Storage	Name of storage array.
Applications	Type of applications
Hosts	Name of the Host. There might be more then one Host for a specific volume; in that event, all host names would be comma separated and alphabetically sorted.
Capacity (GB)	Size of the volume that's accessible to host applications, in gigabytes.
Raw Capacity (GB)	Actual raw disk capacity used by the volume. For example, a RAID-5 volume uses extra capacity to prevent failure in case of a single disk failure.
Extent Utilization	The total percentage of post-cache Service Time used for Read and Write requests out of the available Sample Time
Extent Utilization (R)	The percentage of post-cache Service Time used for Read requests out of the available Sample Time
Extent Utilization (W)	The percentage of post-cache Service Time used for Write requests out of the available Sample Time
Bandwidth Total	Amount of data that is being transmitted in a fixed amount of time in response to IO service requests (measured in MB per sec)
Bandwidth (R)	Amount of Read data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)

Bandwidth (W)	Amount of Write data that is being received in a fixed amount of time in response to IO service requests (measured in MB per sec)
Extent Throughput	Measures the total number of post-cache Read/Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Extent Throughput (R)	Measures the number of post-cache Read IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Extent Throughput (W)	Measures the number of post-cache Write IO service requests passing through the IO channel or portion of that channel per unit of time (measured in IO per sec)
Extent Service Time	The post-cache total amount of time a device uses to service a request. This is automatically calculated using the seek time, latency and Read/Write data
Extent Service Time (R)	The post-cache amount of time a device uses to service a Read request. This is automatically calculated using the seek time, latency and Read data
Extent Service Time (W)	The post-cache amount of time a device uses to service a Write request. This is automatically calculated using the seek time, latency and Write data
IO	Total number of IO operations
IO (R)	Total number of Read IO operations
IO (W)	Total number of Write IO operations
MBytes	Total number of megabytes for R/W since last sample collected
MBytes (R)	Number of megabytes read since last sample collected
MBytes (W)	Number of megabytes written since last sample collected
Response Time	The average time it takes for the volume to respond to an IO request, in milliseconds
Response Time (R)	The average time it takes for the volume to respond to a Read IO request, in milliseconds
Response Time (W)	The average time it takes for the volume to respond to a Write IO request, in milliseconds
Extent IO	Total post-cache number of IO operations
Extent IO (R)	Post-cache number of Read IO operations
Extent IO (W)	Post-cache number of Write IO operations
Extent MBytes	Total number of post-cache megabytes read and written since last sample collected

Extent MBytes (R)	Number of post-cache megabytes read since last sample collected
Extent MBytes (W)	Number of post-cache megabytes written since last sample collected
Cache Hit	Number of times cache accessed since the last sample collected
Cache Hit (R)	Number of cache Read requests since the last sample collected
Cache Hit (W)	Number of cache Write requests since the last sample collected
Cache Hit Ratio	Percentage of Read/Write requests that result in cache hits. The higher the number of hits versus accesses to the volume, the better the performance.

Analyzing Storage Performance: Disk Performance Statistics

Disk Performance Chart



Volume Member Disk Performance

Analyze Performance

Analyzing Performance for Volume Member 0001 Last Week

Disk Contention Analyze Congestion Performance Pattern Topology

Volume Member Disk Performance (5)

No Grouping

Name	Storage	Applications	Hosts	Capacity (GB)	Disk Group	Disk Speed (RPM)	Type	Position	Role	Vendor	Model	Service
01A:005	Sym-05...	app 4	Host 14	1,000.00	6	10000		Directorl...		SEAGA...		23,774.4
01A:006	Sym-05...	app 4	Host 14	1,000.00	6	10000		Directorl...		SEAGA...		23,774.4
01A:007	Sym-05...	app 4	Host 14	1,000.00	6	10000		Directorl...		SEAGA...		23,774.4
01A:008	Sym-05...	app 4	Host 14	1,000.00	6	10000		Directorl...		SEAGA...		23,774.4
01A:009	Sym-05...	app 4	Host 14	1,000.00	6	10000		Directorl...		SEAGA...		23,774.4

All Volume Members on Selected Disk (4)

No Grouping

Name	Head	Storage	Applications	Hosts	Capacity (GB)	Raw Capacity (GB)	Extent Utilization	Bandwidth	Bandwidth(R)	Bandwidth(W)	Throughput
0001	0001	Sym-05...	app 4	Host 14	8.00	16.00	13.86 %	1.02 MB/s	0.51 MB/s	0.51 MB/s	32.80 IO/s
0002	0002	Sym-05...	app 4	Host 14	8.00	16.00	13.60 %	1.02 MB/s	0.51 MB/s	0.51 MB/s	32.80 IO/s
0003	0003	Sym-05...	app 4	Host 14	8.00	16.00	13.58 %	1.02 MB/s	0.51 MB/s	0.51 MB/s	32.80 IO/s
0004	0004	Sym-05...	app 4	Host 14	8.00	16.00	13.39 %	1.02 MB/s	0.51 MB/s	0.51 MB/s	32.80 IO/s

All Volume Members on Selected Disk (4)

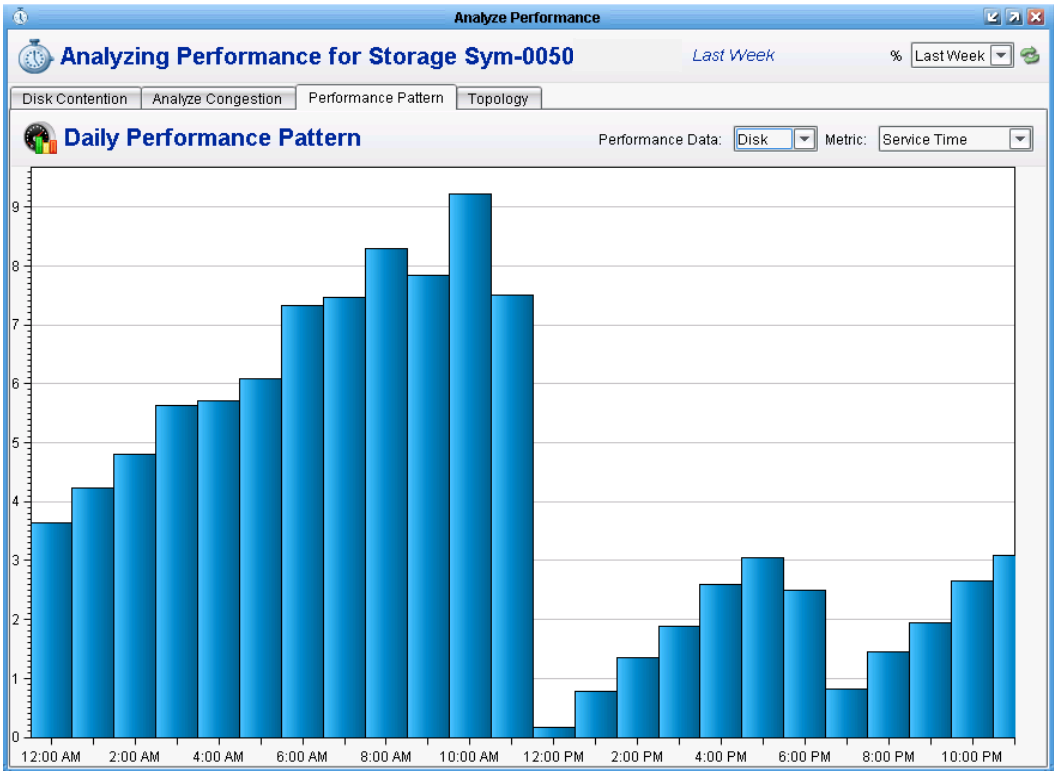
No Grouping

Name	Head	Storage	Applications	Hosts	Capacity (GB)	Raw Capacity (GB)	Extent Utilization	Bandwidth	Bandwidth(R)	Bandwidth(W)	Throughput
0001	0001	Sym-05...	app 4	Host 14	8.00	16.00	13.86 %	1.02 MB/s	0.51 MB/s	0.51 MB/s	32.80 IO/s
0002	0002	Sym-05...	app 4	Host 14	8.00	16.00	13.60 %	1.02 MB/s	0.51 MB/s	0.51 MB/s	32.80 IO/s
0003	0003	Sym-05...	app 4	Host 14	8.00	16.00	13.58 %	1.02 MB/s	0.51 MB/s	0.51 MB/s	32.80 IO/s
0004	0004	Sym-05...	app 4	Host 14	8.00	16.00	13.39 %	1.02 MB/s	0.51 MB/s	0.51 MB/s	32.80 IO/s

No Grouping
Applications
Hosts
Storage
Storage then Head
Storage then Head then Applications
Storage then Head then Hosts

Daily Performance Pattern

The Daily Performance Pattern graph provides you with the ability to identify the utilization or Service Time for a storage array by disk, volume, day, week or by a custom calendar setting. The graph identifies when there are pattern spikes or troughs during a single day and identifies the average hourly results for a given set of days (up to a week).



The Daily Performance Pattern graph shows you in one glance what the utilization percentages are. With this information, you can better make changes to storage allocations based on current usage and determine potential problems with applications because of recurring pattern data for delays and congestion.

Grouping Table Data

The Daily Performance Pattern provides the following ways to group the data:

Performance Data:

Disk

Disk

Volume

Metric:

Service Time

Service Time

Service Time Total

Service Time(R)

Service Time(W)

Utilization

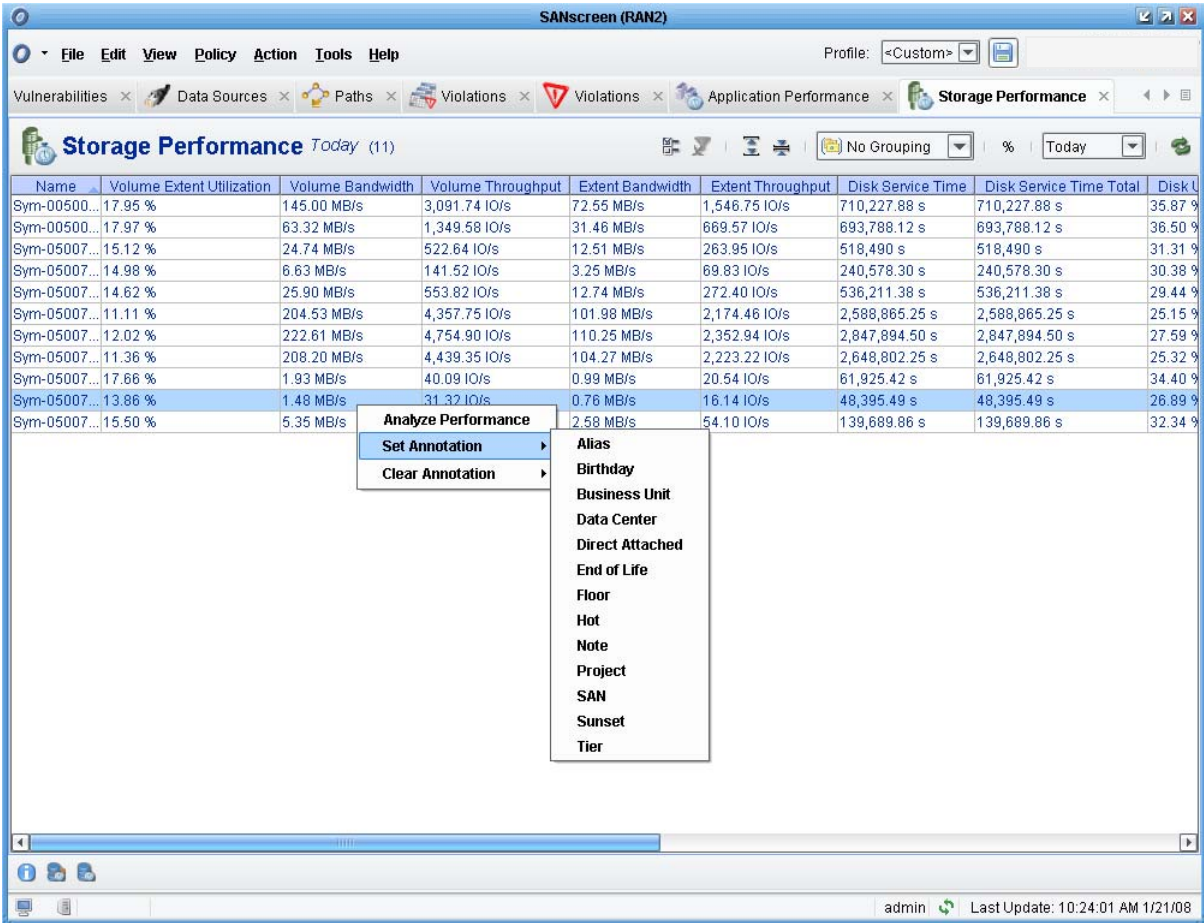
Utilization Total

Utilization(R)

Utilization(W)

Setting Annotations

From the Storage Performance Main Table, Host Performance Main Table and the Volume Detail Pane you can set and Annotations by accessing the right-click menu:



Orphaned Volumes Report

Overview

One challenge to improve utilization in a SAN requires the identification of orphaned volumes. The SAN administrator needs to determine **which volumes have not received significant volume throughput** and thus are candidates for reclamation.

The Application Insight Array Performance Report shows where orphaned volumes exist, enabling the SAN administrator to:

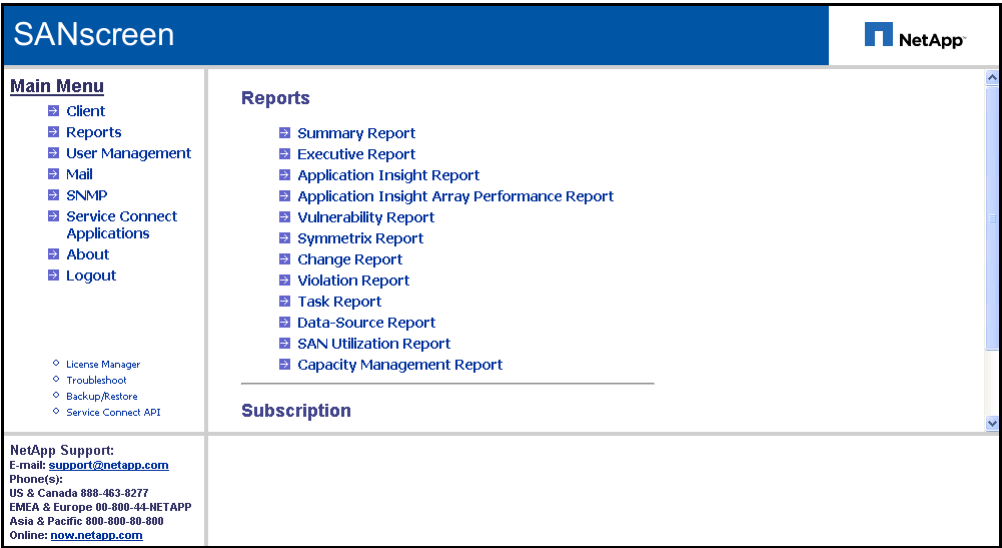
- Identify underutilized storage volumes for reclamation and delay unnecessary array acquisition.
- Reclaim volumes to be reused or moved.

The following example demonstrates one way to manage storage array utilization in SANscreen.

Orphaned Report

A SAN administrator wants to reduce capital expenditures by identifying underutilized volumes and then and then reclaiming or consolidating them.

1. From the SANscreen portal, the SAN administrator selects the Application Insight array performance Report:



2. Next, he or she sets the desired parameters to generate the report, which is based on the throughput (IO/s). Throughput is based on the timeframe of Last Hour, Last Day, or Last Week:

Create Array Performance Report

Report on Last Hour

☒ List all volumes by throughput Less than 100 IO per second

Generate Report Subscribe Report

3. The report includes a summary of orphaned volumes, providing the storage information and Raw Capacity in GB for each:

Summary					
Name	Description				
From Date	2007-12-30 15:33:34				
To Date	2007-12-30 16:33:34				
Total Orphaned Capacity (GB)	8.00				
Total Orphaned Raw Capacity (GB)	16.00				
Storage	Model	Orphaned Raw Capacity (GB)	Orphaned Capacity (GB)	Max. Throughput	Avg. Throughput
Sym-050074300313	Symmetrix DMX800	16.00	8.00	0.84	0.28
Host	Orphaned Raw Capacity (GB)	Orphaned Capacity (GB)	Max. Throughput	Avg. Throughput	
Host 11	16.00	8.00	0.25	0.17	

4. A separate tab in the report provides the specific breakdown of orphaned volume data. The SAN administrator can identify orphaned volumes measured by throughput:

Orphaned Volumes							
Storage	Model	Volume	Capacity (GB)	Raw Capacity (GB)	Hosts	Applications	Tier
Sym-000287700273	Symme	0000	0.05	0.09	us_exchange		Gold
Sym-000287700273	Symme	0031	33.72	38.54	us_exchange		Gold
Sym-000287700273	Symme	0151	33.72	33.72	us_exchange		Gold
Sym-000287700273	Symme	0271	272.32	311.22	us_exchange		Gold
Sym-000287700273	Symme	02D9	8.51	17.02	us_exchange		Gold
Sym-000287700273	Symme	02DA	34.04	68.08	us_exchange		Gold
Sym-000287700273	Symme	02DE	17.02	34.04	SAP		Gold
Sym-000287700273	Symme	02EO	8.51	17.02	SAP		Gold
Sym-000287700273	Symme	02E1	8.51	17.02	SAP		Gold
Sym-000287700273	Symme	02E2	8.51	17.02	SAP		Gold
Sym-000287700273	Symme	02E7	17.02	34.04	SAP		Silver
Sym-000287700273	Symme	02E9	8.51	17.02	SAP		Silver
Sym-000287700273	Symme	02EA	8.51	17.02	SAP		Silver
Sym-000287700273	Symme	02EB	25.53	51.06	ERP		Silver
Sym-000287700273	Symme	0331	238.28	272.32	ERP		Silver
Sym-000287700273	Symme	034D	238.28	272.32	ERP		Silver
Sym-000287700273	Symme	039D	510.59	583.54	ERP		Silver
Sym-000287700273	Symme	03D9	102.12	116.71	ERP		Silver
Sym-000287700273	Symme	0449	238.28	272.32	ERP		Silver
Sym-000287700273	Symme	0465	510.59	583.54	ERP		Bronze
Sym-000287700273	Symme	04AF	17.02	19.45	Post		Bronze
Sym-000287700273	Symme	04B3	17.02	19.45	Post		Bronze
Sym-000287700273	Symme	04B7	17.02	19.45	Post		Bronze

The list shows volumes that are allocated to applications but which are not being used by those applications, so there is no throughput. These volumes are candidates for being reclaimed, increasing valuable storage capacity and decreasing the need for capital expenditures.

Managing Misaligned Tier Volumes

Overview

How does a SAN administrator validate a tiering strategy? The information in the **Application Insight Array Performance Report** helps the SAN administrator manage tiering and meet capacity demands in the SAN by:

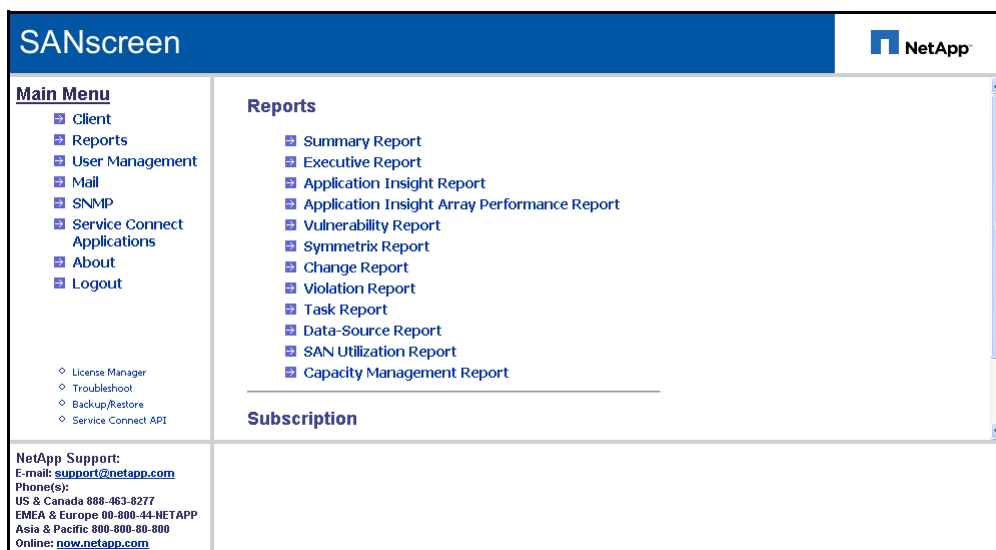
- Identifying volumes that should be migrated to different tiers.
- Ensuring application performance and service levels are not compromised or impacted by tiering decisions and the allocation of resources.

Array performance in Application Insight helps the SAN administrator implement and optimize tiering.

Tier Report

A SAN administrator needs to assess the tiering that exists throughout the SAN. The report lets him know, for example, if a volume on Tier 1 is getting very little IO/s, a sign that it should probably be moved to a lower tier.

1. From the SANscreen portal, the SAN administrator selects the Application Insight Array Performance Report:



- Next, he or she sets the desired parameters to generate the report, which is based on the throughput (IO/s). Throughput is based on the timeframe of Last Hour, Last Day, or Last Week:

Create Array Performance Report

Report on Last Hour
☒ List all volumes by throughput Less than 100 IO per second

Generate Report Subscribe Report

- The report, shown on the next page, includes the specific breakdown of tiering data, with a throughput threshold of >100 IO/s.

Are some devices in a state of high utilization already, and does this indicate a potential problem? What changes made in the current tiering setup would improve performance? Is security a critical issue for devices that presently reside in Tier 2? Are the devices used frequently, or hardly at all?

These are questions that can be addressed using the data collected in the report, which shows volume capacity (GB), raw capacity (GB) and total IO/s for all the Symms:

Tiered Volumes								
Name		Description						
Throughput Threshold		>100 IOPS						
Storage	Model	Volume	Capacity (GB)	Raw Capacity (GB)	Hosts	Applications	Tier	Max. Throughput (IOPS)
Sym-050074300316	Symmetrix DMX800	0000	48.00	64.00	uk_exch			
Sym-050074300316	Symmetrix DMX800	0004	48.00	64.00	uk_exch			
Sym-050074300316	Symmetrix DMX800	0008	48.00	64.00	uk_exch			
Sym-050074300316	Symmetrix DMX800	000C	48.00	64.00	uk_exch			
Sym-050074300316	Symmetrix DMX800	0010	48.00	64.00	uk_exch			
Sym-050074300316	Symmetrix DMX800	0014	48.00	64.00	uk_exch			
Sym-050074300316	Symmetrix DMX800	0018	48.00	64.00	uk_exch			
Sym-050074300316	Symmetrix DMX800	0020	48.00	64.00	uk_cust			
Sym-050074300316	Symmetrix DMX800	0024	48.00	64.00	uk_cust			
Sym-050074300316	Symmetrix DMX800	0028	48.00	64.00	uk_cust			
Sym-050074300316	Symmetrix DMX800	002C	48.00	64.00	uk_cust			
Sym-050074300316	Symmetrix DMX800	0030	48.00	64.00	uk_cust			
Sym-050074300316	Symmetrix DMX800	0034	48.00	64.00	uk_cust			
Sym-050074300316	Symmetrix DMX800	0038	48.00	64.00	uk_cust			
Sym-050074300317	Symmetrix DMX800	0000	48.00	64.00	uk_exch			
Sym-050074300317	Symmetrix DMX800	0004	48.00	64.00	uk_exch			
Sym-050074300317	Symmetrix DMX800	0008	48.00	64.00	uk_exch			
Sym-050074300317	Symmetrix DMX800	000C	48.00	64.00	uk_exch			
Sym-050074300317	Symmetrix DMX800	0010	48.00	64.00	uk_exch			
Sym-050074300317	Symmetrix DMX800	0014	48.00	64.00	uk_exch			
Sym-050074300317	Symmetrix DMX800	0018	48.00	64.00	uk_exch			
Sym-050074300317	Symmetrix DMX800	0020	48.00	64.00	uk_cust			
Sym-050074300317	Symmetrix DMX800	0024	48.00	64.00	uk_cust			
Sym-050074300317	Symmetrix DMX800	0028	48.00	64.00	uk_cust			
Sym-050074300317	Symmetrix DMX800	002C	48.00	64.00	uk_cust			
Sym-050074300317	Symmetrix DMX800	0030	48.00	64.00	uk_cust			
Sym-050074300317	Symmetrix DMX800	0034	48.00	64.00	uk_cust			
Sym-050074300317	Symmetrix DMX800	0038	48.00	64.00	uk_cust			
Sym-050074300317	Symmetrix DMX800	0080	48.00	64.00	uk_backup			
Sym-050074300317	Symmetrix DMX800	0084	48.00	64.00	uk_backup			
Sym-050074300317	Symmetrix DMX800	0088	48.00	64.00	uk_backup			
Sym-050074300317	Symmetrix DMX800	008C	48.00	64.00	uk_backup			
Sym-050074300317	Symmetrix DMX800	0090	48.00	64.00	uk_backup			
Sym-050074300317	Symmetrix DMX800	0094	48.00	64.00	uk_backup			
Sym-050074300317	Symmetrix DMX800	0098	48.00	64.00	uk_backup			
Sym-050074300317	Symmetrix DMX800	00A0	48.00	64.00	uk_dev			
Sym-050074300317	Symmetrix DMX800	00A4	48.00	64.00	uk_dev			
Sym-050074300317	Symmetrix DMX800	00A8	48.00	64.00	uk_dev			
Sym-050074300317	Symmetrix DMX800	00AC	48.00	64.00	uk_dev			
Sym-050074300317	Symmetrix DMX800	00B0	48.00	64.00	uk_dev			
Sym-050074300317	Symmetrix DMX800	00B4	48.00	64.00	uk_dev			
Sym-050074300317	Symmetrix DMX800	00B8	48.00	64.00	uk_dev			
Sym-050074300318	Symmetrix DMX800	0000	48.00	64.00	uk_exch			
Sym-050074300318	Symmetrix DMX800	0004	48.00	64.00	uk_exch			
Sym-050074300318	Symmetrix DMX800	0008	48.00	64.00	uk_exch			
Sym-050074300318	Symmetrix DMX800	000C	48.00	64.00	uk_exch			
Sym-050074300318	Symmetrix DMX800	0010	48.00	64.00	uk_exch			
Sym-050074300318	Symmetrix DMX800	0014	48.00	64.00	uk_exch			
Sym-050074300318	Symmetrix DMX800	0018	48.00	64.00	uk_exch			
Sym-050074300318	Symmetrix DMX800	0020	48.00	64.00	uk_cust			
Sym-050074300318	Symmetrix DMX800	0024	48.00	64.00	uk_cust			
Sym-050074300318	Symmetrix DMX800	0028	48.00	64.00	uk_cust			
Sym-050074300318	Symmetrix DMX800	002C	48.00	64.00	uk_cust			
Sym-050074300318	Symmetrix DMX800	0030	48.00	64.00	uk_cust			
Sym-050074300318	Symmetrix DMX800	0034	48.00	64.00	uk_cust			
Sym-050074300318	Symmetrix DMX800	0038	48.00	64.00	uk_cust			
Sym-050074300318	Symmetrix DMX800	0080	48.00	64.00	uk_backup			
Sym-050074300318	Symmetrix DMX800	0084	48.00	64.00	uk_backup			
Sym-050074300318	Symmetrix DMX800	0088	48.00	64.00	uk_backup			
Sym-050074300318	Symmetrix DMX800	008C	48.00	64.00	uk_backup			
Sym-050074300318	Symmetrix DMX800	0090	48.00	64.00	uk_backup			
Sym-050074300318	Symmetrix DMX800	0094	48.00	64.00	uk_backup			
Sym-050074300318	Symmetrix DMX800	0098	48.00	64.00	uk_backup			
Sym-050074300318	Symmetrix DMX800	00A0	48.00	64.00	uk_dev			

Vulnerabilities

Overview

SANscreen reports vulnerabilities, which are configuration and usage issues that can cause problems, even though they do not result in a path violation. SANscreen looks for vulnerabilities continuously as it monitors your SAN changes.

This chapter describes the features available to view and assess SAN vulnerabilities for array performance in Application Insight. There are three vulnerabilities that will be described:

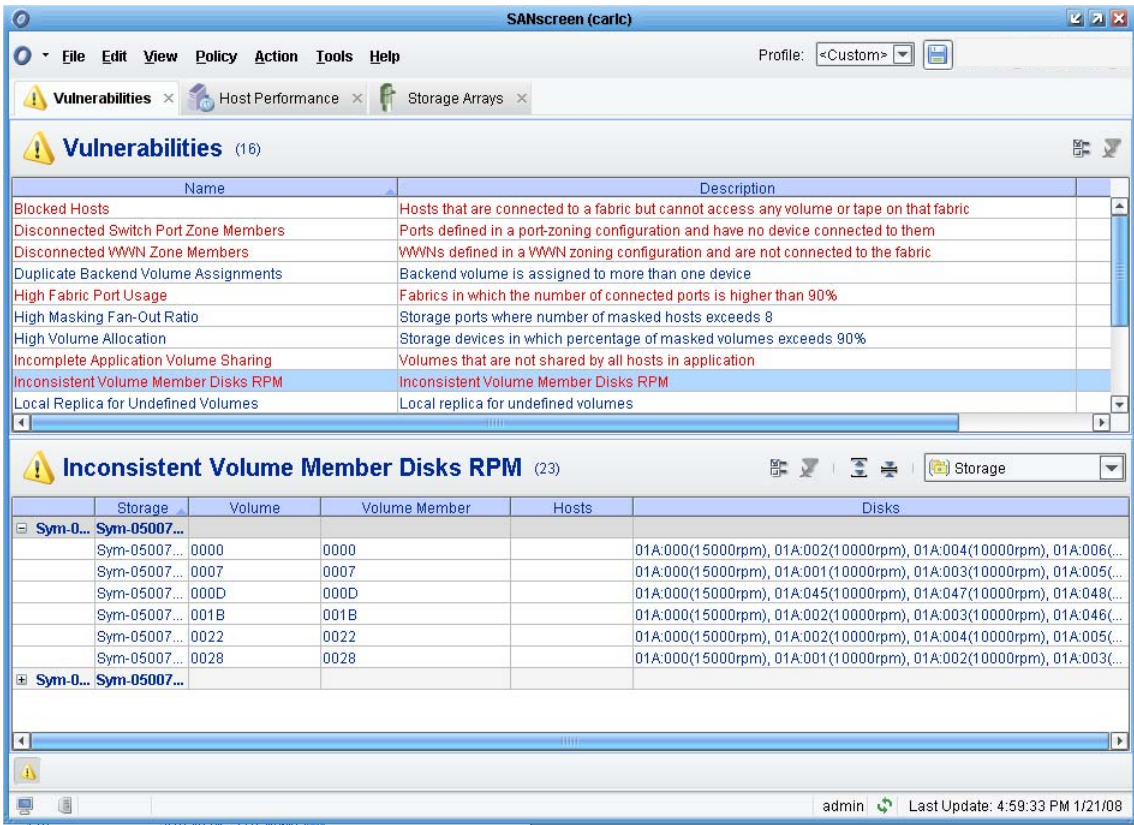
- [Volume with Members on the Same Disk](#)
- [Volume and Replica Share Same Disk](#)
- [Inconsistent Volume Member Disks RPM](#)

Viewing Vulnerability Data

Click the Vulnerabilities icon  from the navigation menu to view SANscreen vulnerability data. This screen is divided into two parts:

1. The **Vulnerabilities** main table lists each type of vulnerability SANscreen monitors:

Field	Description
Name	Type of vulnerability reported on this row.
Description	More detailed description of the vulnerability.
Occurrences	How many instances of this vulnerability have been detected in your SAN. If the count is 1 or more, the row displays in red and the Vulnerabilities Details pane provides more information.



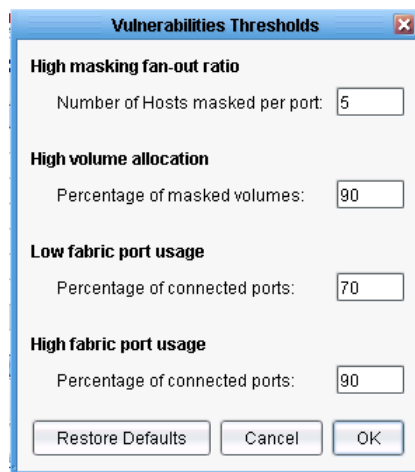
2. **Vulnerabilities Details** apply when you click on a red vulnerability in the main table. The detail pane provides appropriate information about each occurrence of the selected vulnerability. The number following the table's title identifies the total number of reported vulnerabilities of the selected type.

Each row represents a single vulnerability, and the content of the detail is specific to the selected vulnerability,

Setting Vulnerability Thresholds

SANscreen lets you set various thresholds that determine when SANscreen reports a condition as a vulnerability. Proceed as follows to set threshold values:

- 1. Choose the Configure Vulnerabilities option from the Action or right-click menu in the main table display.
- 2. Use the dialog that opens to configure your thresholds:



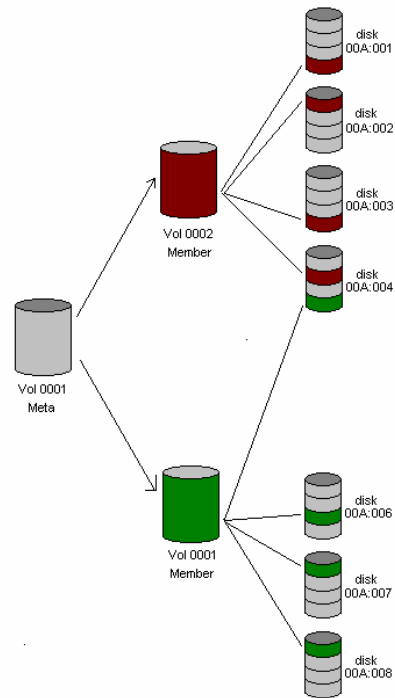
The image shows a Windows-style dialog box titled "Vulnerabilities Thresholds". It contains four sections, each with a label and a text input field. The first section is "High masking fan-out ratio" with the label "Number of Hosts masked per port:" and a value of "5". The second section is "High volume allocation" with the label "Percentage of masked volumes:" and a value of "90". The third section is "Low fabric port usage" with the label "Percentage of connected ports:" and a value of "70". The fourth section is "High fabric port usage" with the label "Percentage of connected ports:" and a value of "90". At the bottom of the dialog are three buttons: "Restore Defaults", "Cancel", and "OK".

Section	Label	Value
High masking fan-out ratio	Number of Hosts masked per port:	5
High volume allocation	Percentage of masked volumes:	90
Low fabric port usage	Percentage of connected ports:	70
High fabric port usage	Percentage of connected ports:	90

Field	Causes SANscreen to report a vulnerability for ...
High masking fan-out ratio Number of hosts masked per port	Each storage port for which the number of masked hosts exceeds the stated number.
High volume allocation Number of masked volumes	Each storage array for which the percentage of masked volumes exceeds the stated percent.
Low fabric port usage Percentage of connected hosts	Each fabric in which the number of connected ports is lower than the stated percent.
High fabric port usage Percentage of connected hosts	Each fabric in which the number of connected ports is higher than the stated percent.

Volume with Members on the Same Disk

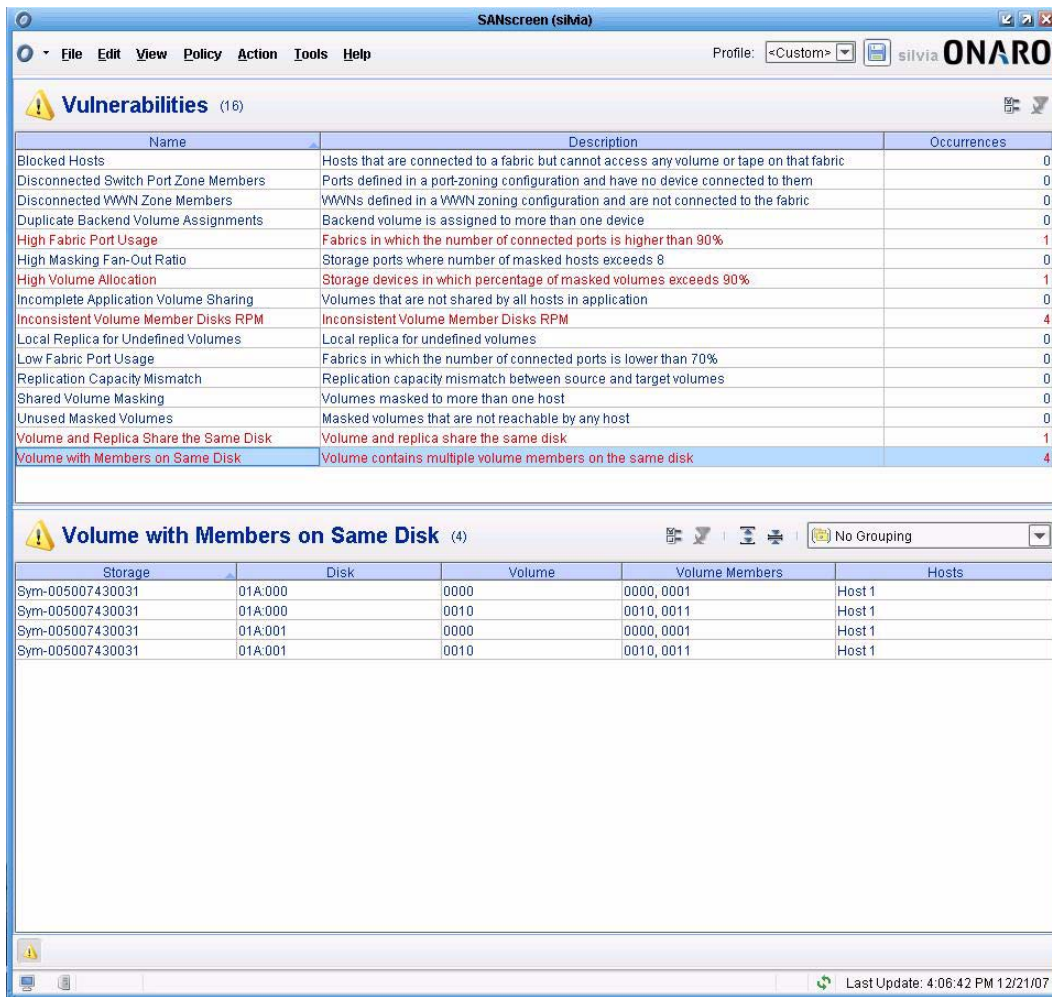
This type of vulnerability identifies volume members that belong to the same metavolume and are sharing the same disk:



The idea is to distribute IO--if Volume Members are on the same disk, you have a potential bottleneck.

Viewing Vulnerability Data

The Vulnerabilities view in SANscreen displays the Contention issue, highlighted here:



SANscreen (silvia)

Profile: <Custom> silvia ONARO

Vulnerabilities (16)

Name	Description	Occurrences
Blocked Hosts	Hosts that are connected to a fabric but cannot access any volume or tape on that fabric	0
Disconnected Switch Port Zone Members	Ports defined in a port-zoning configuration and have no device connected to them	0
Disconnected WWN Zone Members	WWNs defined in a WWN zoning configuration and are not connected to the fabric	0
Duplicate Backend Volume Assignments	Backend volume is assigned to more than one device	0
High Fabric Port Usage	Fabrics in which the number of connected ports is higher than 90%	1
High Masking Fan-Out Ratio	Storage ports where number of masked hosts exceeds 8	0
High Volume Allocation	Storage devices in which percentage of masked volumes exceeds 90%	1
Incomplete Application Volume Sharing	Volumes that are not shared by all hosts in application	0
Inconsistent Volume Member Disks RPM	Inconsistent Volume Member Disks RPM	4
Local Replica for Undefined Volumes	Local replica for undefined volumes	0
Low Fabric Port Usage	Fabrics in which the number of connected ports is lower than 70%	0
Replication Capacity Mismatch	Replication capacity mismatch between source and target volumes	0
Shared Volume Masking	Volumes masked to more than one host	0
Unused Masked Volumes	Masked volumes that are not reachable by any host	0
Volume and Replica Share the Same Disk	Volume and replica share the same disk	1
Volume with Members on Same Disk	Volume contains multiple volume members on the same disk	4

Volume with Members on Same Disk (4)

No Grouping

Storage	Disk	Volume	Volume Members	Hosts
Sym-005007430031	01A:000	0000	0000, 0001	Host 1
Sym-005007430031	01A:000	0010	0010, 0011	Host 1
Sym-005007430031	01A:001	0000	0000, 0001	Host 1
Sym-005007430031	01A:001	0010	0010, 0011	Host 1

Last Update: 4:06:42 PM 12/21/07

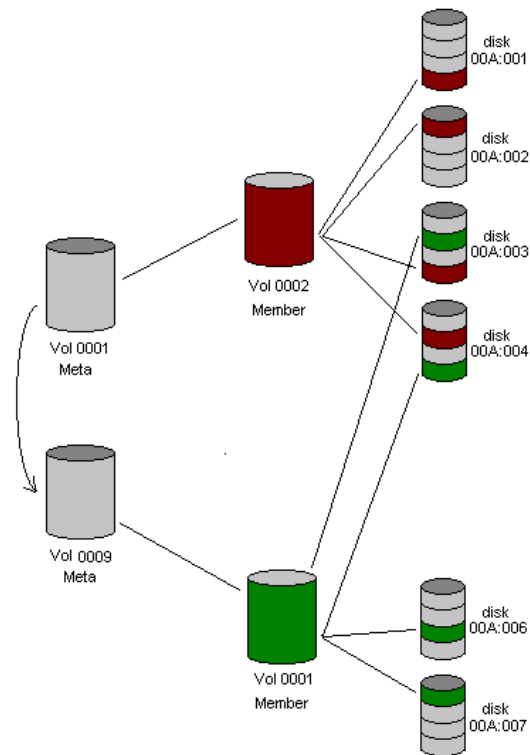
All volume members each appear on both disks--01A:000 and also 01A:001. The SAN administrator must ensure that the conflict is resolved by placing volume members on different disks.

Vulnerabilities Details

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 (e.g., storage). The number in parentheses indicates the number of items reported in the (grouped) row.
Disk	Name of the disk being shared.
Volume	Name to identify the volume that contains the volume members sharing the same disk.
Volume Members	The names of volume members that are sharing the same disk.
Hosts	The host(s) accessing this specific volume.

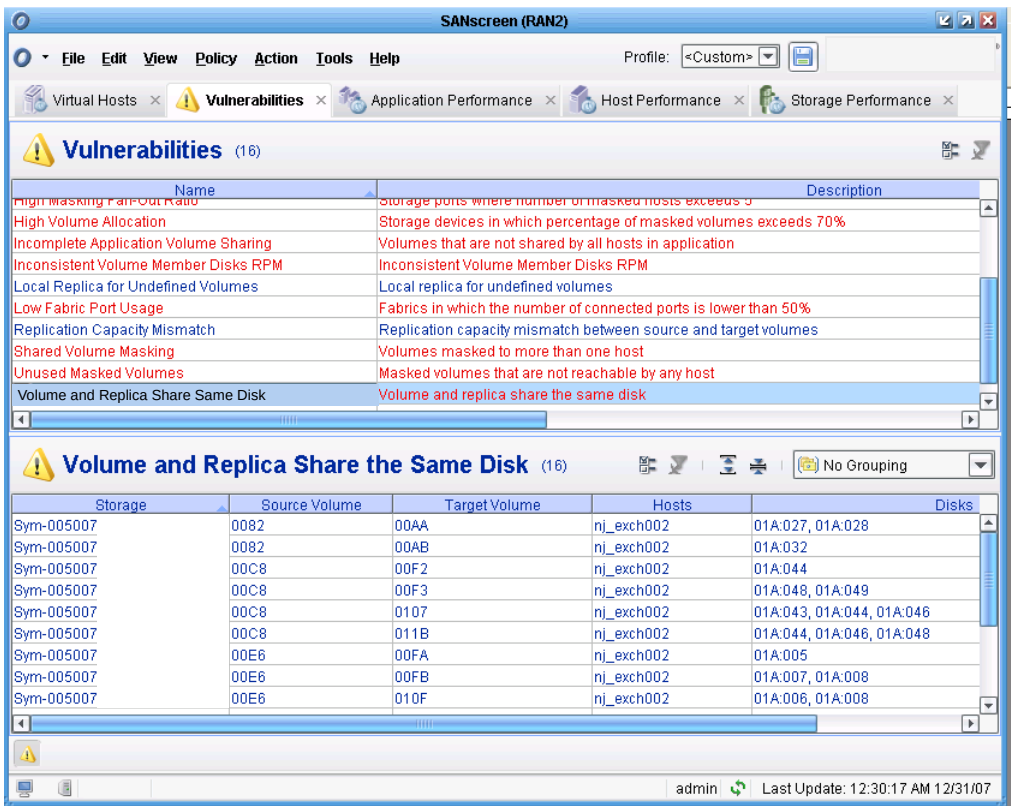
Volume and Replica Share Same Disk

This type of vulnerability identifies volumes and replicas (Business Continuity Volume--BCV) that share the same disk. This causes performance problems (potential contention and degradation of service).



It also prevents full backup, since information that is shared by both the BCV and the volume on the same disk could be lost if the disk is corrupted or fails. That is, if the BCV is used for backup and the disk goes down, you lose both the volume and the backup.

The Vulnerabilities view in SANscreen displays the Contention issue, highlighted here:

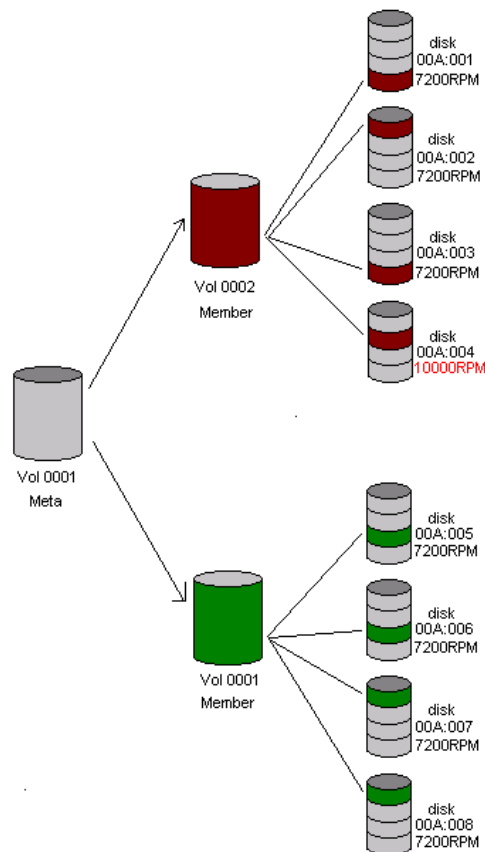


Vulnerabilities Details

Field	Description
blank	Applicable with any presentation order () other than No Grouping. Column that organizes the data according to the selected grouping format (e.g., storage). The number in parentheses indicates the number of items reported in the (grouped) row.
Source Volume	The volume on the disk.
Target Volume	The replica (BCV) that is on the same disk as the volume.
Hosts	Host(s) of the source volume.
Disks	The disk(s) in contention.

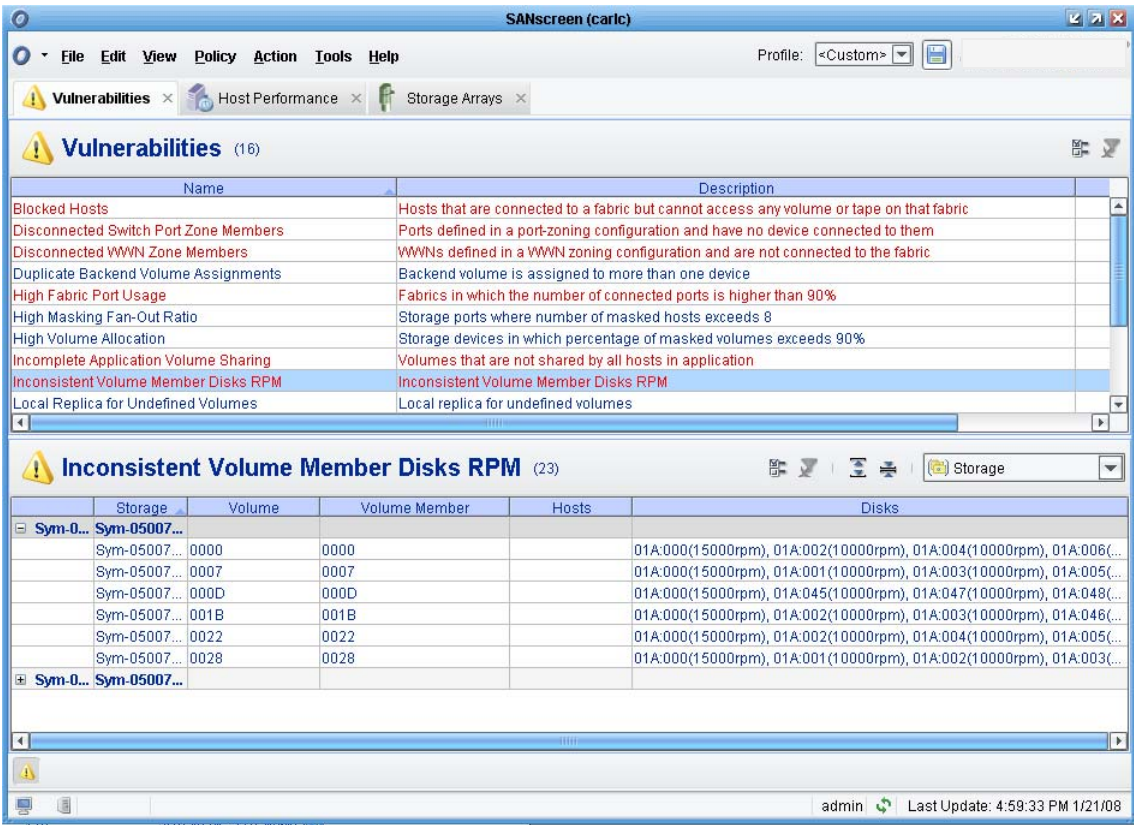
Inconsistent Volume Member Disks RPM

This type of vulnerability identifies volumes that have volume members spanning disks with unequal RPM (e.g., when three of four disks are operating at 7200RPM and one is running at 10,000).



Since all the disks are not using the same RPM, the operations are bound by the slowest disk, introducing latency to the configuration.

The Vulnerabilities view in SANscreen displays the Contention issue, highlighted here:



Vulnerabilities Details

Field	Description
blank	Applicable with any presentation order () other than No Grouping. Column that organizes the data according to the selected grouping format (e.g., storage). The number in parentheses indicates the number of items reported in the (grouped) row.
Storage	Name of the storage array on which the volume exists.
Volume	Name to identify the volume.
Volume Member	The names of volume member that has unequal RPM.
Hosts	The host(s) accessing this specific volume.
Disks	Disks that the volume member spans.

Appendix A:

Terminology--EMC Performance Manager to NetApp array performance for Application Insight

EMC Performance Manager	NetApp A.P
IOs per sec	Throughput
reads per sec	Throughput(R)
writes per sec	Throughput(W)
hits per sec	
read hits per sec	
write hits per sec	
seq reads per sec	
seq read hits per sec	
seq writes per sec	
Kbytes read per sec	Bandwidth(R)
Kbytes written per sec	Bandwidth(W)
DA read requests per sec	Extent Throughput (R)
DA write requests per sec	Extent Throughput (W)
DA prefetched tracks per sec	
DA prefetched tracks used per sec	
DA Kbytes read per sec	Extent Bandwidth(R)
DA Kbytes written per sec	Extent Bandwidth(W)
write pending count	

max write pending threshold	
sampled RDF write waits per sec	
sampled average read time (ms)	
sampled average write time (ms)	
sampled average read miss time (ms)	
sampled average WP disconnect time (ms)	
total DA req per sec	Extent Throughput
total reads per sec	
total read hits per sec	
total read misses per sec	
total ios per sec	
total hits per sec	
total misses per sec	
write misses per sec	
read misses per sec	
seq ios per sec	
% random read hit	
% random read miss	
% sequential read	
% write	
% read	
% hit	Cache Hit Ratio %
% miss	
% read hit	Cache Hit Ratio(R) %
% write hit	Cache Hit Ratio(W) %
% read miss	

% write miss	
% sequential IO	
% sequential writes	
HA Kbytes transferred per sec	
average read size in Kbytes	
average write size in Kbytes	
average IO size in Kbytes	
DA Kbytes transferred per sec	
System bus Kbytes per sec	

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