

ViPR SRM for Storage Administrators Student Guide

Education Services
August 2014

ViPR SRM for Storage Administrators



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Welcome to ViPR SRM for Storage Administrators.

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Course Overview

Description	This course is intended for individuals who will be using ViPR SRM to monitor a storage environment. Various ViPR SRM use cases are presented. Hands-on labs will cover the creation of localized dashboard views, and the use of reports to analyze and respond appropriately to common management issues related to performance, capacity planning, chargebacks, configuration and compliance, service level usage, and alerting.
Audience	This course is intended for those who will be involved in monitoring and administering a storage infrastructure using ViPR SRM.
Objectives	Upon completion of this course you should be able to: • Describe the architecture and benefits of ViPR SRM • Demonstrate use of the ViPR SRM Dashboard to manage storage • Define and establish capacity planning in the storage environment • Monitor and analyze performance indications • Explore and maintain Service Levels and Chargeback accounting • Describe compliance management via ViPR SRM • Use operational alerts to enhance storage situational awareness • Create reports in user dashboards



Agenda

	Modules/Lessons	Labs
Day 1	• Module 1 Overview of ViPR SRM • Lesson 1 Architecture and benefits of ViPR SRM • Module 2 Using the ViPR SRM Dashboards • Lesson 1 Available Global Dashboards • Lesson 2 Exploring Configuration Items • Module 3 Capacity Planning • Lesson 1 Capacity Usage Trends • Lesson 2 Forecasting Capacity Problems • Lesson 3 Understanding the Report Library Capacity Reports • Lesson 4 "What if" Scenarios • Lesson 5 Workload Distribution	• Lab Connecting to the ViPR SRM Application • Lab Global Dashboard Review • Lab Storage Resource Planning



Agenda

Modules/Lessons

Labs

Day 2	- Module 4 Alerting in ViPR SRM - Lesson 1 Alert sources and mechanisms in ViPR SRM - Lesson 2 Storage Compliance Monitoring and Reporting - Module 5 Service Levels and Chargeback Accounting - Lesson 1 Service Levels - Lesson 2 Modifying Storage Service Levels - Lesson 3 Out-of-the-box Chargeback reports	- Lab Examining Alerts in ViPR SRM - Lab Service Levels and Chargeback Reporting



Agenda

Modules/Lessons

Labs

Day 3	• Module 6 Performance Reporting • Lesson 1 Performance Metrics and Graphs • Module 7 Report Customization in ViPR SRM • Lesson 1 Basics of Reporting • Lesson 2 Report Wizard Overview • Lesson 3 Modifying Reports • Lesson 4 Key concepts of Reporting	• Lab Performance Reporting and Analysis • Lab Reporting



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Module 1: Overview of ViPR SRM

Lesson 1: Architecture and Benefits of ViPR SRM

This lesson covers the following topics:

- Benefits and features of ViPR SRM
- Components required to monitor and report on the infrastructure
- Architecture of the environment used for monitoring and reporting



This lesson covers the ViPR SRM family of products and an introduction to the ViPR SRM product.

Storage Resource Management Product Family

- Two Product Lines: ViPR and ViPR SRM
- **ViPR** – Provisions block and file storage:
 - ▶ Block
 - ▶ File
 - ▶ ViPR Object Data Service
 - ▶ ViPR Hadoop Distributed File System
- **ViPR SRM** – monitors and reports physical and virtual storage:
 - ▶ ViPR SRM
 - ▶ Solution Packs to monitor storage
 - ▶ Including a ViPR Solution Pack for monitoring and reporting ViPR instances



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Module 1: Overview of ViPR SRM

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ViPR Block: Provides a block storage service that enables you to support any application, file system, database, operating system or virtualization platform with a unilateral block storage consumption model across ViPR-managed arrays.

ViPR Object Data Service: Enables applications that use Amazon S3, OpenStack Swift, and EMC Atmos to store, access, and manipulate unstructured data as objects or files directly on the underlying file-based storage, without having to rewrite existing applications.

ViPR Hadoop Distributed File System (HDFS) Data Service: Lets existing storage function as a Big Data repository and extend queries and applications to existing data sources.

ViPR SRM: Monitors and reports on physical and virtual entities in the SAN.

ViPR SRM Benefits

ViPR SRM – Software to visualize, analyze, and optimize storage resources

- **Understand Storage Impact:**
 - ▶ end-to-end monitoring and reporting
 - ▶ analysis of storage services
- **Assure Services:**
 - ▶ Manage service-level thresholds
 - ▶ Respond to service-level deviations
- **Optimize Resources:**
 - ▶ Analyze storage workloads and trends
 - ▶ Align storage tiers to service levels



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Module 1: Overview of ViPR SRM

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EMC ViPR SRM is storage resource management software that enables IT to visualize storage relationships, analyze configurations and capacity growth, and optimize resources to improve return on investment (ROI) in traditional and software-defined storage environments.

ViPR SRM enables organizations to deliver end-to-end monitoring, reporting, and analysis of storage services through analysis of real-time metrics for applications, hosts, switches, and arrays.

With ViPR SRM you can manage and respond to service-level deviations through custom thresholds and dashboards across heterogeneous storage and analyze storage workload trends to align storage tiers to application service levels.

ViPR SRM Features

- Storage capacity reporting for EMC and multivendor storage environments
- End-to-end data path visualization and performance reporting
- Agentless discovery
- Continuous configuration validation of design best practices and the EMC Support Matrix
- Custom, multitenant, multi-site, mobile-access dashboards and reports
- Support for EMC ViPR software defined storage

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Module 1: Overview of ViPR SRM

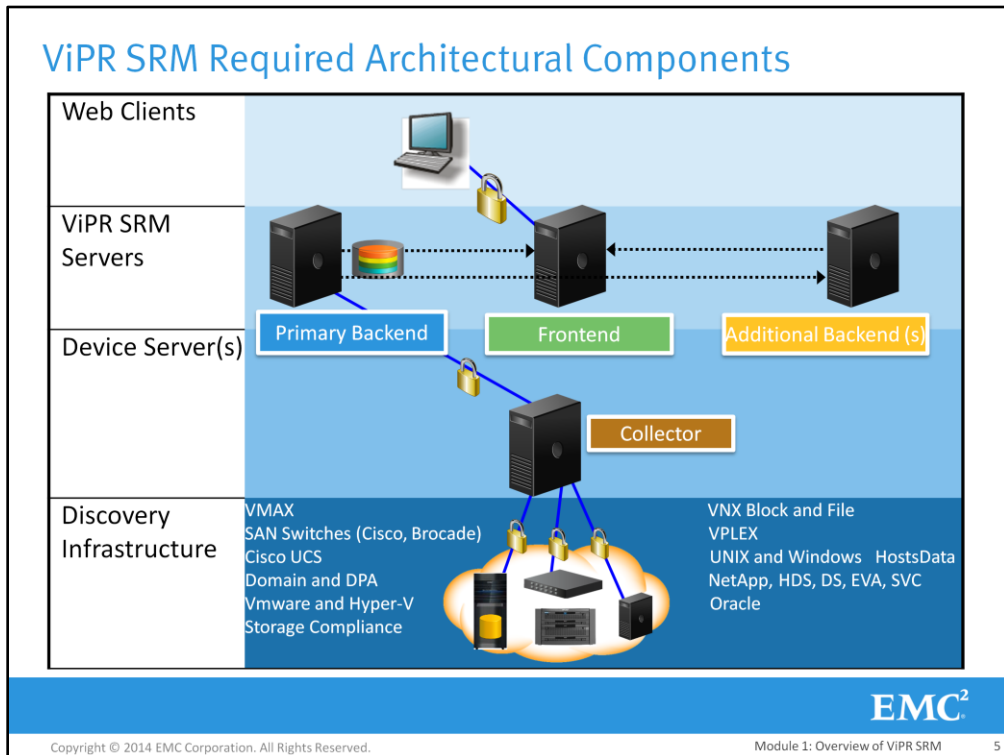
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With EMC ViPR SRM, you will have what you need to ensure application performance and manage storage capacity.

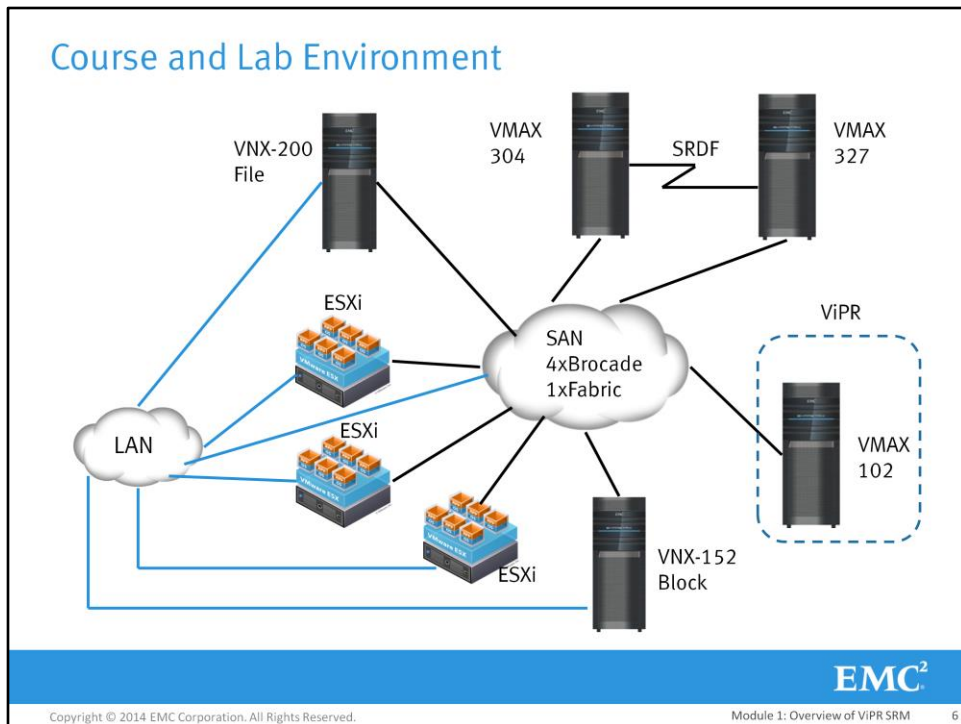
ViPR SRM lets you visualize performance dependencies, analyze storage configurations, and monitor capacity growth across virtual environments, cloud infrastructure, and software-defined datacenters. You will be ready to meet service levels and get the best return on investment.

Agentless discovery presents detailed relationship and topology views that help you identify service dependencies and analyze performance trends. You will have a dynamic picture of how virtual and physical hosts map to storage pools. ViPR SRM continuously tracks changes and validates compliance with your best practices and the EMC Support Matrix. Create custom dashboards and reports to monitor compliance. Track block and file consumption. Optimize storage use, create chargeback reports, and predict capacity needs.

ViPR SRM Required Architectural Components

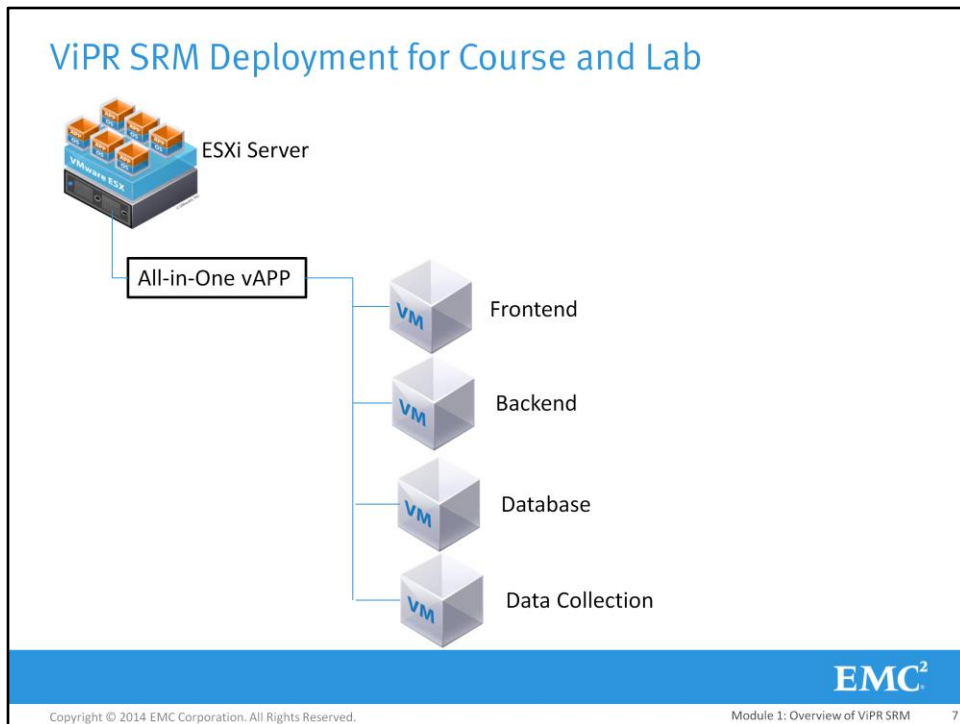


ViPR SRM may be configured in a distributed manner so that multiple Backends work cooperatively to handle large loads. In a configuration such as this, ViPR SRM may be installed with multiple virtual machines created within a virtual appliance to distribute the workload of the ViPR SRM application in an optimal fashion. When ViPR SRM is distributed across more than one virtual host, the hosts may all be windows, linux, or a combination of both.



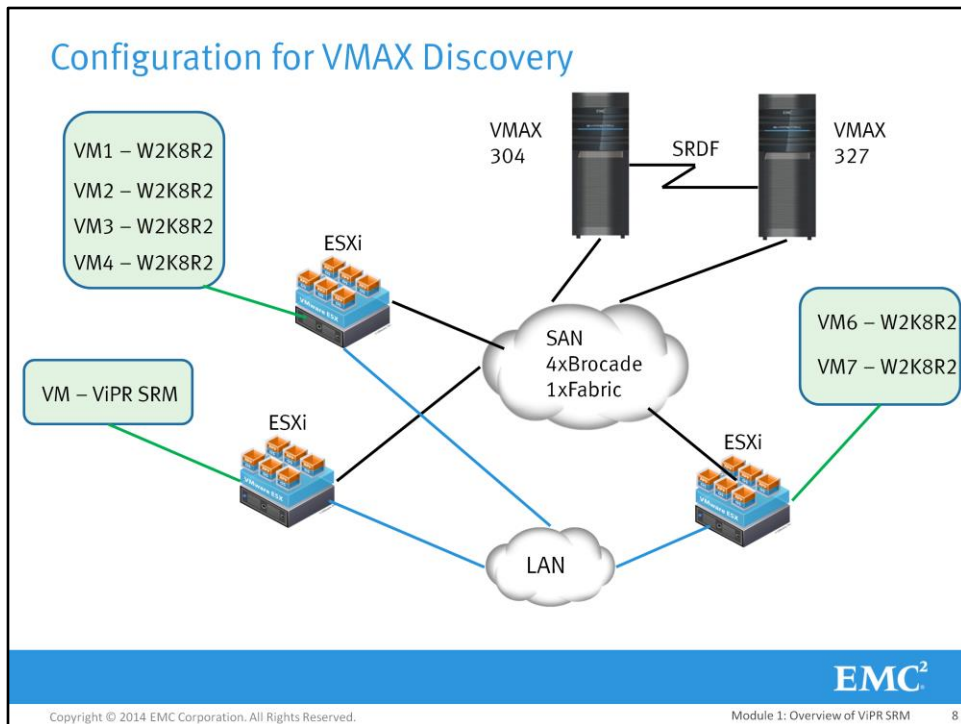
The environment for the course and lab consists of:

- 1) 2xVMAX 20K – VMAX 304 and VMAX 327. These two are SRDF connected.
- 2) 1xVMAX 10K – VMAX 102. This is used exclusively for ViPR.
- 3) 1xUnified VNX 5400 – VNX-152. This is used to provide Block storage.
- 4) 1xUnified VNX 5400 – VNX-200. This is used to provide File storage.
- 5) Some ESXi 5.1 Servers. All hosts in the environment are VMs hosted on these ESXi servers. The All-in-One ViPR SRM instance is also hosted on one of the ESXi servers.
- 6) SAN – consists of 4 Brocade switches that are ISL'ed. So there is only one Fabric.



An All-in-One ViPR SRM is deployed on the ESXi server. For clarity the different components of ViPR SRM are shown in the slide.

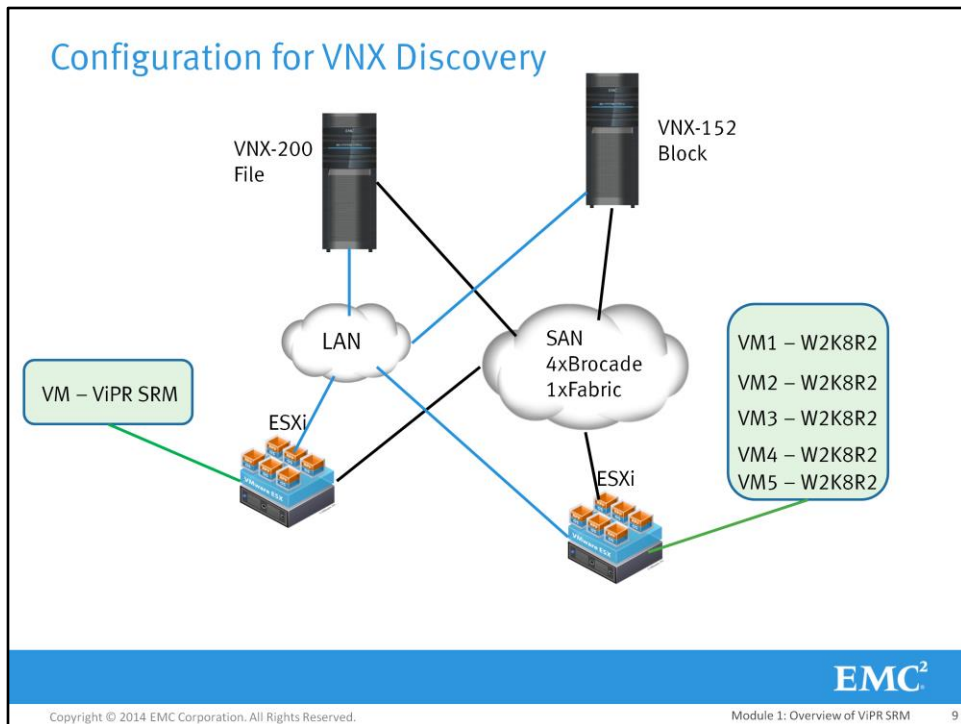
- **Frontend:** This is the Tomcat web server application running multiple web applications that allow users and administrators to use a convenient User Interface (UI) for report browsing, viewing, GUI-led administration tasks.
- **Backend:** APG-Backend is responsible for receiving data from any data collector, performing validation, and processing before storing the data into the database.
- **Database:** The database is the data repository for the whole SRM Suite application. Actually, it is best to distinguish between physical DB and logical DB in this discussion. More precisely, MySQL runs a database instance (the physical, the DB engine) and can manage many "logical" databases. Each logical database must have one and only one APG-Backend driving updates to it. Typically there is only a single MySQL Database Engine on a given Backend host.
- **Data Collection:** This is the entity that performs the discovery and data-collection of infrastructure components. Multiple data-collectors can run on a single host or be spread onto multiple hosts so long as available resources allow (mainly CPU, memory).



To discover and collect data for the VMAX arrays:

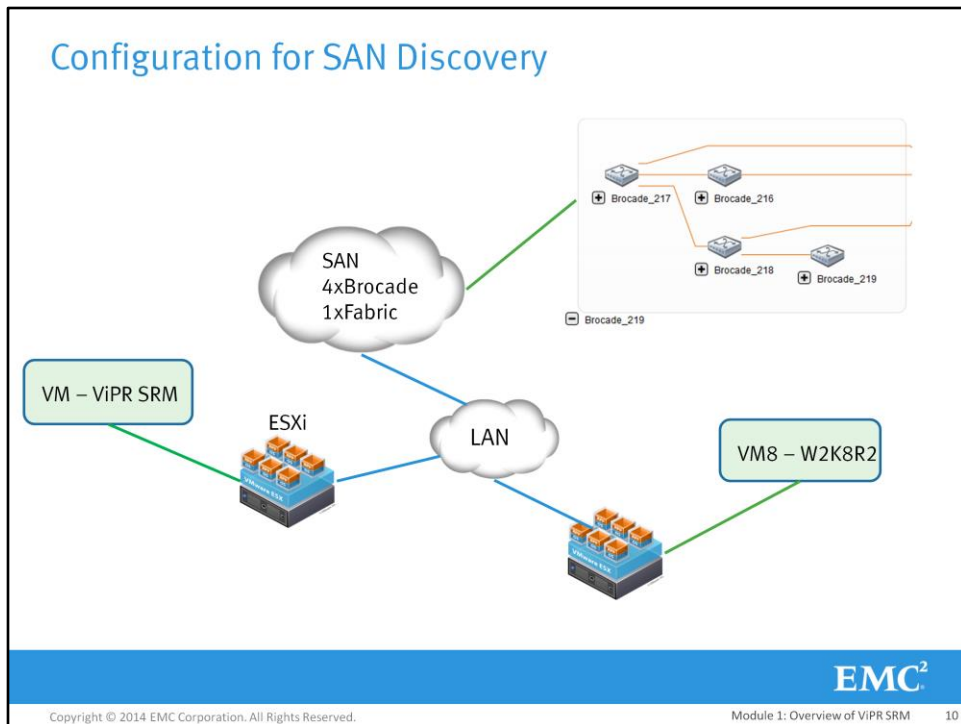
- 1) VM3 – provides Solutions Enabler 7.6.2.8 and SMI-S for VMAX 304.
- 2) VM4 – provides Unisphere for VMAX with Performance Analyzer for VMAX 304.
- 3) VM6 – provides Solutions Enabler 7.6.2.8 for VMAX 327.
- 4) ViPR SRM has been installed as an All-in-One configuration.
- 5) SolutionPack for VMAX has been installed and SYMAPI Server has been configured for Remote with appropriate entries in the `netcnfg` file.
- 6) VM1 and VM2 are configured as consumers of storage from VMAX 304. The LUNs are presented to the VM's as RDM in Physical Compatibility Mode.
- 7) VM6 and VM8 are configured as consumers of storage from VMAX 327. The LUNs are presented to the VM's as RDM in Physical Compatibility Mode.
- 8) The `storevntd` on VM3 and VM5 are configured to forward SNMP traps to ViPR SRM.

The result of this configuration will be that performance data will be available only for VMAX 304. All other details will be available for both VMAX 304 and VMAX 327.



Discovery and monitoring of VNX:

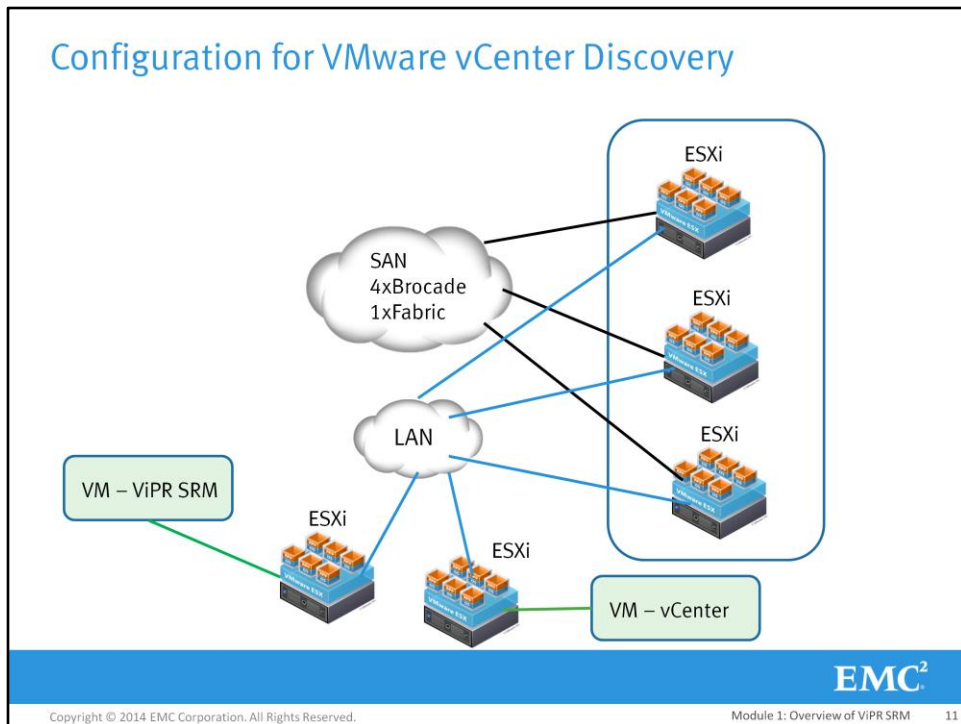
- 1) SolutionPack for VNX is installed on the All-in-One ViPR SRM 3.5 instance. This installs the requisite `naviseccli` for VNX discovery.
- 2) During configuration of the SolutionPack, the IP addresses of SPA and SPB and the Control Station of both the VNX are specified.
- 3) VM5 – is configured to consume Block storage from VNX-152.
- 4) The host using VNX-200 for File storage is not discovered in this ViPR SRM instance.



To discover the FC SAN and Fabric:

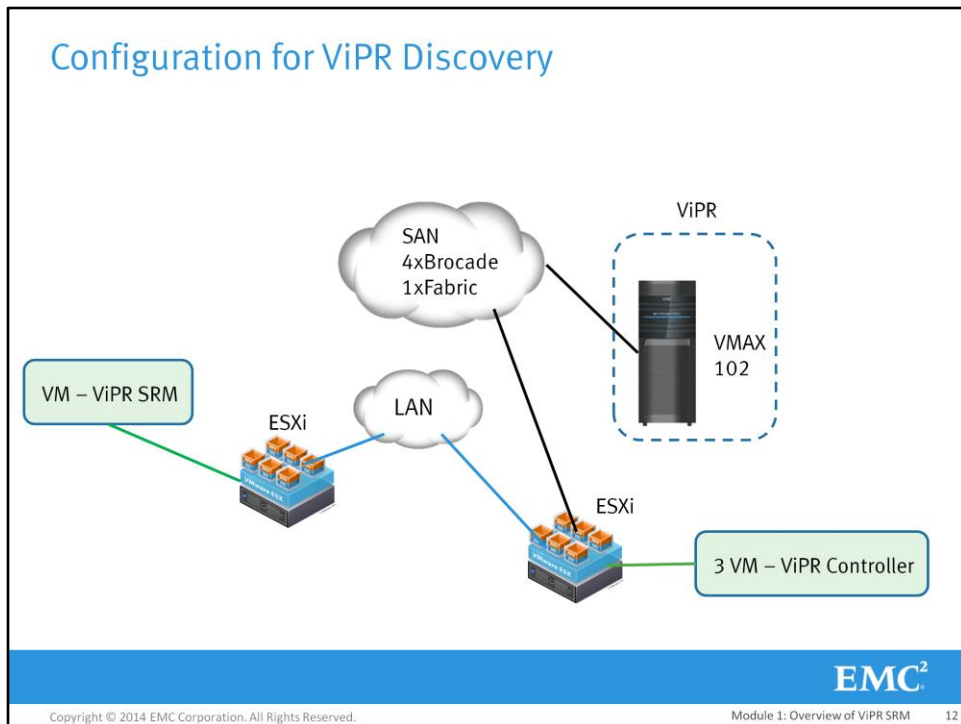
- 1) SolutionPack for Brocade is installed on the All-in-One ViPR SRM instance.
- 2) Switch discovery is via IP and SNMP.
- 3) For fabric discovery (to get information on Zoning) VM8 hosts the SMI-S provider for brocade.

The fabric in the environment consists of four brocade FC switches. They are ISL'ed, so there is only one fabric. To get zoning information for brocade, the SMI-S provider has to be available.



To discover the vCenter:

- 1) SolutionPack for vCenter server is installed on the All-in-One ViPR SRM instance.
- 2) IP address and credentials for vCenter server is provided during configuration of the SolutionPack.



To discover the ViPR controller:

- 1) SolutionPack for ViPR is installed on the All-in-One ViPR SRM instance.
- 2) IP address and credentials for accessing the ViPR controller are provided during configuration of the SolutionPack.

Module 1: Overview of the ViPR SRM

Lesson 1: Summary

During this lesson the following topic was covered:

- Benefits and features of ViPR SRM
- Components required to monitor and report on the infrastructure
- Architecture of the environment used for monitoring and reporting



This lesson covered the ViPR SRM family of products and an introduction to ViPR SRM as a software application to monitor and report performance and data storage capacity across a datacenter with heterogeneous hosts, switches, and arrays.

Lab: Connecting to ViPR SRM Application

This lab covers :

- Logging into your student workstation
- Connecting to and logging into the ViPR SRM application
- Checking the integrity of the application

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Module 1: Overview of ViPR SRM

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This lab covers accessing the ViPR SRM instance available for lab exercises throughout this course.

Lab Debrief: Connecting to ViPR SRM Application

This lab covered :

- Logging into your student workstation
- Connecting to and logging into the ViPR SRM application
- Checking the integrity of the application

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Module 1: Overview of ViPR SRM 15

This lab covered accessing the ViPR SRM instance available for lab exercises throughout this course.

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Module 2: Using the ViPR SRM Dashboard

Upon completion of this module, you should be able to:

- Identify available dashboards in ViPR SRM
- Understand the metrics presented in the dashboard
- Use the dashboards to analyze the global provisioning of storage resources



This module focuses on using the ViPR SRM Dashboard reports.

Module 2: Using the ViPR SRM Dashboard

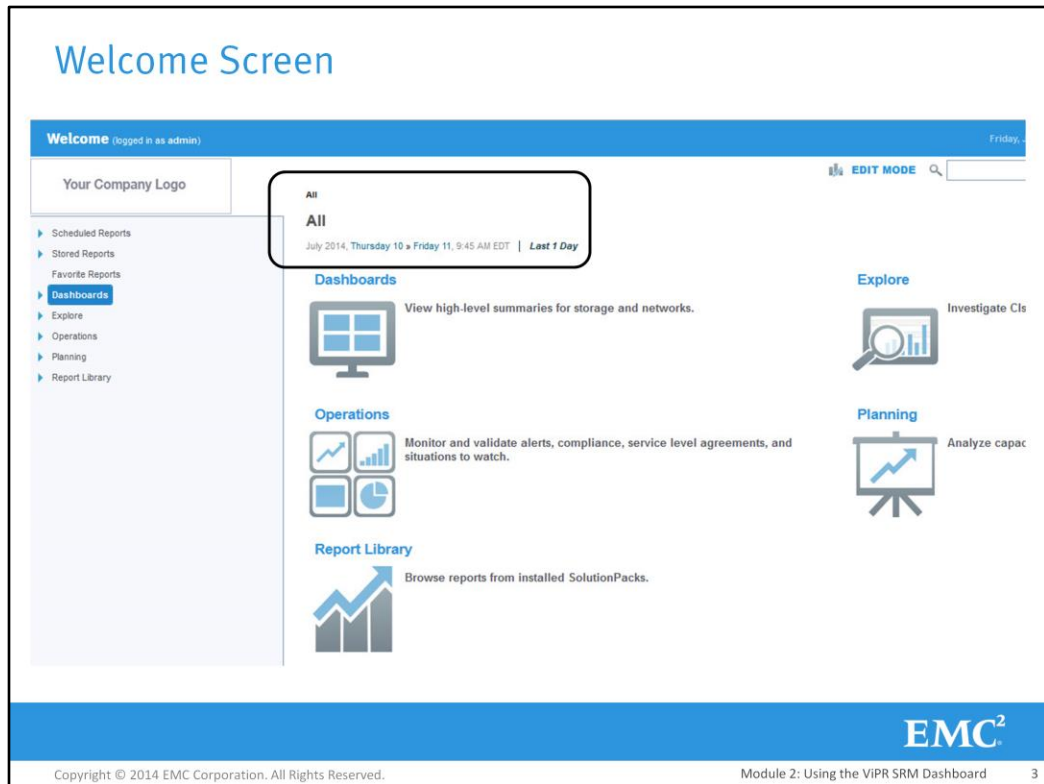
Lesson 1: Available Dashboards

This lesson covers the following topics:

- The Global Dashboards available in ViPR SRM
- Description of metrics presented in the Global Dashboards



This lesson covers the available Global Dashboards in ViPR SRM.



At login, SRM displays the welcome screen. At the highest level is “All”. From here we can navigate to the section of interest either by choosing it on the left panel or by selecting the icon in the right panel.

Available Storage Dashboards

Welcome (logged in as admin)

Your Company Logo

- Scheduled Reports
- Stored Reports
- Favorite Reports
- Dashboards**
- Explore
- Operations
- Planning
- Report Library

All

July 2014, Thursday 10 » Friday 11, 9:52 AM EDT | **Last 1 Day**

Dashboards

View high-level summaries for storage and networks.

All / Dashboards

July 2014, Thursday 10 » Friday 11, 9:53 AM EDT | **Last 1 Day: average on real-time**

View high-level summaries for storage and networks.

Storage

4 elements found, displaying all elements.

Report Name
Enterprise Capacity Dashboard
File Capacity Dashboard
Virtual Storage Dashboard
Chargeback by Group

Report generated in 0.404s.

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Selecting Dashboards on the left panel, or selecting Dashboards on the right panel brings us to **All>>Dashboards**. This provides a high level summary of the storage environment. The reports are categorized as Block Capacity Dashboard, File Capacity Dashboard, and Chargeback by Group.

Enterprise Capacity Dashboard

Enterprise Capacity Dashboard provides the summary view of utilization of storage available for Block Level access, consolidated from all discovered and monitored arrays

- ▲ Enterprise Capacity Dashboard
 - ▶ Raw Capacity Usage
 - ▶ Usable Capacity
 - ▶ Used Capacity by Purpose
 - Usable Capacity Trend
 - Usable Capacity by Service Level
 - ▶ Usable Capacity by Pool

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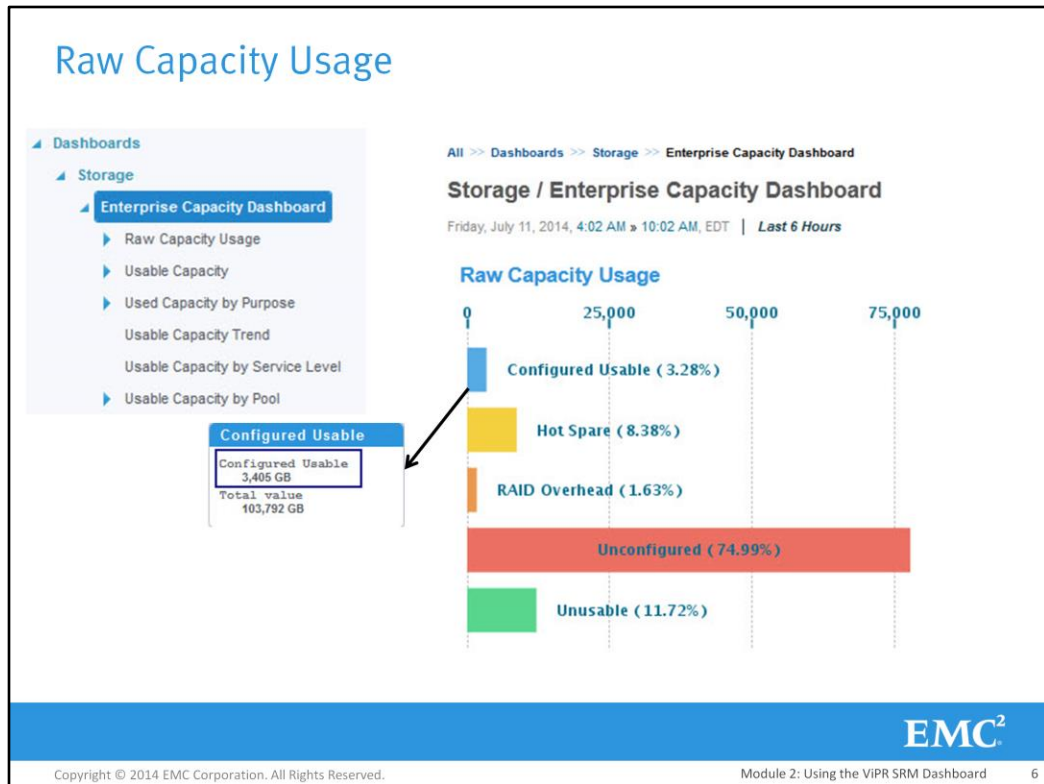
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Module 2: Using the ViPR SRM Dashboard

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The Block Capacity Dashboard provides a valuable view into storage utilization consolidated over all the discovered arrays. This helps the storage administrator understand the distribution of utilization amongst various purposes. A key benefit is the knowledge of Unconfigured capacity available across the enterprise for future deployment.

The Raw Capacity Usage, Usable Capacity and Used Capacity by Purpose can be further examined (expanded) to understand the contributions from the individual arrays.



Raw Capacity Usage provides the break down of available capacity among the five categories shown. Mouse over any of the bar graphs will give a pop-up with numerical values. In this example we see that 3,405 GB of Configured Usable Capacity is available across all arrays in this environment.

Configured Usable: Configured capacity that is available for data storage.

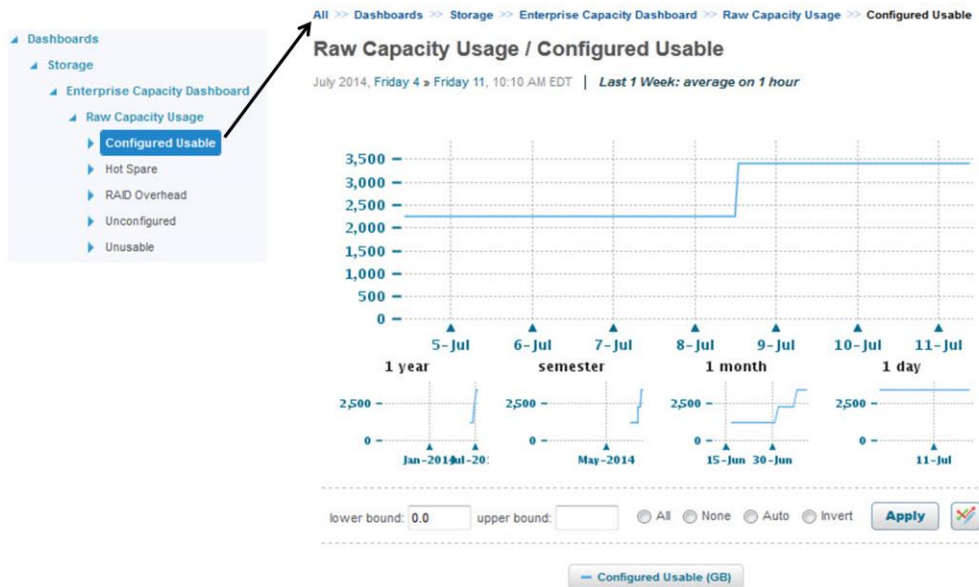
Hot Spare: Capacity of all hot spares on the array.

RAID Overhead: Array capacity used to support RAID protection overhead.

Unconfigured: Total capacity that is available for creation of LUNs, RAID groups, storage pools or hot spares.

Unusable: Array capacity in the form of small fragments that was the result of configuration and provisioning operations.

Raw Capacity Usage – Trends



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Module 2: Using the ViPR SRM Dashboard

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As an illustration of the available granularity, the Storage Administrator can view the Trend of the different allocations of the Raw Capacity. In this example, Configured Usable graphs are shown. This graph gives trend for various timeframes, over a year to over a day. This gives an overall view of how capacity is being configured across the enterprise.

Raw Capacity Usage – Array Level Granularity



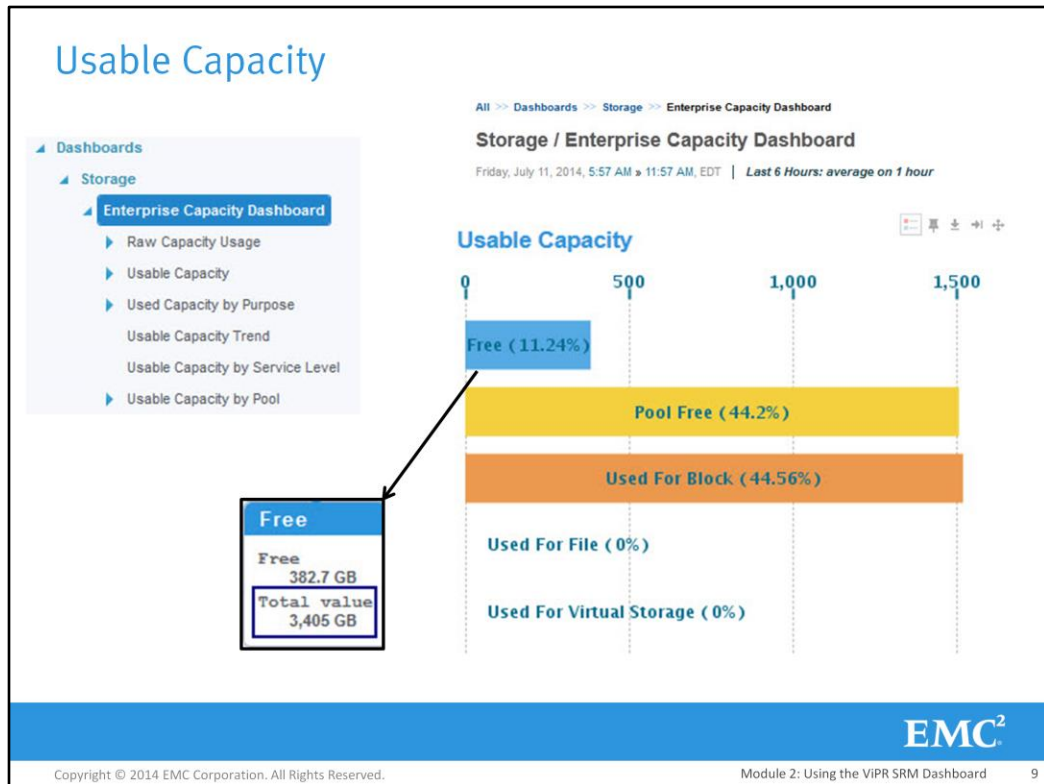
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Module 2: Using the ViPR SRM Dashboard

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If the Storage Administrators want to investigate the trend in contribution from individual arrays to the totals, they can drill down to array level granularity. An example of RAID Overhead from one array is shown in this slide.



Usable Capacity view takes the Configured Usable from the Raw Capacity Usage charts and classifies it into five different categories as shown in the slide. As with most of the bar graphs a mouse-over will pop-up the numerical values. We see that out of 3,405 GB of Configured Usable capacity, 382.7 GB is Free.

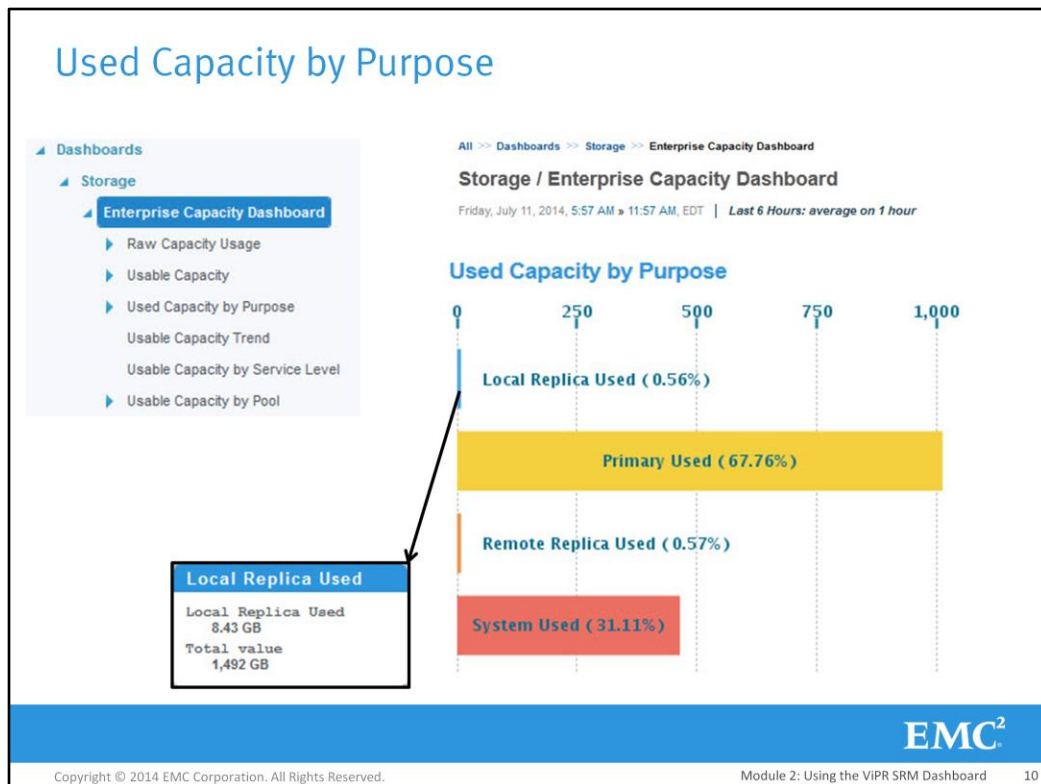
Free: Unbound data devices and SAVE devices, unmapped and/or unmasked thick LUNs.

Pool Free: Unwritten space within pools and unbound capacity within RAID groups.

Used For Block: Capacity that is made available to storage area network.

Used For File: Capacity that is made available to network attached storage.

Used For Virtual Storage: Capacity that is made available to virtual storage through VPLEX.



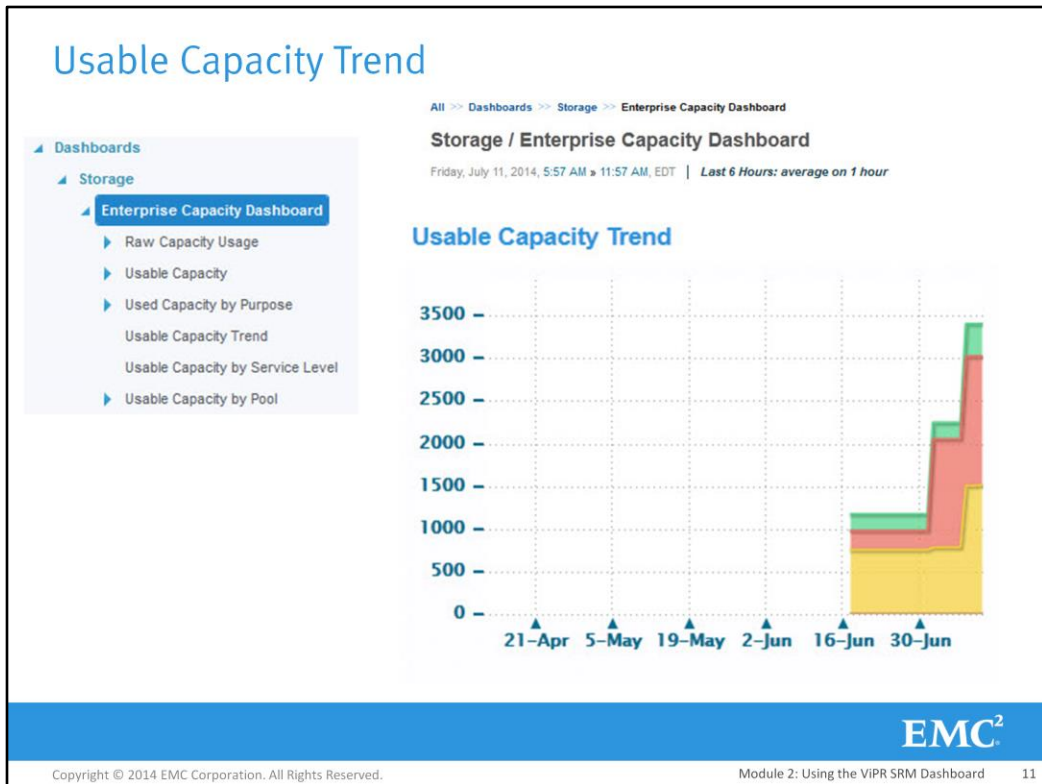
This chart gives the overall Used Capacity according to the purpose for which they have been deployed. Mouse-over Local Replica Used shows that 8.43 GB have been used for this purpose across all the arrays in the environment.

Local Replica Used: Array capacity that has been mapped, masked, and configured as local replicas. This capacity is commonly used for testing and backup.

Primary Used: Array capacity that has been mapped, masked, and configured for the primary storage of application data. This does not include copies.

Remote Replica Used: Capacity used for remote copies, commonly for disaster recovery.

System Used: Capacity reserved for use by the array for internal operations.



This view is very useful to understand the trend in usable capacity across all discovered arrays. As the cursor is moved over the different colored bands of the view, pop-up boxes display the value for each metric along with the time and date of the point where the cursor was placed.

Usable Capacity by Pool

Usable Capacity by Pool

15 elements found, displaying 1 to 10.

<< < 1 2 > >> Show 10

Pool	Array	Pool Type	Pool Used Trend	Pool Usable (GB)	Pool Used (GB)	Used for Block (GB)	Used for File (GB)	Used for Virtual Storage (GB)	Pool Free (GB)	% Pool Used	# Days Until Full
BC_SATA_R6	000192606304	Thin Pool	13.73 ↗	50.52	17.57	17.57	0.00	0.00	32.95	34.78	129d 8h 57m 4s
BC_FC_RAID1	000192606304	Thin Pool	11.56 ↗	50.52	7.72	7.72	0.00	0.00	42.79	15.29	
DEFAULT_POOL	000192606304	Snap Pool	4.21 →	94.76	4.21	4.21	0.00	0.00	90.54	4.44	
ESXi_RAID6	000192606304	Thin Pool	0.09 →	50.00	0.09	0.09	0.00	0.00	49.91	0.19	
appn_pool	000192606304	Snap Pool	0.00 →	2.11	0.00	0.00	0.00	0.00	2.11	0.00	
snap_pool	000192606304	Snap Pool	0.00 →	2.11	0.00	0.00	0.00	0.00	2.11	0.00	
BC_DSE	000192606304	Storage Pool	0.00 →	4.21	0.00	0.00	0.00	0.00	4.21	0.00	
BC_FC_RAID1	000192606327	Thin Pool	10.80 ↗	50.52	21.08	21.08	0.00	0.00	29.43	41.74	
P1	000192606327	Thin Pool	0.00 →	2.10	0.00	0.00	0.00	0.00	2.10	0.14	
ESXi_RAID6	000192606327	Thin Pool	0.01 →	50.00	0.01	0.01	0.00	0.00	49.99	0.02	
				356.85	50.70	50.70	0.00	0.00	306.15		

15 elements found, displaying 1 to 10.

<< < 1 2 > >> Show 10

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Module 2: Using the ViPR SRM Dashboard

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This report provides the list of Pools created. In the context of the VMAX, the pools are comprised of either TDATs or SAVEDEVs. A useful feature is the totals presented for each screen as highlighted in the slide.

Usable Capacity by Service Level

Dashboards

Storage

Enterprise Capacity Dashboard

- Raw Capacity Usage
- Usable Capacity
- Used Capacity by Purpose
- Usable Capacity Trend
- Usable Capacity by Service Level
- Usable Capacity by Pool

All >> Dashboards >> Storage >> Enterprise Capacity Dashboard

Storage / Enterprise Capacity Dashboard

Friday, July 11, 2014, 5:57 AM > 11:57 AM, EDT | Last 6 Hours: average on 1 hour

Usable Capacity by Service Level

5 elements found, displaying all elements.

Service Level	Usable (GB)	Used (GB)	Free (GB)	Used Trend	% Used
Silver	288.66	40.21	248.45	40.21	13.93
Bronze	1,012.00	962.12	49.88	962.12	95.07
FAST VP	25.31	25.31		25.29	100.00
Other	0.00		0.00		
Gold	105.77	21.44	84.33	10.53	20.27
	1,431.75	1,049.09	382.66		

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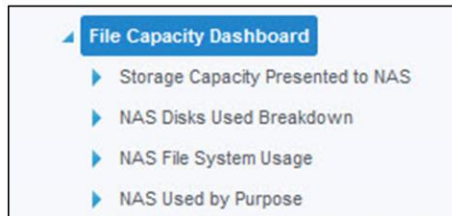
Module 2: Using the ViPR SRM Dashboard

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This report gives usable capacity categorized by the default Service Levels defined. It is also possible to customize Service Level definitions. This will be covered later in the course.

File Capacity Dashboard

File Capacity Dashboard provides the summary view of utilization of storage available for File Level access, consolidated from all discovered and managed arrays



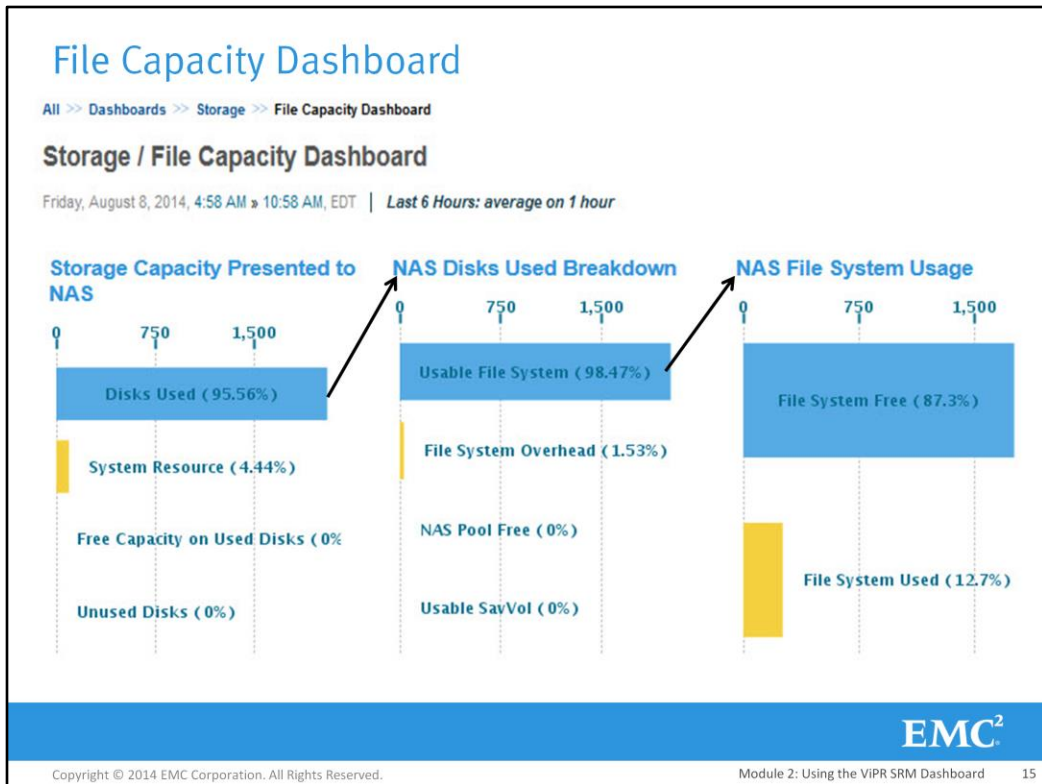
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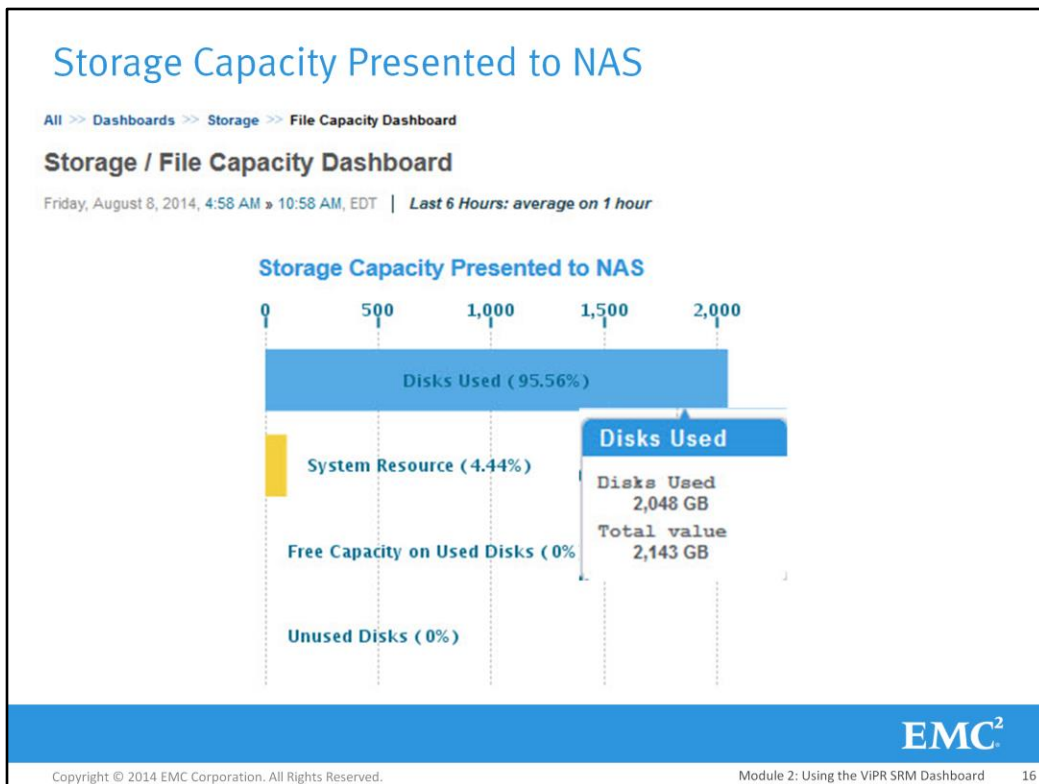
Module 2: Using the ViPR SRM Dashboard

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File Capacity Dashboard provides reports on Network Attached Storage (NAS) that has been discovered by SRM. As with Block Capacity Dashboard, File Capacity can be expanded and examined at the contributing Array level granularity as well.



The Disks Used in Storage Capacity Presented to NAS is expanded into different categories in the NAS Disk Used Breakdown. The Usable File System in NAS Disks Used Breakdown is further expanded in the NAS File System Usage view.



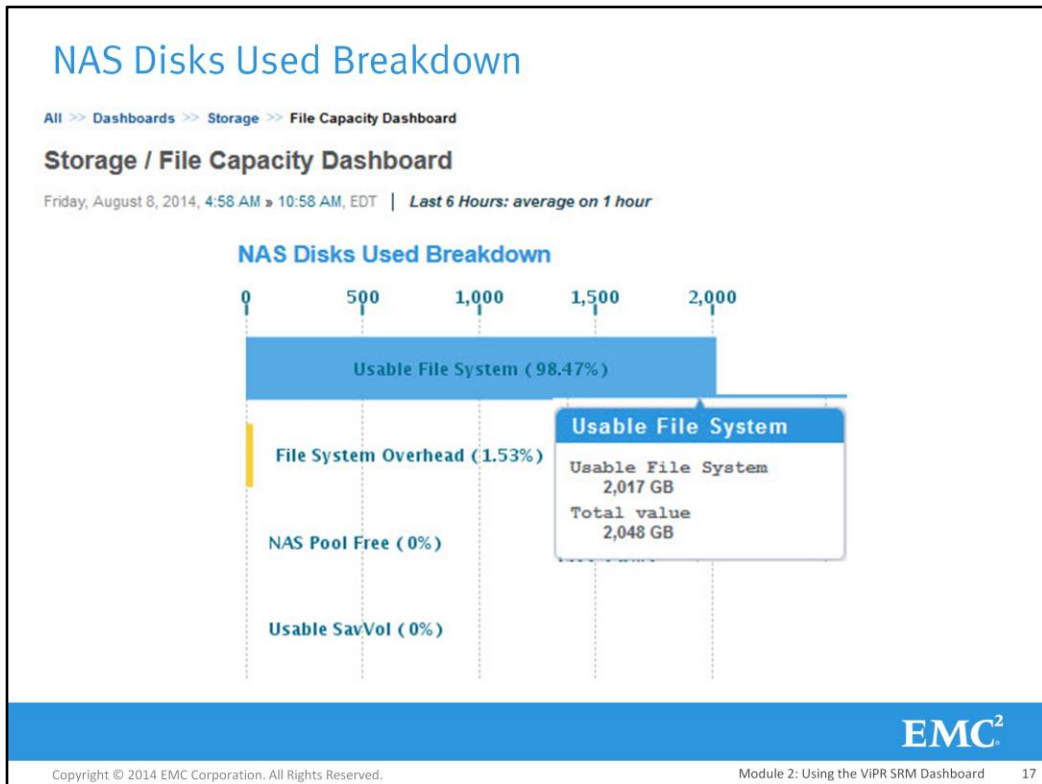
In this example we see that 2,143 GB has been presented to NAS. Of this 2,048 GB is from Disk Used and the rest is from System Resource. Free Capacity and Unused disk in this array are at zero.

Disks Used: Storage Capacity of production file systems and their overhead, storage capacity of SavVols and Free NAS Pool capacity.

Free Capacity on Used Disks: Storage Capacity of free partitions, free metavolumes and free space on partially used NAS Disks.

System Resource: Storage Capacity of NAS Disks used for internal file systems.

Unused Disks: Storage Capacity of non-partitioned NAS Disks.



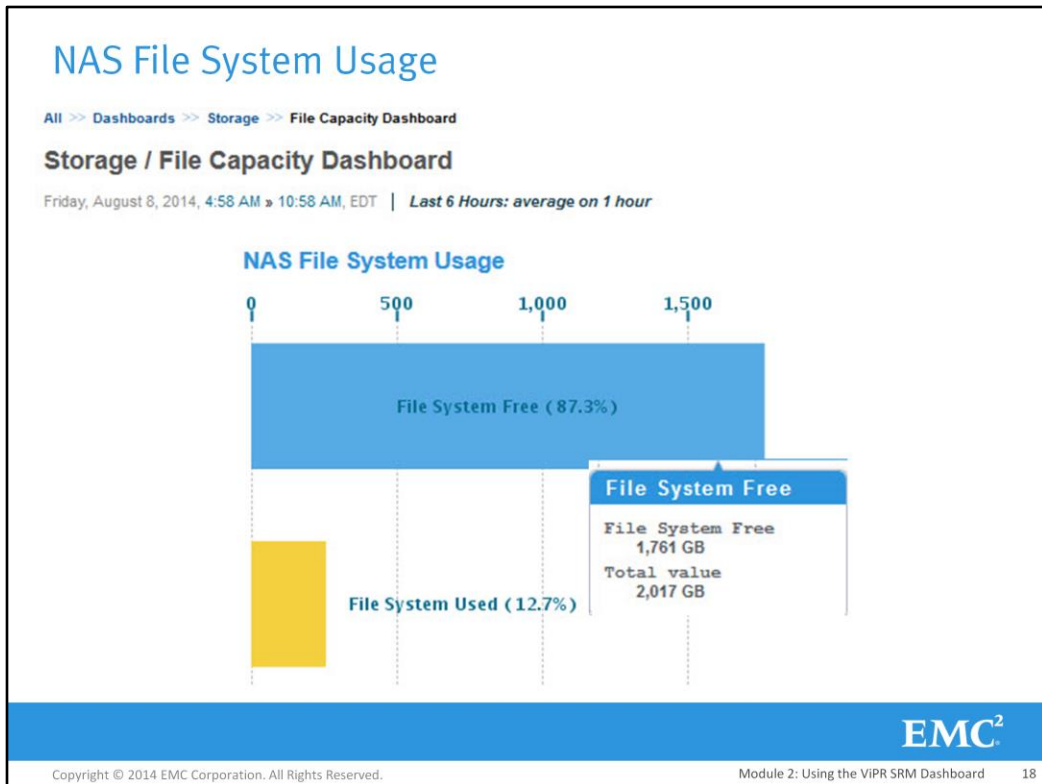
The Disk Used value of 2,048 GB is further categorized as shown in the slide. We can see that 2,017 GB is presented as Usable File System.

Usable File System: Storage capacity of production file systems on NAS Disks or NAS Pools.

NAS Pool Free: Free NAS Pool capacity that is available to create production file systems and SavVols.

Usable SavVol: Storage capacity of SavVols on NAS Disks or NAS Pools.

File System Overhead: Reserved overhead capacity to support a production file system.



Usable File System capacity 2,017 GB is further broken down into File System Free (1,761 GB) and File System Used.

File System Used: Used capacity of production file systems.

NAS Pool Free: Free capacity of production file systems.

Module 2: Using the ViPR SRM Dashboard

Lesson 1: Summary

During this lesson the following topics were covered:

- The Global Dashboards available in SRM
- Description of metrics presented in the Global Dashboards



This lesson covered the available Global Dashboards in SRM and the metrics presented in them.

Module 2: Using the ViPR SRM Dashboard

Lesson 2: Exploring the Configuration Items (CIs)

This lesson covers the following topics:

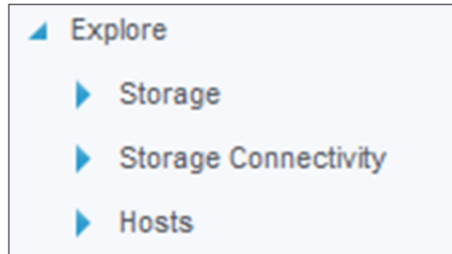
- Storage systems
- Storage connectivity
- Hosts



This lesson covers detailed reports available for different types of Storage Arrays, Storage Connectivity and Hosts.

Explore

- These set of reports give details on the individual CIs discovered and monitored by SRM
- Storage Systems gives detailed information on individual Storage Arrays discovered in SRM
- Storage Connectivity provides information on switches and fabrics in the environment



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Module 2: Using the ViPR SRM Dashboard

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While the Global Dashboards give a consolidated view across all the arrays, the individual dashboards help the Storage Administrator to get a detailed picture of each of the arrays and related Storage Connectivity objects.

Exploring the CIs

All >> Explore

All / Explore

August 2014, Friday 1 » Friday 8, 12:05 PM EDT | Last 1 Week

Investigate CIs and their configuration and performance data.

4 elements found, displaying all elements.

Explorer Views	Devices/Applications count
Storage	4
Storage Connectivity	5
Hosts	46
Search for any device	68

Report generated in 0.501s.

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Module 2: Using the ViPR SRM Dashboard

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The available CIs are categorized and listed. The three main categories are Storage, Storage Connectivity and Hosts.

Explore – Storage Systems

All >> Explore >> Storage

Explore / Storage

July 2014, Friday 4 » Friday 11, 1:43 PM EDT | Last 1 Week: average on 1 hour

Storage Systems

3 elements found, displaying all elements.

Storage System Type	Serial Number	Storage System Alias	Model	Vendor	Firmware	Total Raw (TB)	Last Collection Time
Block	000192606327	000192606327	VMAX20K	EMC Corporation	5876.251.161 date:09.03.2013 patch_date:09.03.2013	40.60	Friday, July 11, 2014 12:38:34 PM EDT
Block	000192606304	000192606304	VMAX20K	EMC Corporation	5876.251.161 date:09.03.2013 patch_date:09.03.2013	27.33	Friday, July 11, 2014 12:42:28 PM EDT
Unified	APM00134303866	Unified VNX-152	VNX5400	EMC Corporation	05.33.000.5.035	33.42	Friday, July 11, 2014 12:54:47 PM EDT
						101.36	

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Module 2: Using the ViPR SRM Dashboard

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This report gives the details of the discovered Arrays, their attributes and the Total available Raw TB. This view is particularly useful to figure out how much of the total is contributed by individual arrays. Details are presented for Block, File and Virtual (VPLEX) devices. This environment has only Block and Unified (Block and File) storage devices.

Explore – Storage Systems VMAX

All >> Explore >> Storage >> Storage Systems >> 000192606304

Storage Systems / 000192606304

July 2014, Friday 4 » Friday 11, 2:10 PM EDT | Last 1 Week: average on 1 hour

Topology Map



Attributes

One element found.

Storage System Type	Storage System	Serial Number	Model	Vendor	Firmware	Total Raw (TB)
Block	000192606304	000192606304	VMAX20K	EMC Corporation	5876.251.161 date:09.03.2013 patch_date:09.03.2013	27.33

000192606304

6 elements found, displaying all elements.

Category Name
Attributes
Enterprise Capacity Dashboard
Enterprise - Path Details & Storage Connectivity
Alerts
VMAX - Inventory Details
VMAX - Performance Dashboard

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Module 2: Using the ViPR SRM Dashboard

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Selecting a Storage System provides the ability to understand further details about it. Information on the connectivity (Topology) and various categories are presented.

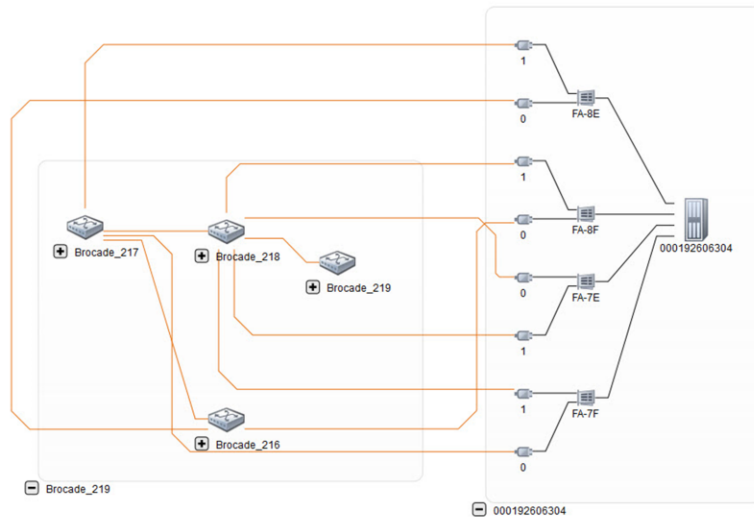
VMAX – Topology Map

All >> Explore >> Storage >> Storage Systems >> 000192606304

Storage Systems / 000192606304 | The layout of the report has changed: [save](#) or [cancel](#)

Topology Map

July 2014, Friday 4 » Friday 11, 2:23 PM EDT | Last 1 Week: average on 1 hour



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Module 2: Using the ViPR SRM Dashboard

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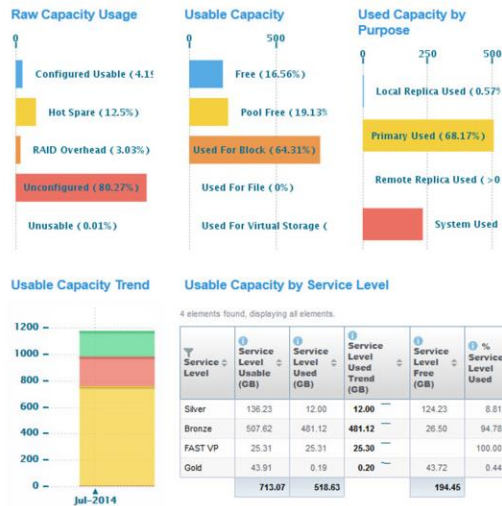
The Topology Map displays the connectivity between the array ports and the switches. This provides a useful reference of the layout of the environment. In my environment Brocade_219 is the Principal switch. The Fabric has been discovered using SNMP and SMI-S. Each of the switches can be further expanded to display the Port connectivity as well.

VMAX – Enterprise Capacity Dashboard

All >> Explore >> Storage >> Storage Systems >> 000192606304 >> Device Summary >> 000192606304 >> Enterprise Capacity Dashboard

000192606304 / Enterprise Capacity Dashboard

July 2014, Friday 4 • Friday 11, 2:46 PM EDT | Last 1 Week: average on 1 hour



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Module 2: Using the ViPR SRM Dashboard

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This report gives a summary view of Capacity allocation among various categories for an individual array – in this case Symmetrix VMAX SID 304.

VMAX – Enterprise Path Details

All >> Explore >> Storage >> Storage Systems >> 000192606304 >> Device Summary >> 000192606304 >> Enterprise - Path Details & Storage Connectivity

000192606304 / Enterprise - Path Details & Storage Connectivity

July 2014, Friday 4 • Friday 11, 2:51 PM EDT | Last 1 Week

Path Details

161 elements found, displaying 1 to 10.

1 2 3 4 5 6 7 >>> Show 10

Array LUN	Array LUN Storage Group	Array LUN Service Level	Array LUN Protection	Array Initiator Type	Array Initiator Device	Array Initiator Node	VPLEX Virtual Volume	VPLEX Initiator Type	VPLEX Initiator Device	VPLEX Initiator Node
02AB	esx161_FAST_SG, esx161_rdm, esx161_parent	FAST VP	RAID-1, RAID-6	Hypervisor	60000970000192606304533030324142	10.127.94.161				
02AC	esx161_FAST_SG, esx161_rdm, esx161_parent	FAST VP	RAID-1, RAID-6	Hypervisor	60000970000192606304533030324143	10.127.94.161				
02AD	esx161_FAST_SG, esx161_rdm, esx161_parent	FAST VP	RAID-1, RAID-6	Hypervisor	60000970000192606304533030324144	10.127.94.161				
02AE	esx161_FAST_SG, esx161_rdm, esx161_parent	FAST VP	RAID-1, RAID-6	Hypervisor	60000970000192606304533030324145	10.127.94.161				
02AF	esx161_FAST_SG, esx161_rdm, esx161_parent	FAST VP	RAID-1, RAID-6	Hypervisor	60000970000192606304533030324146	10.127.94.161				
02B0	esx161_FAST_SG, esx161_rdm, esx161_parent	FAST VP	RAID-1, RAID-6	Hypervisor	60000970000192606304533030324230	10.127.94.161				

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Module 2: Using the ViPR SRM Dashboard

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This report provides details of each of the devices in the Symmetrix array. Information is provided on the Storage Group(s) that the device belongs to, the Host to which it has been masked (Initiator Node), the applicable Service Levels.

VMAX – Storage Connectivity

All >> Explore >> Storage >> Storage Systems >> 000192606304 >> Device Summary >> 000192606304 >> Enterprise - Path Details & Storage Connectivity >> Connectivity

Enterprise - Path Details & Storage Connectivity / Connectivity

July 2014, Friday 4 → Friday 11, 2:56 PM EDT | Last 1 Week

The Array Connectivity report identifies each switch port connected to each storage port in the selected array.
[Click here to display column definitions](#)

8 elements found, displaying all elements.

FE Adapter:Port	Type	Array Port WWN	Switch Slot/Port	Switch Name	Switch Model	Switch Vendor	Switch Firmware
FA-7E:0	FA	5000097208628118	24	Brocade_218	Brocade 4100 Switch	Brocade	v5.0.1b
FA-7E:1	FA	5000097208628119	27	Brocade_218	Brocade 4100 Switch	Brocade	v5.0.1b
FA-8E:0	FA	500009720862811C	0	Brocade_216	Brocade 4100 Switch	Brocade	v5.0.1b
FA-8E:1	FA	500009720862811D	17	Brocade_217	Brocade 4100 Switch	Brocade	v5.0.1b
FA-7F:0	FA	5000097208628158	1	Brocade_217	Brocade 4100 Switch	Brocade	v5.0.1b
FA-7F:1	FA	5000097208628159	28	Brocade_218	Brocade 4100 Switch	Brocade	v5.0.1b
FA-8F:0	FA	500009720862815C	7	Brocade_216	Brocade 4100 Switch	Brocade	v5.0.1b
FA-8F:1	FA	500009720862815D	26	Brocade_218	Brocade 4100 Switch	Brocade	v5.0.1b

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Module 2: Using the ViPR SRM Dashboard

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This report is essentially a table view of the Topology Map. The Symmetrix Front-End director/ports are identified. The FC switch and the port on the switch that they are connected to is also displayed, along with other information pertaining to the switch itself.

VMAX – Inventory Details

Inventory

7 elements found, displaying all elements.

Component	Description	Count
Arrays	Represent the entire System/Storage Bay Symmetrix VMAX	1
Disks	Hardware storage component from which you can read and write data.	64
Directors	The component in the Symmetrix system that supports front end, back end, and SRDF connections, and also provides physical memory, connection to the virtualmatrix, and connection to Back-End I/O Modules	16
Devices	A uniquely addressable part of the Symmetrix subsystem that consists of a set of access arms, the associated disk surfaces, and the electronic circuitry required to locate, read, and write data. A logical unit of storage defined within a Symmetrix array.	831
Ports	Interface device between the storage system and other computers or peripheral devices. Also, an interface between a drive and bus.	12
Pools	A logical construct of drives supporting both read and write data accesses. NOTE: Pool performance stats are only available using UniSphere for VMAX	7
Storage Groups	A storage group is a logical grouping of up to 4,096 Symmetrix devices. Both thick and thin LUNs can be used.	29



This report provides a useful list of the components in the discovered array.

Explore Storage Systems – VNX

All >> Explore >> Storage >> Storage Systems >> APM00134303866

Storage Systems / APM00134303866

August 2014, Friday 1 > Friday 8, 12:23 PM EDT | Last 1 Week: average on 1 hour

Topology Map

Attributes

One element found.

Storage System Type	Storage System	Serial Number	Model	Vendor	Firmware	Total Raw (TB)
Unified	Unified VNX-152	APM00134303866	VNXS400	EMC Corporation	05.33.000.5.035	33.42

Report generated in 1.343s.

Unified VNX-152

6 elements found, displaying all elements.

Category Name

Attributes

- Enterprise Capacity Dashboard
- Enterprise - Path Details & Storage Connectivity
- File Capacity Dashboard
- File - Path Details & Storage Connectivity
- VNX Block - Performance Details

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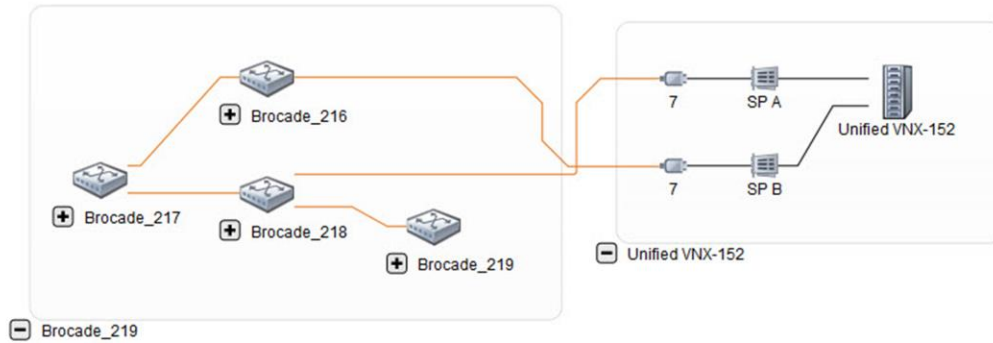
As with the VMAX, we can explore VNX arrays as well. Notice that the Category structure is pretty similar to that of VMAX. Since this is a Unified VNX, there are additional categories that relate to File details.

VNX – Topology Map

All >> Explore >> Storage >> Storage Systems >> APM00134303866

Storage Systems / APM00134303866 | *The layout of the report has changed: [save](#) or [cancel](#)*

August 2014, Friday 1 » Friday 8, 12:23 PM EDT | **Last 1 Week: average on 1 hour**



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Module 2: Using the ViPR SRM Dashboard

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The Topology Map displays the connectivity between the VNX array Storage Processors (SP's) and the switches. This provides a useful reference of the layout of the environment. In my environment the Unified VNX array is connected to the same Fabric as the VMAX.

VNX – Enterprise Capacity Dashboard

All >> Explore >> Storage >> Storage Systems >> APM00134303866

Storage Systems / APM00134303866

August 2014, Friday 1 » Friday 8, 12:59 PM EDT | Last 1 Week: average on 1 hour



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Module 2: Using the ViPR SRM Dashboard

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This report gives a summary view of Capacity allocation among various categories for the Unified VNX.

VNX – Enterprise Path Details

All >> Explore >> Storage >> Storage Systems >> APM00134303866

Storage Systems / APM00134303866

August 2014, Friday 1 » Friday 8, 12:59 PM EDT | Last 1 Week: average on 1 hour

Path Details

22 elements found, displaying 1 to 10.

1 2 3 >> Show 10

Array LUN	Array LUN Storage Group	Array LUN Service Level	Array LUN Protection	Array Initiator Type	Array Initiator Device	Array Initiator Node	VPLEX Virtual Volume	VPLEX Initiator Type	VPLEX Initiator Device	VPLEX Initiator Node
100	ESX161	Gold	RAID-10	Hypervisor	6006016042F03500C4A5F394DF1CE411	10.127.94.161				
101	ESX161	Gold	RAID-10	Hypervisor	6006016042F03500C5A5F394DF1CE411	10.127.94.161				
102	ESX161	Gold	RAID-10	Hypervisor	6006016042F03500C6A5F394DF1CE411	10.127.94.161				
103	ESX161	Gold	RAID-10	Hypervisor	6006016042F03500C7A5F394DF1CE411	10.127.94.161				

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Module 2: Using the ViPR SRM Dashboard

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This report provides details of each of the devices in the VNX array. Information is provided on the Storage Group(s) that the device belongs to, the Host to which it has been masked (Initiator Node), the applicable Service Levels.

VNX – Storage Connectivity

All >> Explore >> Storage >> Storage Systems >> APM00134303866

Storage Systems / APM00134303866

August 2014, Friday 1 » Friday 8, 12:59 PM EDT | Last 1 Week: average on 1 hour

Connectivity

8 elements found, displaying all elements.

FE Adapter:Port	Type	Array Port WWN	Switch Slot/Port	Switch Name	Switch Model	Switch Vendor	Switch Firmware
SP A:4	FA	5006016408601EBD					
SP A:5	FA	5006016508601EBD					
SP A:6	FA	5006016608601EBD					
SP A:7	FA	5006016708601EBD	2	Brocade_218	Brocade 4100 Switch	Brocade	v5.0.1b
SP B:4, SP A:4	FA	5006016C08601EBD					
SP B:5, SP A:5	FA	5006016D08601EBD					
SP B:6, SP A:6	FA	5006016E08601EBD					
SP B:7, SP A:7	FA	5006016F08601EBD	3	Brocade_216	Brocade 4100 Switch	Brocade	v5.0.1b

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Module 2: Using the ViPR SRM Dashboard

34

This report is essentially a table view of the Topology Map. The VNX Storage Processors/ports are identified. The FC switch and the port on the switch that they are connected to is also displayed, along with other information pertaining to the switch itself.

Explore – Storage Connectivity

All >> Explore >> Storage Connectivity

Explore / Storage Connectivity

August 2014, Friday 1 » Friday 8, 1:55 PM EDT | Last 1 Week

2 elements found, displaying all elements.

Category	Devices count
Fabrics	1
Switches	4

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Module 2: Using the ViPR SRM Dashboard

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Storage Connectivity provides reports on the discovered fabrics and switches in the environment.

Fabrics – Zones

All >> Explore >> Storage Connectivity >> Fabrics >> 100000051E023364

Fabrics / 100000051E023364

August 2014, Thursday 7 » Friday 8, 2:25 PM EDT | Last 1 Day: average on real-time

276 elements found, displaying 1 to 10.

<< < 1 2 3 4 5 6 7 > >> Show 10

Zone Set Name	Zone Name	Zone Member ID	Alias (TBD)	Node Port	Node Name	Node Type
CSDEV	CSDEV_P0_SYM1_FA_1C0	5000097208628118		0	000192606304	Array
CSDEV	CSDEV_P1_SYM1_FA_1C0	5000097208628118		0	000192606304	Array
CSDEV	ESX40_250_HBA1_Symm834_7GP0	5000097208628158		0	000192606304	Array
CSDEV	ESX40_250_HBA2_Symm834_8GP0	500009720862815C		0	000192606304	Array
CSDEV	ESX40_251_HBA1_SYM68_7G0	5000097208628158		0	000192606304	Array
CSDEV	ESX40_251_HBA2_SYM68_8G0	500009720862815C		0	000192606304	Array
CSDEV	ESX_94_161_0_VMAX_20K	5000097208628159		1	000192606304	Array
CSDEV	ESX_94_161_1_VMAX_20K	500009720862815D		1	000192606304	Array
CSDEV	ESX_94_178_0_SYM20_7E1	5000097208628119		1	000192606304	Array
CSDEV	ESX_94_178_1_SYM20_8E1	500009720862811D		1	000192606304	Array

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Module 2: Using the ViPR SRM Dashboard

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One can get detailed information on the configured zones and the members. As mentioned before this information requires SMI-S for discovery when using Brocade FC switches.

Storage Connectivity – Switches

All >> Explore >> Storage Connectivity >> Switches

Storage Connectivity / Switches

August 2014, Friday 1 » Friday 8, 2:31 PM EDT | Last 1 Week

4 elements found, displaying all elements.

Switch	Model	IP	Description	Total FC Ports	# Used Ports	Availability (%)	Last Collection Time
Brocade_217	Brocade 4100 Switch	10.127.94.217	DS_4100B	32	22	100.00  ✓	Friday, August 8, 2014 1:53:45 PM EDT
Brocade_218	Brocade 4100 Switch	10.127.94.218	DS_4100B	32	16	100.00  ✓	Friday, August 8, 2014 1:53:44 PM EDT
Brocade_219	Brocade 4100 Switch	10.127.94.219	DS_4100B	32	20	100.00  ✓	Friday, August 8, 2014 1:53:44 PM EDT
Brocade_216	Brocade 4100 Switch	10.127.94.216	DS_4100B	32	13	100.00  ✓	Friday, August 8, 2014 2:03:44 PM EDT
				128	71		

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Module 2: Using the ViPR SRM Dashboard

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Storage Connectivity gives list of Switches that have been discovered. We can explore the switches to get more detailed information about the ports and their connections.

Explore – Hosts

All >> Explore >> Hosts

Explore / Hosts

August 2014, Friday 1 » Friday 8, 2:55 PM EDT | Last 1 Week

Host Type	Host	IP	Operating System	Domain	ESX Cluster	Memory	No. CPU	Availability (%)
Hypervisor	10.127.94.161	10.127.94.161	VMware ESXi 5.1.0 build-799733		10.127.94.161	128 GB	2	100.00  
Hypervisor	10.127.94.163	10.127.94.163	VMware ESXi 5.1.0 build-799733	corp.emc.com	10.127.94.163	128 GB	2	100.00  
Hypervisor	10.127.94.178	10.127.94.178	VMware ESXi 5.1.0 build-799733	corp.emc.com	10.127.94.178	128 GB	2	100.00  

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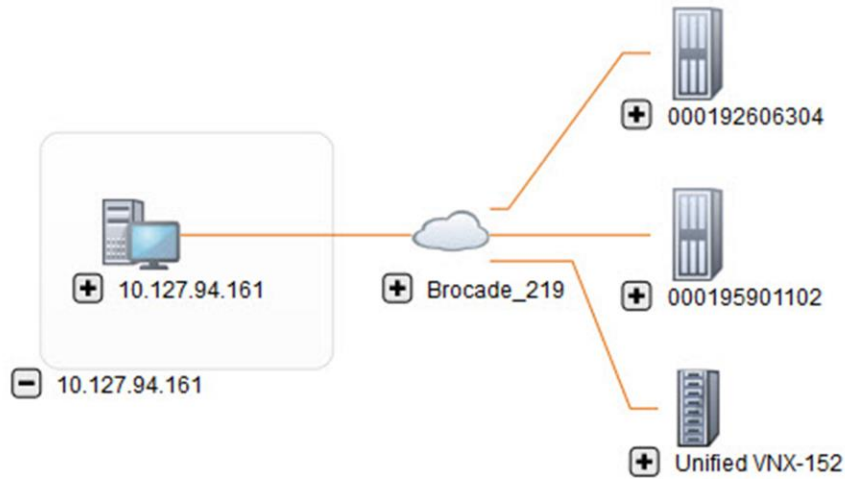
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Module 2: Using the ViPR SRM Dashboard

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Exploring Hosts provides information on all the hosts that have been discovered by the ViPR SRM instance. A partial list of the hosts in my environment is shown in this slide. As there are no Physical Hosts in my environment, all the hosts have been discovered by deploying the SolutionPack for VMware. There are only ESXi (Hypervisors) and VMs in this environment.

Hosts – Topology Map



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Module 2: Using the ViPR SRM Dashboard

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Shown here is an example of the topology map for one of the Hypervisors. We can see that it is connected to the Fabric and has been zoned to access storage from 2 VMAX arrays and one VNX array. LUNs have been presented to this ESXi from these arrays. The VMs hosted in the ESXi consume these LUNs in RDM Physical Mode and for Datastore.

Module 2: Using the ViPR SRM Dashboard

Lesson 2: Summary

During this lesson the following topics were covered:

- Storage systems
- Storage connectivity
- Hosts



This lesson covered detailed reports available for different types of Storage Arrays.

Lab: Global Dashboard Review

This lab covers :

- Examining the pool free capacity of all discovered storage
- Reviewing storage consumption of service levels
- Assessing storage capacity levels and making recommendations

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Module 2: Using the ViPR SRM Dashboard

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This lab covers navigating and examining Dashboard views to determine Pool Free Capacity, storage consumption by service levels and storage capacity levels.

Lab Debrief: Global Dashboard Review

This lab covered:

- Examining the pool free capacity of all discovered storage
- Reviewing storage consumption of service levels
- Assessing storage capacity levels and making recommendations

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Module 2: Using the ViPR SRM Dashboard

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This lab covered navigating and examining Dashboard views to determine Pool Free Capacity, storage consumption by service levels and storage capacity levels.

Module 2: Summary

Key points covered in this module:

- Available dashboards in ViPR SRM
- The metrics presented in the dashboard
- Using the dashboards to analyze the global provisioning of storage resources



This module covered available dashboards and using them.

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Module 3: Storage Resource Planning

Upon completion of this module, you should be able to:

- Usable capacity trends
- Forecast capacity problems
- Proactively detect hot spots
- Use ViPR SRM to determine “What-if Scenarios” and “Workload Distribution”



This module focuses on Storage Resource Planning. The emphasis here is on monitoring storage capacity trends, and hot spots as well as forecasting storage needs by creating “what-if” scenarios and monitoring workloads on the storage.

Module 3: Storage Resource Planning

Lesson 1: Capacity Usage Trends

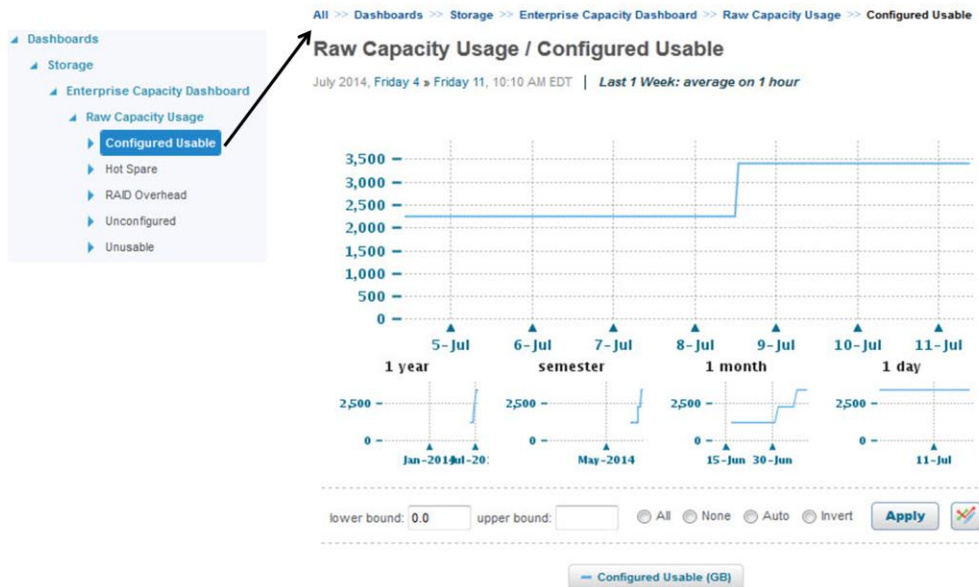
This lesson covers the following topics:

- Enterprise wide capacity trends
- VMAX usage trends
 - Storage pool capacity planning
 - Tiers
- VNX usage trends
 - Usable capacity trend
 - Usable capacity by pool and RAID group



This lesson covers capacity usage trends in the VMAX and VNX storage arrays.

Enterprise Raw Capacity Usage Trend



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Module 3: Storage Resource Planning

3

As an illustration of the available granularity in SRM, the Storage Administrator can view the Trend of the different allocations of the Raw Capacity. In this example Configured Usable graphs are shown. This graph gives trend for various timeframes, over a year to over a day. This gives an overall view of how capacity is being configured across the enterprise.

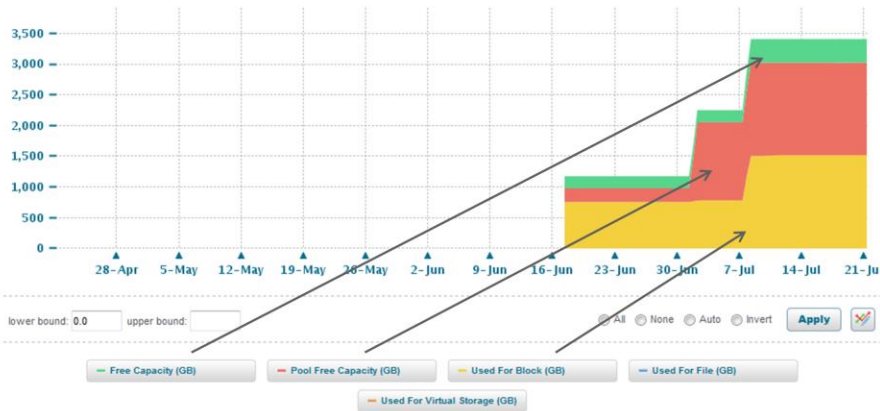
Enterprise Wide Usable Capacity Trend

All >> Planning >> Usable Capacity Trend Planning / Usable Capacity Trend

2014, April > July, the 21 at 1:19 PM EDT | Last Quarter: average on 1 day

Historical capacity trend covers all discovered storage for the past three months

Historical usable capacity enterprise wide for last 3 months.



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Module 3: Storage Resource Planning

4

At login, SRM displays the welcome screen. At the highest level is “All”. From here we can navigate to the section of interest either by choosing it on the left panel or by selecting the icon in the right panel. Here we are viewing the historical capacity usage to identify trends that will require action by the storage administrator to avoid “out of space conditions”.

VMAX Capacity Trends for Storage Pools

All >> Report Library >> EMC VMAX >> Capacity Reports >> Storage Pool Capacity Planning

Capacity Reports / Storage Pool Capacity Planning

July 2014, Sunday 20 » Monday 21, 1:24 PM EDT | Last 1 Day

Trending
columns

14 elements found, displaying all elements.

Pool Name	Array	Type	Pool State	Pool Emulation	Capacity	Free Capacity	Current Utilization (%)	Expected Utilization in 30 days (%)	Will reach 90% on
BC_SATA_R6	000192606304	Thin	Enabled	FBA	50.520 GB	31.544 GB	37.56	56.63	Friday, October 17, 2014 12:01:30 PM EDT
BC_SATA_R6	000192606327	Thin	Enabled	FBA	50.520 GB	37.777 GB	25.22	87.45	Thursday, August 21, 2014 5:44:12 PM EDT

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Module 3: Storage Resource Planning

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Storage pools are simply a collection of devices on the Symmetrix array that can be used for mapping, masking, Virtual LUN Technology, and FAST operations.

There are three types of storage pools that can be defined in the VMAX under Enginuity code. They are Timefinder/Snap pools, SRDF/A DSE pools, and Thin pools. Typically, storage pools have the same disk type (EFD, FC, SATA) and have only one emulation type (ex: FBA or CKD). Although disk type is not stated in this table, it would need to be investigated for pools where the Free Capacity is low or nonexistent since these pools are running out of disk space. If storage is not available for use within the array, a purchase may be necessary.

VMAX Capacity Trends for Tiers

All >> Report Library >> EMC VMAX >> Capacity Reports >> Tiers
Capacity Reports / Tiers

July 2014, Sunday 20 » Monday 21, 1:47 PM EDT | Last 1 Day: average on real-time

Detailed View

4 elements found, displaying all elements.

Tier Name	Array	Nb. Pools	Capacity	Used	Free	% Full	% Free	Expected % in 30 days	Will reach 90% on	Deviation (0 means stable)
BC_SATA_TIER	000192606304	1	51.00 GB	19.00 GB	32.00 GB	37.25	62.75	55.71	Tuesday, October 21, 2014 8:26:32 AM EDT	0.00
BC_SATA_Tier	000192606327	1	51.00 GB	13.00 GB	38.00 GB	25.49	74.51	100.00	Sunday, August 3, 2014 11:54:39 PM EDT	0.00



Although 74.51% of the BC_SATA_Tier on array 327 is free, the consumption rate is high.

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Module 3: Storage Resource Planning

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Administrators always need to keep a close watch on the allocated capacity to their storage tiers, what has been used and how much is still free but this doesn't tell them at what rate the storage is being consumed. That metric cannot be ignored, and it is present in this table. Storage Administrators will be notified about the expected percentage of use in each tier in 30 days and at what date and time the tier consumption will reach 90%. This trending information allows the Administrator to take proactive steps to prevent a tier full condition.

VNX Usable Capacity Trends

All >> Report Library >> EMC VNX >> Summary >> Array Summary >> Unified VNX-152 >> Block, APM00134303866 >> Unified VNX-152 >> Usable Capacity Trend

Usable Capacity Trend Details

4 elements found, displaying all elements.

Metric	Value [Monday]	Value [Tuesday]	Value [Wednesday]	Value [Thursday]	Value [Friday]	Value [Saturday]	Value [Sunday]	Value [Monday]
Used for Block	28.21 GB	28.21 GB	28.21 GB	28.21 GB	28.21 GB	28.21 GB	28.21 GB	28.21 GB
Used for File	0.00 GB	0.00 GB	0.00 GB	0.00 GB	0.00 GB	0.00 GB	0.00 GB	0.00 GB
Pool Free	1.02 TB	1.02 TB	1.02 TB	1.02 TB	1.02 TB	1.02 TB	1.02 TB	1.02 TB
Free	0.00 GB	0.00 GB	0.00 GB	3.62 GB	3.62 GB	0.00 GB	0.00 GB	0.00 GB

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Module 3: Storage Resource Planning

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Usable capacity trends can be revealed for the VNX array in a table by declaring capacity usage each day of the week.

VNX Usable Capacity by Pool

All >> Report Library >> EMC VNX >> Summary >> Array Summary >> Unified VNX-152 >> Block, APM00134303866 >> Unified VNX-152 >> Usable Capacity by Pool

Unified VNX-152 / Usable Capacity by Pool

July 2014, Monday 14 » Monday 21, 2:00 PM EDT | Last 1 Week: average on 1 hour

Click to display column definitions

Usable Capacity by Pool

One element found.

Pool	Pool Type	Array	Usable (GB)	Used (GB)	Used for Block (GB)	Used for File (GB)	Used for Virtual (GB)	Free LUN Capacity (GB)	Free (GB)	Used Trend	% Used	% Subscribed	# Days Until Full
GLOBAL	Snap Pool	Unified VNX-152	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 →			

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Here a VNX is investigated for the usable capacity in a snap-pool. The fact that the pool capacity is not used at all indicates that there are no snaps in the system.

VNX Usable Capacity by RAID Group

All >> Report Library >> EMC VNX >> Summary >> Array Summary >> Unified VNX-152 >> Block, APM00134303866 >> Unified VNX-152 >> Usable Capacity by RAID Group

Unified VNX-152 / Usable Capacity by RAID Group

July 2014, Monday 14 » Monday 21, 2:20 PM EDT | Last 1 Week: average on 1 day

RAID/Parity Group

One element found.

RAID/Parity Group	RAID/Parity Group Type	Array	RAID/Parity Group Raw (GB)	RAID/Parity Group Usable (GB)	RAID/Parity Group Used (GB)	RAID/Parity Group Free (GB)	RAID/Parity Group Used Trend	% Used	# Consumers	# Days Until Full
0	RAID-5	Unified VNX-152	1,073.35	1,073.34	28.23	1,045.11	28.23	—	2.63	12

Not enough activity to determine

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Usable Capacity by Capacity by RAID Group here shows the capacity used for a RAID-5 group and includes the parity usage as well.

Lab: Part 1- Capacity Trends

This lab covers :

- Capacity trends

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Module 3: Storage Resource Planning

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This lab covers the use of ViPR SRM for storage resource planning by examining reports on storage capacity trends.

Lab Debrief: Part 1 - Capacity Trends

This lab covered :

- Capacity trends
 - Contributors – largest and what does this mean

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Module 3: Storage Resource Planning

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This lab covered the use of ViPR SRM for storage resource planning by examining reports for storage capacity trends and forecasting storage needs based on consumption rates.

Module 3: Storage Resource Planning

Lesson 1: Summary

During this lesson the following topics were covered:

- Displaying enterprise wide storage capacity trends
- VMAX capacity usage trends
 - Storage pool capacity planning
 - Tiers
- VNX capacity usage trends
 - Usable capacity trend
 - Usable capacity by pool and RAID group



This lesson covered the available VMAX and VNX storage capacity usage trends.

Module 3: Storage Resource Planning

Lesson 2: Forecasting Capacity Problems

This lesson covers the following topics:

- Array utilization



This lesson covers detailed reports available for forecasting capacity problems in array utilization.

Forecasting Storage Pool and Array Capacity Problems

All >> Planning >> Forecast Capacity Problems

Forecasting is available for:

- File System Usage
- LUN Utilization
- Storage Pool Utilization

Over the last 24 hours and 7 days by percentage and the next 7 days projected

Forecast Capacity Problems / Array Utilization

2014, February » August, the 21 at 8:29 AM EDT | Last Semester

Capacity utilization for the array is computing using : Free capacity, Pool Free capacity and Configured Usable capacity of the overall array.

6 elements found, displaying all elements.

Array	Total Raw	Configured Usable	Free	Pool Free	Utilization (%)	Will Reach 90% on	Will Reach 90% in
Unified VNX-152	33.42 TB	12.84 TB	0.00 GB	12.77 TB	1.95		
000195901102							
000192606327	40.60 TB	1.13 TB	188.22 GB	235.23 GB	63.36		
000192606304	27.33 TB	1.15 TB	194.45 GB	224.61 GB	64.30		
Unified VNX-200	33.42 TB	14.94 TB	0.00 GB	1.55 TB	54.23		
APM00134303866							

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The forecasting component of ViPR SRM shows array utilization in this table. In this report only the Array Utilization table shows very low utilization of the Unified VNX-152 array and does not have enough data to populate records for 000195901102 and APM00134303866. However, Unified VNX-200 shows the sparkline as increasing in value, so this is a good choice for reviewing any forecast information.

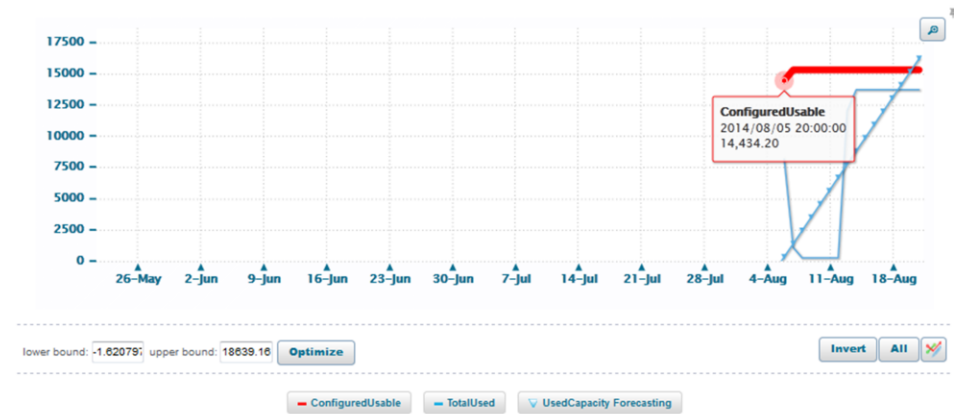
Other forecasting may be accomplished for File System Usage, LUN Utilization, and Storage Pool Utilization over the past day, and week. Projections are made for the next week based on the trends. Then a determination is made as to when the components will reach 90% of capacity.

Forecasting LUN and File System Capacity Problems

All >> Planning >> Forecast Capacity Problems

Array Utilization / Unified VNX-200

2014, May » August, the 21 at 8:39 AM EDT | Last Quarter: average on 1 day



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Expanding the Unified VNX-200 shows that the Used Capacity increased sharply near August 12. The projected forecast for this array shows that at that rate of increase, the configured usable storage would be completely consumed in a short period of time. However, the usage level flattened and prevented an out of capacity condition.

Lab: Part 2 – Forecasting Capacity Consumption

This lab covers :

- Forecasting capacity consumption

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Module 3: Storage Resource Planning

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This lab covers the use of ViPR SRM for storage resource planning by forecasting storage needs based on consumption rates.

Lab Debrief: Part 2 – Forecasting Capacity Consumption

This lab covered:

- Forecasting capacity consumption
 - File systems, LUNs, and Storage Pools
 - Reviewed sparkline markers for array utilization
 - Examined reports for hot spots

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Module 3: Storage Resource Planning

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This lab covered the use of ViPR SRM for storage resource planning by forecasting storage needs based on consumption rates.

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Module 3: Storage Resource Planning

Lesson 2: Summary

During this lesson the following topics were covered:

- Array utilization



This lesson covered the ability of ViPR SRM to forecast problems associated with many different components of the storage environment.

Module 3: Storage Resource Planning

Lesson 3: Understanding the Report Library Capacity Reports

This lesson covers the following topics:

- EMC ViPR, VMAX and VNX capacity reports
- VMware vCenter datastore capacity distribution



This lesson covers detailed capacity reports available from the Report Library for ViPR, the VMAX and VNX Storage Arrays, and VMware vCenter Datastores.

EMC ViPR Capacity Reporting

Report Library

- Brocade FC Switch
- EMC ViPR**
 - Virtual Data Centers
 - Capacity
 - Details
- EMC VMAX
- EMC VNX
- EMC Watch4net Health
- VMware vCenter

All >> Report Library >> EMC ViPR

Report Library / EMC ViPR

July 2014, Wednesday 23 > Thursday 24, 9:11 AM EDT | Last 1 Day: average on real-time

Virtual Data Centers

One element found.

Virtual Data Center	Virtual Arrays	Virtual Pools	Hosts	Block Volumes	File Systems	Data Stores
VIPR VMAX10K-102	1	1	7	1	0	0

List of Storage Systems

2 elements found, displaying all elements.

Storage System	Virtual Data Center	Model Family	Serial Number	Management IP Address	Number of Storage Pools	Usable Capacity
SYMMETRIX-000192606304	VIPR VMAX10K-102	EMC VMAX	000192606304	10.127.94.193	6	24.06 TB
SYMMETRIX-000195901102	VIPR VMAX10K-102	EMC VMAX	000195901102	10.127.94.193	6	1.54 TB

Capacity Available to Virtual Arrays

One element found.

Virtual Array Name	Virtual Pool Name	Virtual Data Center	Virtual Pool Description	Used Capacity	Provisioned Capacity	Free Capacity	Current Utilization (%)	Current Provisioned (%)
VIPR VMAX10K-102 Virtual Array	VIPR VMAX10K-102 Virtual Pool	VIPR VMAX10K-102	Virtual Pool from VMAX10K-102	1.00 GB	3.00 GB	700.00 GB	1.00	1.00

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Module 3: Storage Resource Planning

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In the list of of Storage Systems from the ViPR SolutionPack each array is identified in the Virtual Datacenter along with the Virtual Datacenter instance each array is associated with. This represents the total physical storage being reported by ViPR and it is the storage that ViPR will present in a virtualized environment to the end users of that storage. In this view the Virtual Datacenter identified as ViPR VMAX10k-102 contains only one Virtual Array identified as ViPR VMAX10k-102 Virtual Array. This array has one virtual storage pool called VMAX10k-102 Virtual Pool. The provisioned capacity of this virtual array is 3.0GB of which only 1GB is used and 700GB is free.

Note: each physical storage system has six storage pools configured on the individual array.

EMC ViPR Virtual Pool Capacity Reporting

All >> Report Library >> EMC ViPR >> Details >> Virtual Pools >> List of Virtual Pools
List of Virtual Pools

One element found.

Virtual Pool Name	Virtual Data Center	Virtual Pool Type	Description	Provisioning Type	Pool Assignment	Supported Protocols	Number of Storage Pools	Used Capacity	Free Capacity	Storage Pool(s) Used Capacity	Storage Pool(s) Usable Capacity	Storage Pool(s) Utilization (%)	# Days Until Full
VPR VMAX10K-102 Virtual Pool	VPR VMAX10K-102	Block	Virtual Pool from VMAX10K-102	Thin	Automatic	Fibre Channel	3	1.00 GB	700.00 GB	0.00 GB	700.00 GB	0.00	

All >> Report Library >> EMC ViPR >> Details >> Virtual Pools >> List of Virtual Pools >> VPR VMAX10K-102 Virtual Pool
List of Storage Pools

3 elements found, displaying all elements.

Storage Pool	Virtual Data Center	Storage System	Type	Supported Provisioning Modes	Operational Status	Used Capacity	Free Capacity	Subscribed Capacity	Usable Capacity	Current Utilization (%)
VPR_EFD_RS	VPR VMAX10K-102	SYMMETRIX-000195901102	Block	Thin	Ready	0.00 GB	100.00 GB	1.00 GB	100.00 GB	0.00
VPR_FC15_R1	VPR VMAX10K-102	SYMMETRIX-000195901102	Block	Thin	Ready	0.00 GB	200.00 GB	1.00 GB	200.00 GB	0.00
VPR_SATA_RS	VPR VMAX10K-102	SYMMETRIX-000195901102	Block	Thin	Ready	0.00 GB	400.00 GB	3.00 GB	400.00 GB	0.00

List of Block Volumes

One element found.

Volume	Virtual Data Center	Tenant	Project	Virtual Array	Virtual Pool	Storage System	Model Family	Supported Protocols	Provisioned Capacity
sid_102_esx_161	VPR VMAX10K-102	Provider Tenant	VPR_ESX_161	VPR VMAX10K-102 Virtual Array	VPR VMAX10K-102 Virtual Pool	SYMMETRIX-000195901102	EMC VMAX	Fibre Channel	2.00 GB
Total									2.00 GB

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Module 3: Storage Resource Planning

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Investigating the virtual storage pool further, it is noted that three storage pools are used to create the virtual storage pool resulting in 700GB of usable, free capacity and 1GB of used capacity. The list of storage pools from the physical storage environment that make up the virtual storage pool follows. Only the 102 array is used to give storage to the virtual pool and only one block volume is created from this storage with 2GB of provisioned storage.

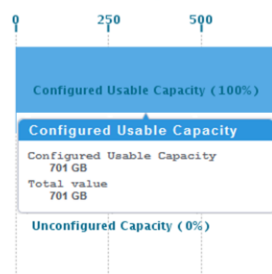
EMC ViPR Capacity and Trend Reporting

All >> Report Library >> EMC ViPR >> Capacity

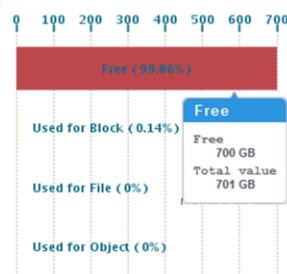
EMC ViPR / Capacity

Tuesday, July 22, 2014, 5:53 AM » 11:53 AM, EDT | Last 6 Hours: average on 1 hour

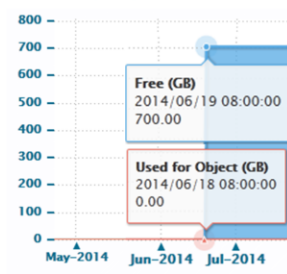
Raw Capacity Usage



Usable Capacity



Usable Capacity Trend



All raw capacity is configured usable

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Module 3: Storage Resource Planning

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In this example of capacity reporting for a ViPR instance, all of the Raw Capacity of the available storage has been configured as usable capacity. The usable capacity is broken down into the percentages of what has been used for object, file, block, and free storage. The usable capacity trend graph shows that apart from the 1GB of storage used for block storage, all the remaining storage is free and has not been configured for any purpose since reporting has begun.

EMC VMAX Capacity Reports

All >> Report Library >> EMC VMAX >> Capacity Reports

EMC VMAX / Capacity Reports

July 2014, Monday 21 » Tuesday 22, 1:52 PM EDT | Last 1 Day

5 elements found, displaying all elements.

Name
Storage Pool Capacity Planning
Thin Devices
All disks
By DiskGroup
Tiers

Both were used
in trend analysis

- Capacity reports include all discovered VMAX arrays
- Capacity utilization levels and consumption rates are given

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Module 3: Storage Resource Planning

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Capacity reporting enables the Administrator to determine how storage has been allocated across the storage pools in all the discovered arrays. Thin pools are of particular interest since LUNs in these pools are generally oversubscribed. Administrators will use the capacity reports to investigate what percentage of the thin devices have been bound or enabled and consumed or allocated.

The All Disks capacity report for VMAX shows all the disks from each array and reports on the disk type, disk group, and performance information as well as capacity data for each disk. The By DiskGroup report expands the information on each disk group by showing the backend directors responsible for addressing each disk in the group and all of the capacity information including Hyper Capacity space available. The Tiers report details all the tiers found across each array and displays the capacity information associated with each tier.

VMAX All Disks Capacity Report

All >> Report Library >> EMC VMAX >> Capacity Reports >> All disks

Capacity Reports / All disks

July 2014, Monday 21 > Tuesday 22, 2:26 PM EDT | Last 1 Day

128 elements found, displaying 1 to 25.

Array	Disk Name	Use	Disk Type	Disk Group	RPM	Director	IOPS	Throughput (/s)	Raw Capacity	Free Capacity	Free Capacity (%)
000192606327	DF-7B.D 4	Assigned	SAS	DISK_GROUP_002	10000	DF-7B	0	0 MB	273 GB	259 GB	94.97
000192606327	DF-7B.D 2	Assigned	SAS	DISK_GROUP_002	10000	DF-7B	0	0 MB	273 GB	255 GB	93.43
000192606304	DF-7D.D 6	Assigned	Fibre Channel	DISK_GROUP_003	15000	DF-7D	174	1 GB	273 GB	257 GB	94.15
000192606304	DF-7D.D 4	Assigned	Fibre Channel	DISK_GROUP_003	15000	DF-7D	253	2 GB	273 GB	258 GB	94.57
000192606327	DF-7B.D 6	Assigned	Fibre Channel	DISK_GROUP_003	15000	DF-7B	0	0 MB	273 GB	259 GB	94.90
000192606304	DF-7D.D 2	Assigned	SAS	DISK_GROUP_002	10000	DF-7D	0	4 MB	273 GB	254 GB	93.03
000192606304	DF-7D.D 0	Assigned	SATA	DISK_GROUP_001	7200	DF-7D	185	3 GB	932 GB	894 GB	95.94
000192606327	DF-7B.D 0	Assigned	SATA	DISK_GROUP_001	7200	DF-7B	0	0 MB	2 TB	658 GB	36.93
000192606304	DF-7D.D E	Hot spare	Fibre Channel	DISK_GROUP_003	15000	DF-7D	0	0 MB	273 GB	0 GB	0.00
000192606327	DF-7B.D E	Hot spare	Fibre Channel	DISK_GROUP_003	15000	DF-7B	0	0 MB	273 GB	0 GB	0.00

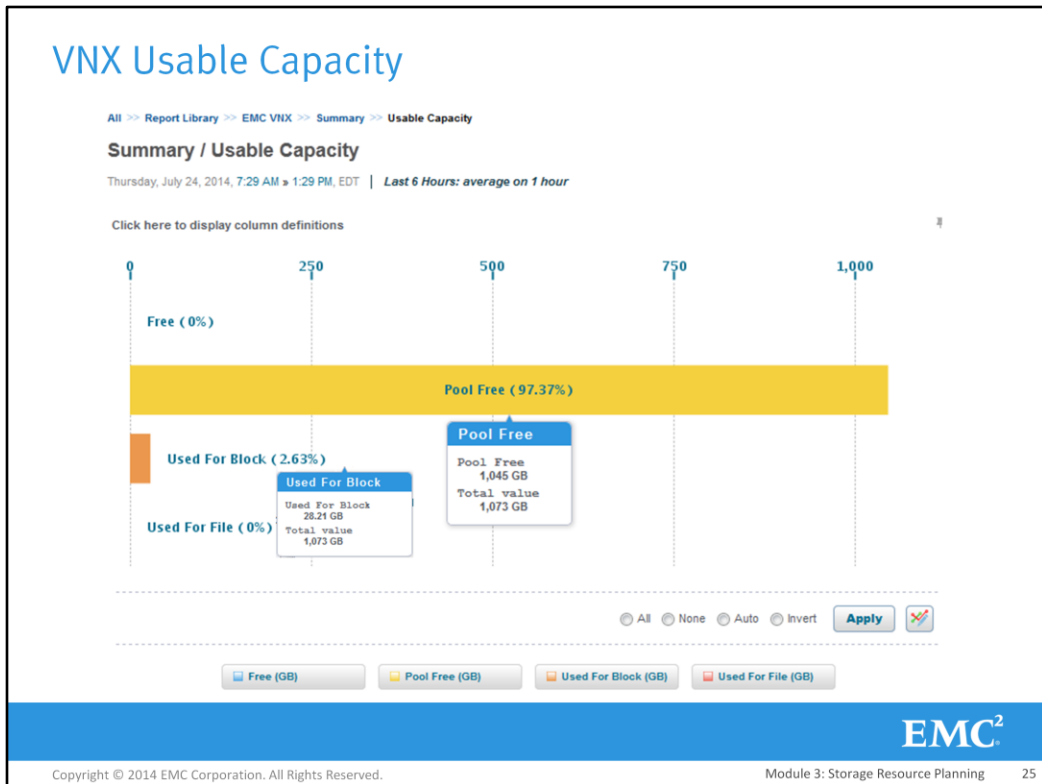
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Module 3: Storage Resource Planning

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This report can be quite long as it covers all physical disks found in all discovered arrays. In analyzing the capacity report it is important to focus on what the free capacity level is in each drive. Each disk which has a red circle identifier is a disk with a critical state for free capacity. It should be determined how much storage is in this state as a percentage of all the storage. If data can be migrated, this is a solution which does not require adding storage, but if migration will not alleviate enough of the problem then more storage may be necessary. The solution could also be to move the data off the disk then replace the disk with a disk that has greater capacity and migrate the data back onto the new disk.



The configured usable storage for the VNX is 28GB+1045GB which equals 1073GB. There is no capacity being used for file systems and there is no remaining usable capacity storage apart from storage used for block and pool free storage.

Bar graph definitions are:

Free: Unbound data devices and SAVE devices, unmapped and/or unmasked thick LUNs.

Pool Free: Unwritten space within pools and unbound capacity within RAID groups.

Used For Block: Capacity that is made available to storage area network.

Used For File: Capacity that is made available to network attached storage.

VNX Block Capacity Reporting

All >> Report Library >> EMC VNX >> Summary >> Array Summary >> Unified VNX-152 >> Block, APM00134303866

Unified VNX-152 / Block, APM00134303866

July 2014, Tuesday 15 » Tuesday 22, 2:50 PM EDT | Last 1 Week

Block, APM00134303866

One element found.

Array	IPs	Model	Pools	RAID Groups	LUNs	Disks	Total Raw (GB)	Configured Including RAID (GB)	Configured Usable (GB)
Unified VNX-152	10.127.94.111, 10.127.94.110	VNX5400	0	1	12	40	34,225.40	1,073.35	1,073.34

continued

RAID Overhead (GB)	Unconfigured (GB)	Unusable (GB)	Hot Spare(GB)	SPs In Problem	Disks In Problem	LUNs In Problem
0.00	32,883.38	268.67	0.00	0	0	0

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Module 3: Storage Resource Planning

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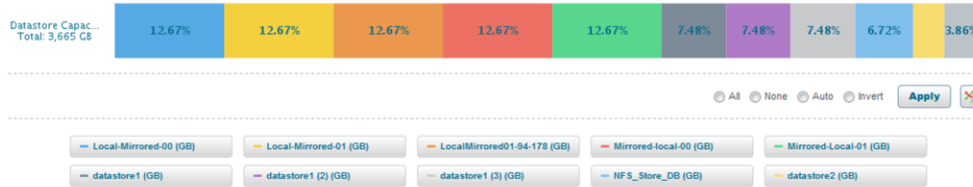
More than 90% of the storage in the Unified VNX-152 array exists as Unconfigured storage space. Only slightly more than 3% of the storage has been configured as usable. There is one RAID group on this VNX comprised of 12 LUNs for block storage. As was seen earlier, all the block storage sums to approximately 28GB.

VMware vCenter Capacity Reports

All >> Report Library >> VMware vCenter >> Datastore Capacity Distribution

VMware vCenter / Datastore Capacity Distribution

July 2014, Monday 21 > Tuesday 22, 3:26 PM EDT | Last 1 Day: average on 1 hour



- Each color band represents a datastore and the percentage of total datastore storage it consumes
- Hovering the cursor over a color band grants a link to that datastore and clicking the band will create a datastore report
- Datastore consumption is reported for virtual disks, swap files, free space, and snapshots

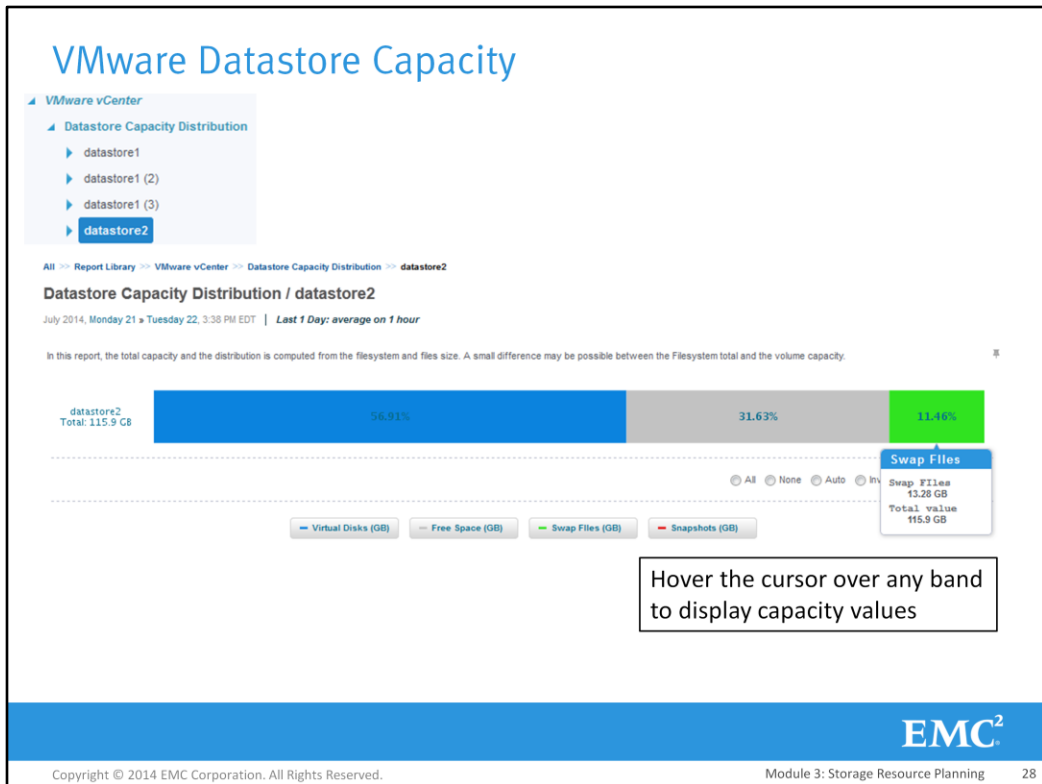
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The VMWare vCenter SolutionPack will report on datastore capacity distribution throughout the vCenter. Each color band in the datastore report shows the percentage of the total datastore capacity each individual datastore is occupying. Clicking on a color band presents a capacity report for that datastore.



Datastore capacity may be displayed for any datastore listed under the Datastore Capacity Distribution node in the report tree. Here, the capacity distribution is shown for datastore2 which is 115.9GB. The example shows the capacity for Swap files. When the cursor is placed over the band for the swap file capacity, a pop-up box reveals the numerical contribution of swap file capacity and the total capacity of the datastore.

Module 3: Storage Resource Planning

Lesson 3: Summary

During this lesson the following topics were covered:

- EMC ViPR, VMAX and VNX capacity reports
- VMware vCenter datastore capacity distribution



This lesson covered the capacity reports available for storage solution packs in the Report Library node of the report tree. Storage reports reviewed included ViPR, VMAX, VNX, and VMware.

Module 3: Storage Resource Planning

Lesson 4: “What if” Scenarios

This lesson covers the following topics:

- Storage pool capacity planning
- Choosing a scenario type
- Add a reservation
- Pool expansion



This lesson covers “What-If” scenarios for Storage Pool Planning. The “Add Reservation” and “Pool Expansion” scenarios will be examined to determine how theoretical changes to pool capacity and used capacity of the pool affect projected trends in pool usage. This will help determine if proposed changes will keep the pool from filling and becoming unusable.

ViPR SRM What-if Scenarios

All >> Operations >> What-if scenarios >> Pool Capacity Planning

What-if scenarios / Pool Capacity Planning

2014 » 2015, January 1, 12:00 AM EST | Current 1 Year: average on 1 day

This reports aims to help storage administrator to do what-if analysis against pool utilization.

How to create a scenario

- Right click on a Pool
 - Add Reservation : Simulate we increase Used Capacity of the Pool
 - Pool Expansion : Simulate we increase the Pool capacity
- The UsedProjection green line should not cross the CapacityProjection red line ; which means the pool will be full

Subscription Trend



Pool Capacity Planning

15 elements found, displaying all elements. Show ALL

Array	Pool	Pool Type
000192606304	DEFAULT_POOL	Snap Pool
000192606304	appn_pool	Snap Pool
000192606304	snap_pool	Snap Pool
000192606327	BC_FC_RAID1	Thin Pool
000192606327	BC_DSE	Storage Pool
000192606327	DEFAULT_POOL	Snap Pool
000192606327	r2_snap_pool	Snap Pool
000192606327	BC_SATA_R6	Thin Pool
	IC_DSE	Storage Pool
	SX1_RAID6	Thin Pool
	GLOBAL	Snap Pool
000192606304	BC_FC_RAID1	Thin Pool
000192606327	ESX1_RAID6	Thin Pool
000192606327	P1	Thin Pool
000192606304	BC_SATA_R6	Thin Pool

Context menu options: Add Pool Expansion..., Add Reservation...

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Storage pool capacity planning begins with viewing the current trend for an individual pool on a specific array. In the subscription trend graph above, it can be noted that at some point in August 2014 the Used Projection will exceed the Capacity Projection. When this happens, the demand for storage will exceed the available capacity of storage. This situation must be resolved. The resolution will require knowing how much storage will be added to the pool and when. This criteria can be simulated in the “What-if” scenarios.

Adding “What-if” Used and Pool Capacity

Pool Expansion details:

The screenshot shows a dialog box titled "Add Pool Expansion..." with a close button (X) in the top right corner. Inside the dialog, there is a sub-header "Add a future expansion to a pool" followed by a dashed line. Below this, there are three input fields: "Capacity to Reserve (specify unit - default=GB)" with the value "200", "Planned Date for Capacity Add (YYYY-MM-DD)" with the value "2014-08-20", and "Notes on this reservation" with the text "increase pool size". At the bottom right of the dialog are "Cancel" and "Ok" buttons. To the right of the dialog, there is a notification message that says "The requested action has been launched." Below this, there is another notification message that says "Reading file /tmp/qxkYfZc7RM. Reading completed. 1 scenario inserted, 0 scenario updated on a total of 1". An arrow points from the "Ok" button of the dialog to the second notification message.

Add Pool Expansion...

Add a future expansion to a pool

Capacity to Reserve (specify unit - default=GB)

Planned Date for Capacity Add (YYYY-MM-DD)

Notes on this reservation

The requested action has been launched.

Reading file /tmp/qxkYfZc7RM
Reading completed. 1 scenario inserted, 0 scenario updated on a total of 1

The size of the pool capacity must be increased before the projected use exceeds the capacity projection
Capacity projection = 50.52GB throughout the graph time line
Increase Pool size before August 28, 2014

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Module 3: Storage Resource Planning

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If the pool size expansion simulation is scheduled to take place on the calendar beyond the point where the used projection is greater than the capacity projection for this what-if scenario, the simulation will fail. The reason for this is that the pool capacity has been exhausted and it is essentially too late to add storage. If however, the extra storage is added to the pool before this point, it should add to the pool without error.

“What-if” Scenario Pool Expansion

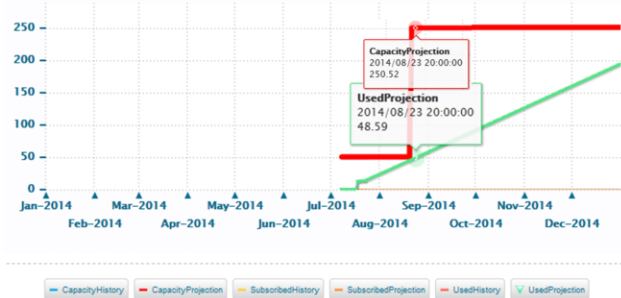
Pool Capacity Planning

15 elements found, displaying all elements.

Show ALL

Array	Pool	Pool Type
000192606304	DEFAULT_POOL	Snap Pool
000192606304	appn_pool	Snap Pool
000192606304	snap_pool	Snap Pool
000192606327	BC_FC_RAID1	Thin Pool
000192606327	BC_DSE	Storage Pool
000192606327	DEFAULT_POOL	Snap Pool
000192606327	r2_snap_pool	Snap Pool
000192606327	BC_SATA_R6	Thin Pool
000192606304	BC_DSE	Storage Pool
000192606304	ESX_RAID6	Thin Pool
Unified VNX-152	GLOBAL	Snap Pool

Subscription Trend



Capacity Reservations

One element found.

When	Type	Notes	Capacity (GB)
2014/08/20 12:00:00 EDT	PoolExpansion	increase pool size	200.0

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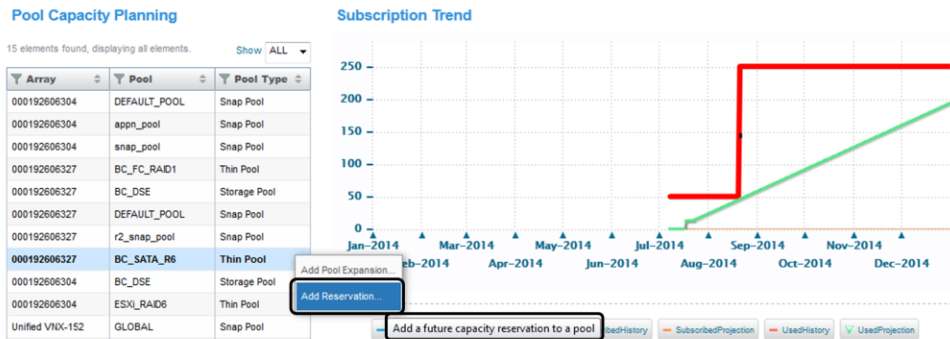
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Module 3: Storage Resource Planning

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Always keep the capacity of the pool greater than the expected use. From the graph lines in this output capacity was added to the pool just in time to keep the used projection lower than the current capacity. Therefore, this scenario will work based on the current levels and consumption rates of storage in the BC_SATA_R6 pool on Array 000192606327.

“What-if” Add Reservation Scenario



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Having a capacity projection much ahead of the used projection yields some room to experiment with adding future capacity reservation to the pool and viewing the output to determine if the proposed increase in used capacity of the pool can be tolerated.

Increasing Used Capacity of the Pool

Add Reservation...

i Add a future capacity reservation to a pool

Capacity to Reserve (specify unit: 20
- default=GB)

Planned Date for Capacity Add 2014-09-01
(YYYY-MM-DD)

Notes on this reservation increasing used capacity of

Cancel Ok

i The requested action has been launched.

x
Reading file /tmp/Q0114WB7LP
Reading completed. 1 scenario inserted, 0 scenario updated on a total of 1

The size of the pool capacity must be increased before the projected use exceeds the capacity projection

Capacity projection = 250.52GB on September 01,2014

Increase Used Capacity of the Pool after August 20,2014

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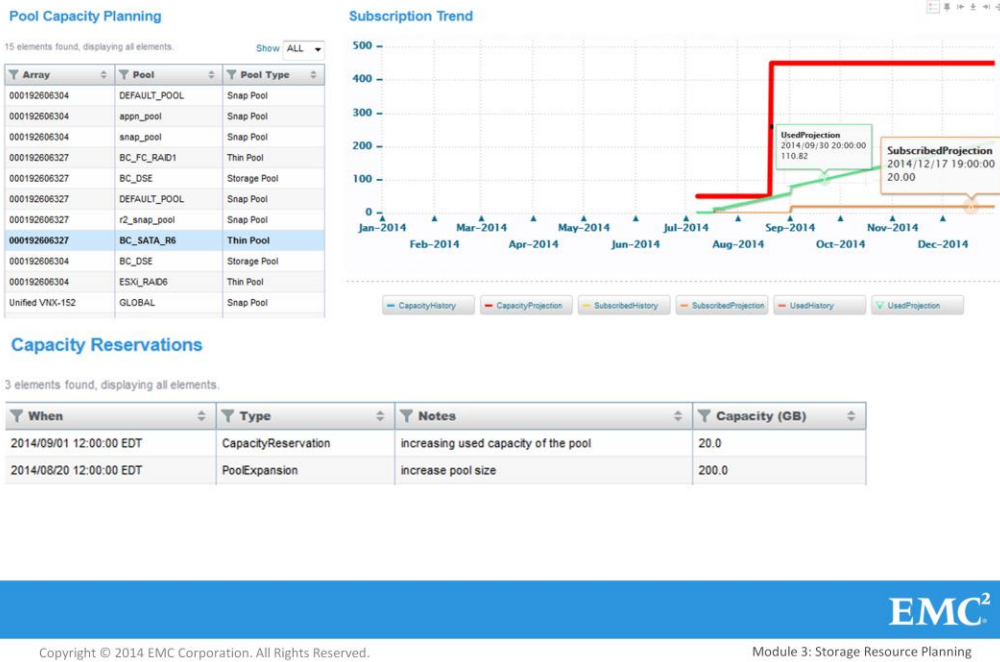
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Module 3: Storage Resource Planning

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The increase of pool Used Capacity may be simulated with the Add Reservation scenario in the What-If options. It is most important to run a What-if Add Reservation scenario that will not exceed the Capacity Projection of the pool over the time that the scenario is executed. If care has been taken to avoid this potential situation, the output from the “Add Reservation” dialog box should declare that “The requested action has been launched.”

Add Reservation to Used Capacity



Clearly from this output, it can be seen the simulation of adding 20GB to the used capacity on September 01, 2014 does not cause the rate of capacity consumption to exceed the amount storage capacity available over the period the scenario runs. However, it can be concluded by reviewing the right side of the graph, that it will be necessary after December 2014 for the pool size to be re-evaluated. Note that the increase of used capacity results in an equal increase in subscription to the pool.

Module 3: Storage Resource Planning

Lesson 4: Summary

During this lesson the following topics were covered:

What-If Scenarios:

- Storage pool capacity planning
- Choosing a scenario type
- Add a reservation
- Pool expansion



This lesson covered storage pool capacity planning and creating a scenario where both the pool capacity and used capacity of the pool were increased to determine if the proposal of increases could be tolerated by the storage system.

Module 3: Storage Resource Planning

Lesson 5: Workload Distribution

This lesson covers the following topics:

- Storage array workload distribution
- Virtual workload distribution



This lesson covers reviewing workload distributions to the physical array and virtual environments.

VMAX Workload Distribution

Workload Distribution

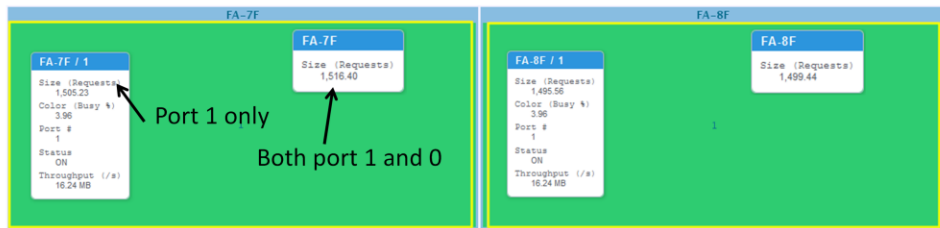
- Array Workload Distribution
 - VMAX
 - 000192606304

All >> Operations >> Workload Distribution >> Array Workload Distribution >> VMAX >> 000192606304

VMAX / 000192606304

July 2014, Tuesday 22 • Wednesday 23, 2:52 PM EDT | Last 1 Day: average on 1 hour

Device name	Device description	Device model
000192606304	5876.251.161 date:09.03.2013 patch_date:09.03.2013	VMAX28K
Status	Vendor	
active	EMC Corporation	



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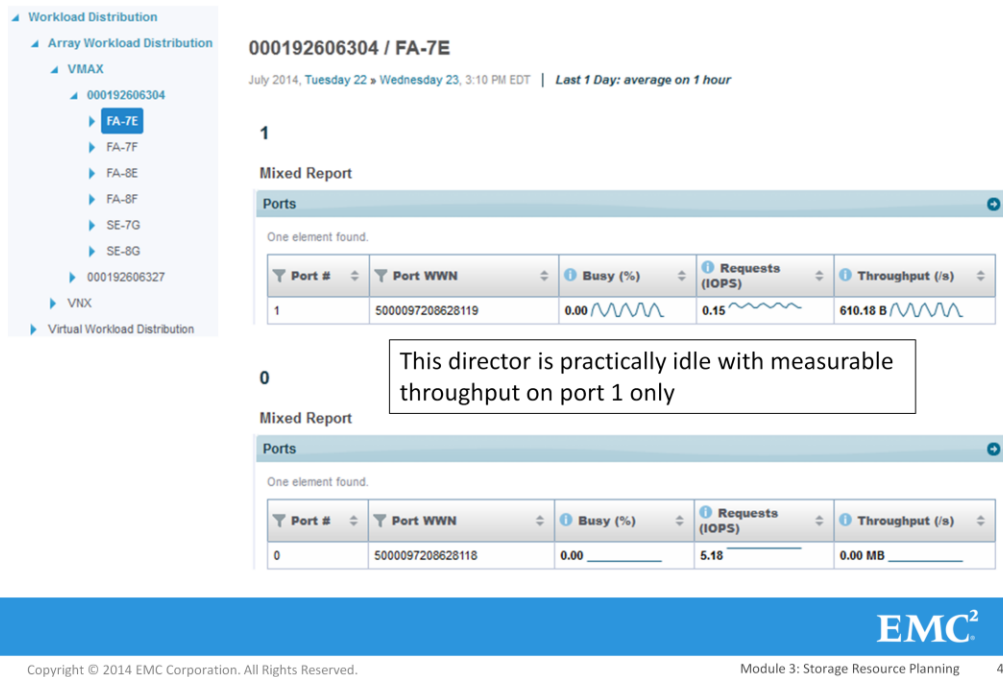
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Module 3: Storage Resource Planning

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Workload distribution details may be viewed for both VMAX and VNX. Here we use the VMAX as an example. The frontend directors FA-7F port 1 and FA-8F port 1 are shown for normal workloads. Hovering the cursor over the different blocks in each director listing yields the pop-up boxes shown. In this example the Size (Requests) metric varies between the FA title bar and large green box. The title bar however takes into account both ports whereas the larger green area is only for the port shown, which in this case is port 1.

VMAX Adapter Workload Distribution



This report is showing very little activity on the ports of director FA-7E. It is so low, that the measured percentage that the director is busy is zero on both ports.

Virtual Environment Workload Distribution

All >> Operations >> Workload Distribution >> Virtual Workload Distribution >> VMware vCenter >> Franklin

Click on any Datacenter to load it's ESX Workload Distribution Report

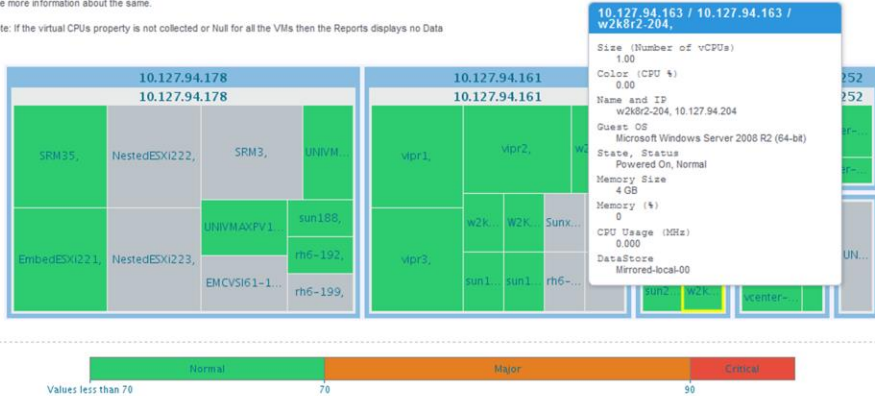
One element found.

DataCentre Name	# of Clusters	# of ESX's	# of VM's
Franklin	7	7	37

Franklin

VM Workload Distribution on ESX Clusters where the sizing of the VMs is based on number of virtual CPUs assigned and coloring of the VMs are done based on the CPU % of the VM. Mouse hover on a VM to see more information about the same.

Note: If the virtual CPUs property is not collected or Null for all the VMs then the Reports displays no Data



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Every gray and green square in the lower table represents a virtual machine belonging to the ESX server identified by its IP address in the title bar above. The green squares represent VMs that are powered on. Gray represents a powered off VM. Hovering a cursor over any one block will produce a pop-up box showing the details of the particular virtual machine.

Module 3: Storage Resource Planning

Lesson 5: Summary

During this lesson the following topics were covered:

Workload Distributions:

- Storage array workload distribution
- Virtual workload distribution



This lesson covered viewing workload distributions in both physical arrays and virtual server environments.

Lab: Storage Resource Planning

This lab covers :

- Capacity trends
- Forecasting capacity consumption

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Module 3: Storage Resource Planning

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This lab covers the use of ViPR SRM for storage resource planning by examining reports for storage capacity trends, and forecasting storage needs based on consumption rates.

Lab Debrief: Storage Resource Planning

This lab covered :

- Capacity trends
- Forecasting capacity consumption

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Module 3: Storage Resource Planning

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This lab covered the use of ViPR SRM for storage resource planning by examining reports for storage capacity trends and forecasting storage needs based on consumption rates.

Module 3: Summary

Key points covered in this module:

- Usable capacity trends
- Forecast capacity problems
- Proactively detect hot spots
- Use ViPR SRM to determine “What-if Scenarios” and “Workload Distribution”



This module covered the aspects of capacity planning that are available with ViPR SRM, including capacity reporting, trending, and forecasting. Other elements of the planning process included creating “what-if” scenarios and workload distribution maps.

This slide is intentionally left blank.



Module 4: Alerting in ViPR SRM

Upon completion of this module, you should be able to:

- Describe how alerts are handled
- Describe the sources of alerts
- Enumerate the available alerts for discovered CIs
- Describe storage compliance reporting and compliance based alerts
- Monitor the storage infrastructure using Situations to Watch



This module focuses on Alert and Compliance reports available in ViPR SRM.

Module 4: Alerting in ViPR SRM

Lesson 1: Alert Sources and Mechanisms in ViPR SRM

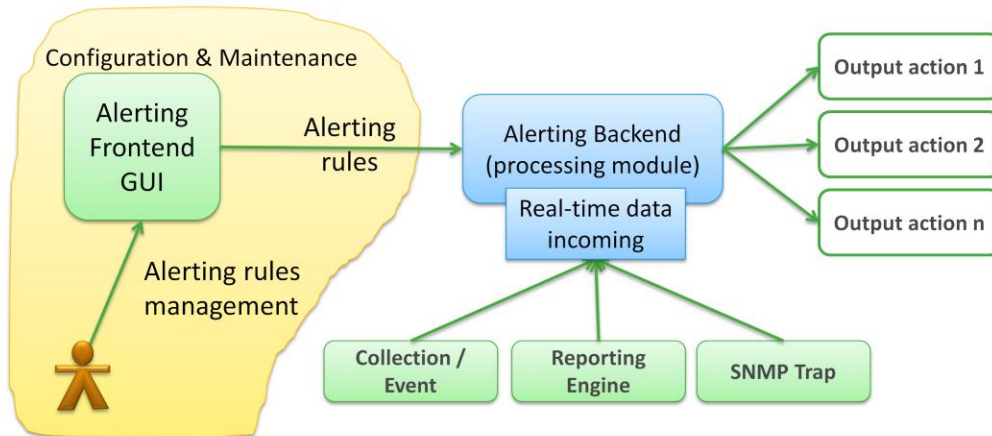
This lesson covers the following topics:

- Alert handling
- Sources of alerts
- Enabling alerts
- Customizing pre-defined alerts



This lesson covers Alert sources and Alert handling in ViPR SRM.

Alerting Modules – Overview



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Module 4: Alerting in ViPR SRM

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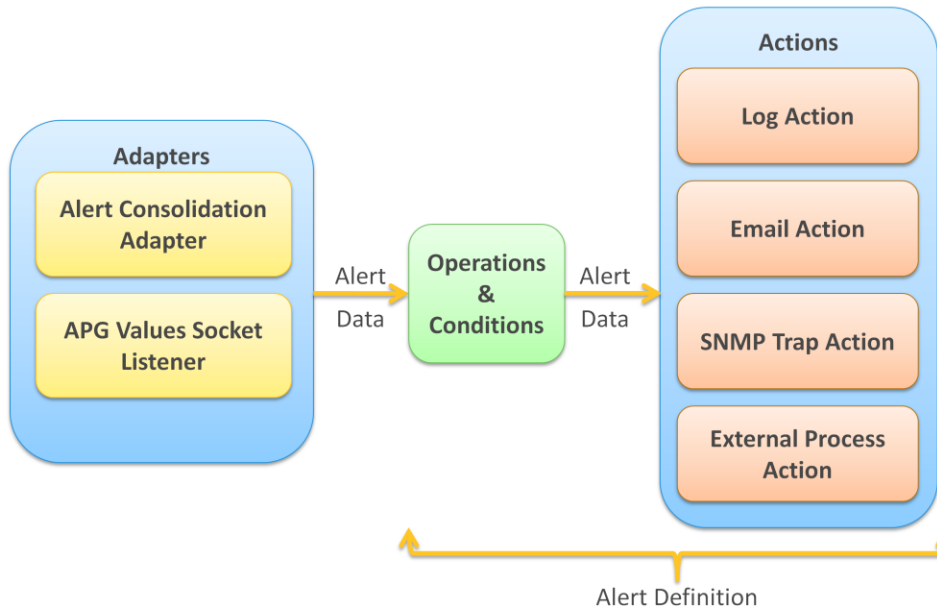
The Alerting Frontend is where you define alert definitions and their dependencies. The definitions are often referred to as rule sets. The Frontend interfaces with one or more Alerting Backends.

The Alerting Backend receives data and alerts via multiple collection methods. You can have multiple Alerting Backends on different servers to distribute the load.

Typically, an Alerting Backend receives performance data directly from the Collector-manager. It can also receive alert events and flows from an Event Processing Manager, the reporting engine, or a third party SNMP source.

Any data received at the Alerting Backend gets processed and tested against rule sets. When received data matches a rule set, the Alerting Backend will take appropriate output action (depending upon the rule's definition).

Alerting – Architecture



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Module 4: Alerting in ViPR SRM

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Once Adapters are defined, they are used in rule set as data input entry point. Incoming data is then processed by a set of structured Operations and Conditions. Finally those that pass end up in actions processing (four types).

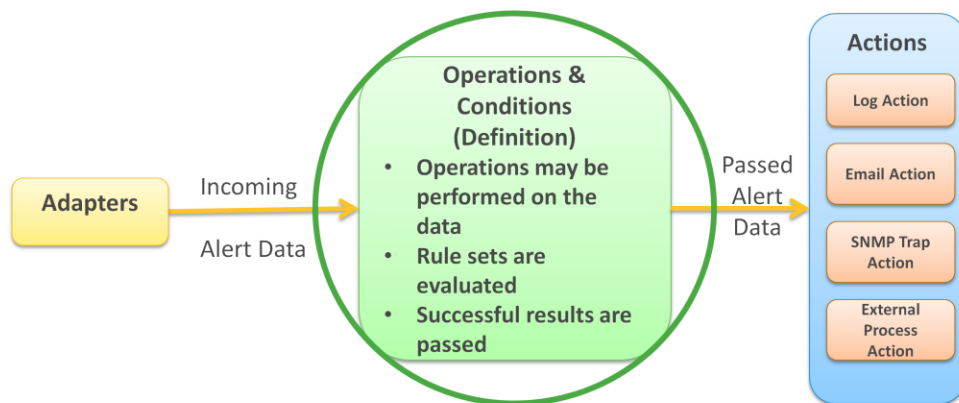
Action: The last element in any path of an Alert Definition. The action is typically triggered (or not) by the logical output of a set of operations and conditions.

Operation: An ATOMIC operation that will modify or evaluate one or two inputs.

Condition: An ATOMIC operation that will modify or evaluate a condition from one or two inputs and select a path whether the condition is met or not.

Alert definition: A set of one or more Operations and/or Conditions representing a logical formula followed by one or more Actions.

Alerting – Ruleset



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Module 4: Alerting in ViPR SRM

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Definitions

Alert definitions are used to process the incoming data values. Comparisons, operations, data modifications can be applied as part of the process. Criteria for thresholds are defined for actions to be taken when data matches. When the criteria for an alert is met in the definition, the output actions are triggered.

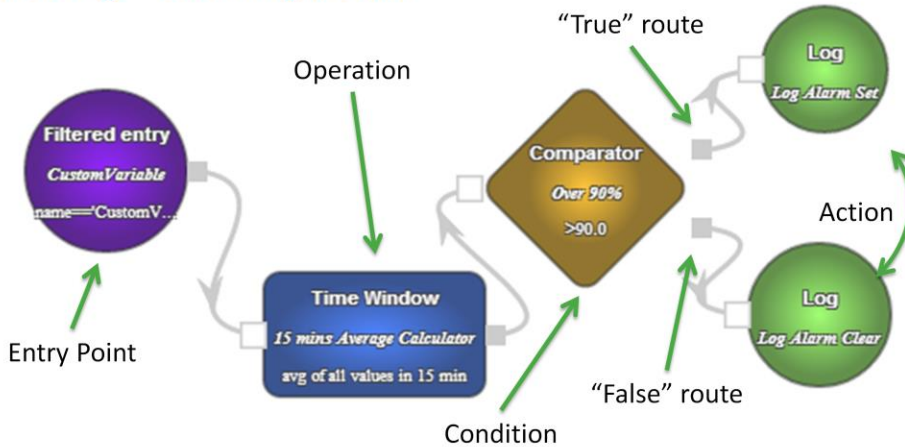
Definitions can be composed of Operations and Conditions.

Operations will manipulate the incoming data using mathematic operations, properties can be combined to form new values, time ranges can be defined (ex: trigger if a condition is met for a period of time), effective dates and times can be set (alert is only active during certain days or time of day), etc.

Conditions can be of a true/false nature: Will perform an action after comparing an incoming value to a set value, or if X number of values have accumulated for the same value id. Be sure to review the 'Watch4net-Alerting-Guide' for a complete description of each Operation and Condition available.

A definition can be as simple as monitoring the temperature value for a device, and sending an email to an admin if it exceeds a specified value. A definition can also be complex, monitoring several values over time from multiple devices, with dependencies on other conditions, and then perform a series of actions when a condition has been met, and finally perform another set of actions when the values return to normal. An alert definition can contain multiple conditions, and perform multiple output actions per condition. There are several examples included with the Alert Definitions.

Alerting – Drawing Board



Remember!

An Alert Definition is a set of Operations & Conditions preceded by a Filter (Optional) and followed by an Action.

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Module 4: Alerting in ViPR SRM

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Alerts are defined in the Alerting drawing board. The links between elements are called "connectors". They are used to link different elements together. Doing so establishes the flow of data from elements to elements.

The **Filtered Entry** (Adaptor), on the left, has only one connector since it is **always** the first element in the chain (ie a data entry point). This entry is used to select the scope of metrics to be processed to the rule. Next, the resulting data is passed to the **Operation** block. The drawing board includes several defined operation blocks including:

- No Operation
- Case
- Arithmetic
- Math
- Time Window (shown here)
- Aggregation
- Date
- Data Creator
- Timer

This is where data comes into the process. Operations generally have one input and one output. Conditions, either **Comparator** or **Counter**, have two outputs: 1 for true (condition met) and 1 for false (condition not met). The Action (or Output) has only one input connector since it is the last element in the chain. There is no limit on the number of elements linked on the same output. Available action types are:

- Log
- Mail
- SNMP Trap
- External Process

Source of Alerts

- With the SRM Suite, there are pre-defined alerts associated with some SolutionPacks:
 - ▶ Brocade FC Switch
 - ▶ Cisco MDS Nexus
 - ▶ EMC VMAX
 - ▶ EMC VNX
 - ▶ VMware vCenter
- There are also some examples, alert consolidations, and file system utilization alerts
- Each SolutionPack that supports alerts has an option to enable alerts



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Module 4: Alerting in ViPR SRM

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With the SRM Suite, there are pre-defined alerts associated with some SolutionPacks:

- Brocade FC Switch
- Cisco MDS Nexus
- EMC VMAX
- EMC VNX
- VMware vCenter

There are also some examples, alert consolidations, and file system utilization alerts. Each SolutionPack that supports alerts has a option to enable alerts.

Consult both the ***Storage Resource Management Suite Installation and Configuration Guide*** and the ***SRM Suite User and Administration Guide*** for additional information on enabling and using the provided alerts.

Alerts Available for Installed SolutionPacks

Local Manager

Alert definitions

Brocade FC Switch

Compliance

EMC VMAX

EMC VNX

Examples

VMware vCenter

Alert Consolidation Email Notification

Alert Consolidation Trap Notification

File System Utilization

Adapters

Templates

Grouped boxes

Alert definitions

Alert definitions configure the data workflow - filtering, operations, conditions - based on which alerts will be triggered or cleared.

Show 10 entries

Search:

Type	Name	Description	State
	Brocade FC Switch	Contains 2 folder(s), 0 enabled definition(s) and 0 disabled definition(s).	
	Compliance	Contains 0 folder(s), 0 enabled definition(s) and 1 disabled definition(s).	
	EMC VMAX	Contains 7 folder(s), 0 enabled definition(s) and 0 disabled definition(s).	
	EMC VNX	Contains 2 folder(s), 0 enabled definition(s) and 0 disabled definition(s).	
	Examples	Contains 0 folder(s), 0 enabled definition(s) and 9 disabled definition(s).	
	VMware vCenter	Contains 0 folder(s), 3 enabled definition(s) and 0 disabled definition(s).	
	File System Utilization	File System Utilization	
	Alert Consolidation Email Notification	Alert notification definition for sending emails	
	Alert Consolidation Trap Notification	Alert notification definition for sending SNMP traps	

Showing 1 to 9 of 9 entries

First Previous 1 Next Last

All / Invert / None with selected alert definition(s)

Enable Disable Delete

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Module 4: Alerting in ViPR SRM

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Alert definitions can be accessed through the Administration interface of SRM. Shown here are the definitions available based on the SolutionPacks that have been installed. In this case SPs for Brocade FC Switch, Compliance, EMC VMAX, EMC VNX and VMware vCenter have been installed. Note that at this point in time none of the alert definitions have been enabled.

Enabling Alerts for Brocade FC Switch Example

Local Manager

Alert definitions

Brocade FC Switch

BROCADE_FCSWITCH_PORT

BROCADE_GENERIC_INTERFACES

Alert definitions

Alert definitions configure the data workflow - filtering, operations, conditions - based on which alerts will be triggered or cleared.

Show 10 entries Search:

Type	Name	Description	State
	BROCADE_FCSWITCH_PORT	Contains 0 folder(s), 0 enabled definition(s) and 12 disabled definition(s).	
	BROCADE_GENERIC_INTERFACES	Contains 0 folder(s), 0 enabled definition(s) and 2 disabled definition(s).	

Showing 1 to 2 of 2 entries

First Previous 1 Next Last

All / Invert / None

with selected alert definition(s) Enable Disable Delete

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Expanding the tree for Brocade FC Switch shows that there are two categories of alerts available – one pertaining to switch ports and the other to generic interfaces.

Enabling Alerts

	Type	Name	Description	State
☐		Class3 Discards	This alert allows the user to monitor total class3 Discards per poll cycle	
☐		CreditLost-Trigger	This alarm triggers if CreditLost metric is >0 for more than 10 Mins	
☐		Invalid CRC	This alert allows the user to monitor total Invalid CRCs per poll cycle	
☐		Invalid Tx Words	This alert allows the user to monitor total Invalid Tx Words per poll cycle	
☒		Link Utilization	Generate threshold based alert for Brocade Switch currentUtilization Alert Definition	
☒		LinkFailure	This alert allows the user to monitor total Link Failures Per cycle	
☒		Loss Of Signal	This alert allows the user to monitor total Loss Of Signal Per poll cycle	
☐		Loss Of Synchronization	This alert allows the user to monitor total Loss Of Synchronization Per poll cycle	
☐		Number Link Resets	This alert allows the user to monitor total Number Link Resets Per poll cycle	
☐		Offline Sequences	This alert allows the user to monitor the number of offline sequences received and transmitted by a connectivity device port	

Showing 1 to 10 of 12 entries

First Previous 1 2 Next Last

All / Invert / None

with selected alert definition(s)

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Module 4: Alerting in ViPR SRM

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To enable alerts, choose the category (BROCADE_FCSWTICH_PORTS in this example), select the alerts of interest and then click Enable. Once enabled, the alert State will change to a Green check mark.

VMAX Alerts

Alert definitions

i Alert definitions configure the data workflow - filtering, operations, conditions - based on which alerts will be triggered or cleared.

Show 10 entries

Search:

Type	Name	Description	State
	RDF	Contains 0 folder(s), 0 enabled definition(s) and 3 disabled definition(s).	
	VMAX-Array	Contains 0 folder(s), 0 enabled definition(s) and 8 disabled definition(s).	
	VMAX-BEDirector	Contains 0 folder(s), 0 enabled definition(s) and 4 disabled definition(s).	
	VMAX-Devices	Contains 0 folder(s), 0 enabled definition(s) and 6 disabled definition(s).	
	VMAX-Disk	Contains 0 folder(s), 0 enabled definition(s) and 6 disabled definition(s).	
	VMAX-FEDirector	Contains 0 folder(s), 0 enabled definition(s) and 7 disabled definition(s).	
	VMAX-FEDirectorByPort	Contains 0 folder(s), 0 enabled definition(s) and 3 disabled definition(s).	

Showing 1 to 7 of 7 entries

First Previous 1 Next Last



All / Invert / None

with selected alert definition(s)

 Enable

 Disable

 Delete

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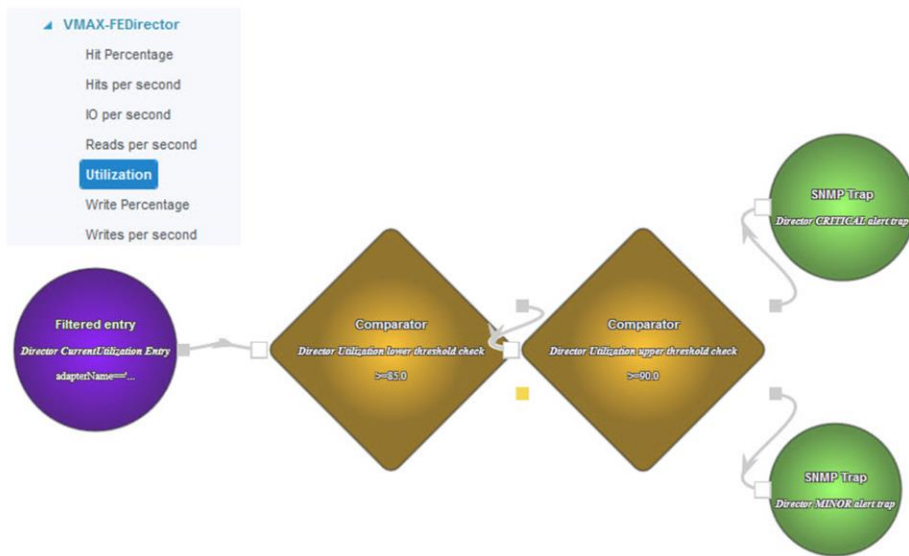
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Module 4: Alerting in ViPR SRM

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With ViPR SRM 3.5 several categories of alerts are available for the VMAX arrays. Some alerts require performance monitoring of the VMAX using Unisphere for VMAX and another set of alerts – specifically VMAX-Devices is available only if an SMI-S provider has been specified for discovering and monitoring the VMAX. The storevntd can be configured to send SNMP traps to the alerting backend as well.

Customizing VMAX Alert – Example



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This example shows the drawing board for VMAX-FEDirector Utilization alert. There are two comparator operations involved – one to determine the minor threshold and the other to determine critical threshold. By default the lower threshold has been set to 85% or greater and the upper threshold has been set to 90% or greater. If the utilization exceeds 85% but is less than 90% then an SNMP trap will be triggered and a Minor alert will be posted. Likewise if the utilization exceeds 90% then a Critical alert will be posted. Also note that this alert will be available only if Unisphere for VMAX has been configured to monitor the VMAX array.

Customizing VMAX Alert – Example

Edit Component

Name: Director Utilization lower thre

Type: Constant Comparator Operation

Description: Set the value to trigger MINO

Description
This conditional operation will compare each data with a constant value and add a new property called ADDED_THRESHOLD containing the comparator in the output data. Each data with a condition met will be sent to the true actions/operations while the others will be sent to the false actions/operations.

Parameters

Stateless ☒

Constant value

Operator

Cancel

Edit Component

Name: Director Utilization upper thre

Type: Constant Comparator Operation

Description: Set the value to trigger CRITI

Description
This conditional operation will compare each data with a constant value and add a new property called ADDED_THRESHOLD containing the comparator in the output data. Each data with a condition met will be sent to the true actions/operations while the others will be sent to the false actions/operations.

Parameters

Stateless ☒

Constant value

Operator

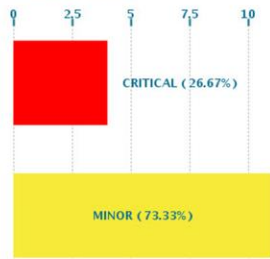
Cancel **Ok**

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Module 4: Alerting in ViPR SRM 13

For purposes of illustration, the lower threshold has been changed to 20% and the upper threshold to 50% to trigger alerts in my environment.

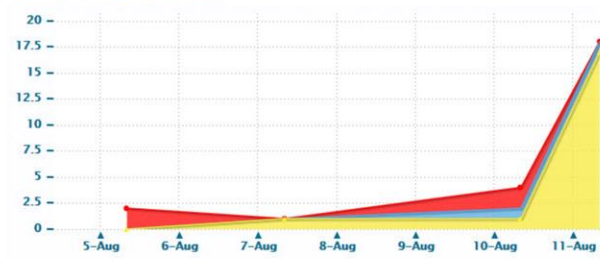
Alerts Dashboard

Alerts by Severity



CRITICAL MINOR

History of Alerts by Severity

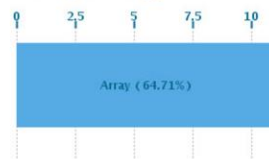


CRITICAL INFORMATIONAL MINOR

Alerts by Source



Alerts by Device Type



Alerts by Category



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Module 4: Alerting in ViPR SRM

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The Alerts Dashboard gives an at-a-glance view of the alerts triggered in the environment. Each of these reports can be further examined to display alert details, affected CI, source of the alert and the timestamp when the alert was generated.

All Alerts – Table

All >> Operations >> Alerts >> All Alerts

Alerts / All Alerts

August 2014, Monday 4 » Monday 11, 9:40 AM EDT | Last 1 Week

	Severity	Created At	Device Type	Device	Affected Object Type	Affected Object	Event Name	Category	Message	Source	Owner	Ack
	CRITICAL	2014/08/10 19:04:41 EDT	Array	APM00134303866			29199	Availability	The write cache on the storage system has not been configured yet or has been disabled because of a hardware component problem or software problem.	VNXBlock-Collector-Genericevent		
	CRITICAL	2014/08/10 19:04:41 EDT	Array	APM00134303866	DPE	Bus 0 Enclosure 0	29705	Availability	Disk Processor Enclosure Bus 0 Enclosure 0 is faulted. Servers may have lost access to disk drives in this storage system.	VNXBlock-Collector-Genericevent		
	CRITICAL	2014/08/05 18:45:05 EDT	Array	APM00134303866			29258	Availability	There are 11 hosts whose initiators may not be connected to a storage group properly. These HBAs are not able to access LUNs that belong to their server. Please use Unisphere Manager to get more information.	VNXBlock-Collector-Genericevent		
	CRITICAL	2014/08/05 13:25:05 EDT	Array	APM00134303866	Host	SID_304_FA8E_P0,SID_304_FA7E_P1	29259	Availability	The following hosts have initiators that no longer have an active connection to the storage system: SID_304_FA8E_P0, SID_304_FA7E_P1.	VNXBlock-Collector-Genericevent		
	INFORMATIONAL	2014/08/11 07:08:36 EDT	FileServer	Unified VNX-200	Database	NASDB	96108871986	Operational	nasdb_backup: VNX File database backup done.	VNXFile-Collector-Genericevent		

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Module 4: Alerting in ViPR SRM

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Table view of all alerts gives high level view of the alerts currently active. Information includes the severity of the alert, time it was created and other details regarding the device and the alert message.

Alert Details

All >> Operations >> Alerts >> All Alerts >> 127.0.0.1_000192606304_FA-7F_null

All Alerts / 127.0.0.1_000192606304_FA-7F_null

August 2014, Monday 4 » Monday 11, 10:04 AM EDT | Last 1 Week: average on real-time

Alert Details and Impact Analysis

Alert Details

Severity MINOR	Device type Array	Device name 000192606304
Category Performance	Affected object type Controller	Affected object FA-7F
Event id 6046285012845041601	Event display name	Source VMAX-GenericEvent
Source ip address 127.0.0.1	Source domain name	Event name
Source event type ReadHit	Full message ReadHit count for Controller FA-7F is at 24.967625%	

One element found.

Ack	Owner	Time	Message	Event State
		2014/08/11 08:33:51 EDT	ReadHit count for Controller FA-7F is at 24.967625%	ACTIVE

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Module 4: Alerting in ViPR SRM

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Selecting an alert from the table gives further information about it. In this example a VMAX performance alert (ReadHit) is shown. This alert was generated by ViPR SRM based on the Performance metrics that were collected.

Acknowledge Alert

✖	CRITICAL	2014/08/05 12:25:05	Array	APM00134303866	Host	SID_304_FA8E_P0,SID_304_FA7E_P1
!	INFORM		FileServer	Unified VNX-200		
⚠	MINOR		Array	000192606304	Communications sub-system	

Acknowledge
Release Ownership
Take Ownership
Un-Acknowledge

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Module 4: Alerting in ViPR SRM

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Right-click on the alert allows one to Acknowledge it or Take Ownership of it.

Module 4: Alerting in ViPR SRM

Lesson 1: Summary

During this lesson the following topics were covered:

- Alert handling
- Sources of alerts
- Enabling alerts
- Customizing pre-defined alerts



This lesson covered Alert sources and Alert handling in ViPR SRM.

Module 4: Alerting in ViPR SRM

Lesson 2: Storage Compliance Monitoring and Reporting

This lesson covers the following topics:

- Need for storage compliance monitoring and reporting
- Managing storage compliance rules and policies
- Viewing and acting on compliance breach reports



This lesson covers the Storage Compliance solution pack. Utilities for managing policies and rules are discussed as well as breach reports.

Leading IT Management Challenges

- **Problems with Discovery and Configuration management:**
 - ▶ Many data center outages are caused by self-inflicted misconfigurations
- **Cost of Change and Compliance Management:**
 - ▶ Change management accounts for significant data center costs
 - ▶ Many companies have difficulty measuring compliance



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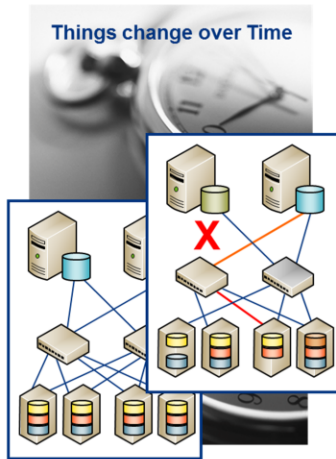
Module 4: Alerting in ViPR SRM

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In IT customer surveys, two of the most important challenges facing IT managers are problems with discovery and configuration management, and the cost of change and compliance management.

These two issues cause most of all IT service outages through self-inflicted improper configurations and account for a large portion of all data center costs. In fact, only a very small minority of companies can effectively measure configuration compliance.

Configuration Drift



- Exists in every storage environment due to sheer number of ongoing changes
- Can account for failure in high availability
- Needs to be identified when unintentional mistakes occur

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Configuration Drift, which occurs over time, is another pain point in IT organizations. As the size and complexity of data centers grows, change becomes a constant, almost daily task. Keeping documentation up to date and accurate has proven to be an important, but unwieldy, task. This process can be greatly improved through automation.

Over time unauthorized changes, mistakes, or incorrect configurations will occur. For example: path redundancy in the infrastructure configuration is expected to be in place but may no longer exist at some point due to a component failure. This causes configuration drift. Configuration drift can account for why recovery and availability fail.

ViPR SRM Compliance Overview

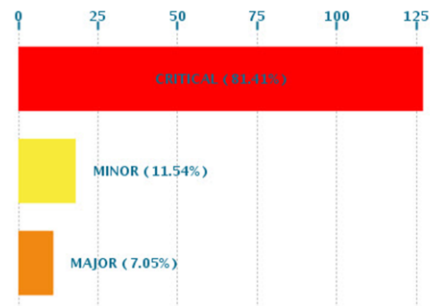
- ViPR SRM Compliance addresses host, switch, fabric, and storage change management
- ViPR SRM compliance performs:
 - ▶ Near to real time discovery
 - ▶ Change tracking
 - ▶ Best practice validation of the SAN
- ViPR SRM minimizes operational costs

All >> Operations >> Compliance >> Storage Compliance >> Breach Report

Storage Compliance / Breach Report

2013 » 2014, August 11, 10:19 AM EDT | Last 1 Year: count on real-time

Active Breaches by Severity



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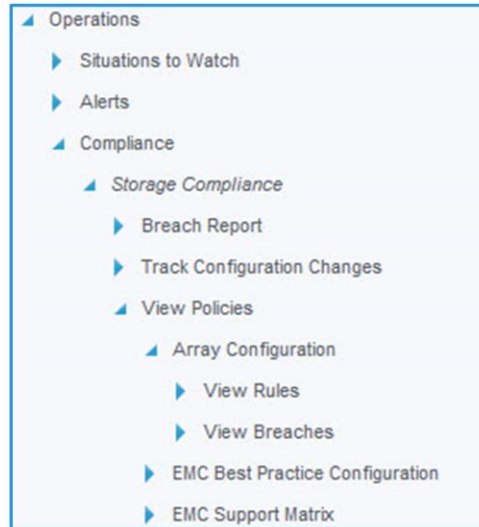
22

ViPR SRM Compliance is a data center management application that addresses change management challenges in storage, switch, host, and fabric compliance. ViPR SRM Compliance management offers complete coverage of the storage infrastructure from host-based, multi-pathing software to the array microcode.

ViPR SRM Compliance performs near real time discovery, change tracking and best practice validation of the SAN, using agentless discovery to simplify management and reduce deployment times by eliminating the need for host agents.

ViPR SRM Compliance proactively detects infrastructure vulnerabilities to ensure customers are maintaining compliance with internal configuration policies, interoperability rules, vendor guidelines and industry best practices. It minimizes operational costs by reducing the time spent on resolving configuration issues and downtime associated with human error.

Compliance Report Tree



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The ViPR SRM Compliance SolutionPack eliminates the need for cumbersome and ineffective manual change management processes. ViPR SRM Compliance enables customers to meet the challenges of compliance management and configuration drift by automating the process of validating the storage infrastructure configuration. This validation is performed against both industry and internally defined best practices and policies.

Key functionality of the ViPR SRM Compliance SolutionPack includes:

Tracking Configuration Changes - ViPR SRM Compliance monitors for and detects changes to objects discovered in the data center, providing a full audit trail for all changes made to the storage environment. When changes are incorrectly implemented, it will report these events thus enabling managers to quickly recognize a policy breach. Built-in templates enable users to quickly define and modify policies to meet operational requirements for change tracking. Templates are designed around common industry best practices for physical and logical connectivity, path management, and hardware/software configuration support.

Breach Reporting - Visibility is provided for active and inactive breach events, the rule and policy breached, when the breach occurred and its current state.

EMC Support Matrix Matching - When the EMC Support Matrix (ESM) compliance policy containing ESM validation rules for interoperability is enabled then all attributes of hosts, switches, and arrays must be discovered and recognized by the EMC Support Matrix to ensure adherence to interoperability standards and end-of-life status. If a discovered object has an attribute which is not recognized when the process of matching is performed on the object, a breach will occur and will remain until the attribute is manually matched in the Matching User Interface.

Rules that Define a Policy

All >> Operations >> Compliance >> Storage Compliance >> View Policies >> Array Configuration >> View Rules

Array Configuration / View Rules

2013 » 2014, July 9, 11:59 AM EDT | Last 1 Year

User interface output

In administration, the rules may be modified through "Edit"

4 elements found, displaying all elements.

Rule Name	Description	Applies On	State	Severity	# of Breaches
Masking Entry on Unmapped Volume	Violation is fired when there is a masking entry without corresponding mapping entry. This rule is applicable only to Physical Hosts and ESX Servers.	Host	Disabled	CRITICAL	0
Supported Array Microcode Version	Array microcode does not conform with User specific microcode version.	Array	Disabled	MAJOR	0
Symmetrix Port Flag Settings validator.	Symmetrix port flag settings should have appropriate values. This rule is applicable to Symmetrix Arrays.	Array	Disabled	CRITICAL	0
Unused Volume Masking Entries	Violation is fired when there is a masking entry that is not used by any single fully established path.	Array	Disabled	CRITICAL	0

Report generated in 0.189s.

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Shown here, the Policy Array Configuration has four Rules.

Managing Compliance Policies

Policy & Rules Management

Name	Description	Rules	State	# of Breaches	Last Run	Last Modified
Array Configuration	This policy enforces best practices for hardware, software, and configuration on a storage array.	4	Disabled	0		
EMC Best Practice Configuration	This policy enforces that there are no orphaned zones, masking, or entries or stranded hosts, i.e. hosts without fully established paths to any volume.	6	Disabled	0		
EMC Support Matrix	This policy enforces best practices for interoperability based on Support Matrix.	8	Disabled	0		
High Availability Physical Connectivity	This policy enforces best practices for the physical connectivity to ensure high availability, optimal path traversal and avoiding I/O congestion.	1	Disabled	0		
High Availability Software Configuration	This policy enforces software configuration to support high availability pathing configuration.	5	Disabled	0		
Host Configuration	This policy enforces best practices for hardware, software and pathing configuration on a host.	6	Disabled	0		
Path Management	This policy validates configuration to ensure connectivity and redundancy.	4	Disabled	0		
VPLEX Configuration	This policy enforces best practices for software, and pathing configuration on a VPLEX.	4	Disabled	0		
ViPR Configuration	This policy enforces best practices for configurations in ViPR.	1	Disabled	0		
Zoning Best Practices	This policy enforces best practices for zoning.	9	Disabled	0		

Page 1 of 10 View 1 - 10 of 10

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Policies and Rules are enabled and managed through the path:

Administration>Miscellaneous>Compliance

This displays the list of pre-defined policies and the rules contained in each. The user can also create a new policy in this window. Currently none of the Policies and/or Rules have been enabled. So, the first step will be to enable the policies of interest for our environment.

Configuring a Policy – Path Management Example

Edit Policy

Description | Scope | Rules | Schedule

Provide Policy name, description and state to create a policy. If you choose the state as Disabled, you should manually enable the policy after creating the policy to run it.

Policy Name: Path Management

Policy Description: This policy validates configuration to ensure connectivity and redundancy.

State: Enabled

Cancel Save

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Right-click on the policy and choose edit. The policy has four tabs:

- Description (which is self-evident)
- Scope (the objects to which the policy must be applied)
- Rules (that make up the policy)
- Schedule to run the policy

Configuring a Policy – Path Management Example

Edit Policy

Description Scope Rules Schedule

Manage scopes using the table below. To create a scope, click Create Scope. To see the members select scopes and click Show Members.

Name	Filter
All Arrays	devtype='Array'
All ESX Servers	devtype='Hypervisor'
All Fabrics	devtype='FabricSwitch' & (parttype='Fabric' parttype='VSAI')
All Hosts	((devtype='Host' devtype='Hypervisor')) devtype='VirtualMachine'
All Switches	devtype='FabricSwitch' & parttype='Port'
All ViPR Virtual Data Centers	devtype='Host' & parttype='Tenant'
All Virtual Machines	devtype='VirtualMachine'

Cancel Save

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The Scope tab shows which devices will have their configurations reviewed by this policy and this policy's rules.

Selecting a device and then selecting 'Show Members' button will show a list of devices in the scope of this policy.

Select the objects that should be monitored for this policy.

Configuring a Policy – Path Management Example

Edit Policy

Description Scope **Rules** Schedule

Manage rules using the table below. To create a rule, click Create Rule and select a rule name from the drop-down list. To edit/delete a rule, select a rule and click Edit Rule or Delete Rule.

Edit Rule Delete Rule Create Rule

Name +	Description	Type	State	Severity
Host Must Be Provisioned with Storage	Identifies hosts that are connected to a fabric but do not have a fully established path to a storage volume, either because the host wo	Pathing	Enabled	Critical
Masking Entry on Unmapped Volume	Violation is fired when there is a masking entry without corresponding mapping entry. This rule is applicable only to Physical Hosts and ESX Servers.	Masking	Enabled	Critical
Missing Path	No path exists between a host and a particular volume, but the path is currently defined as expected path.	Pathing	Enabled	Critical
Unused Volume Masking Entries	Violation is fired when there is a masking entry that is not used by any single fully established path.	Masking	Disabled	Critical

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We can edit, delete, or create rules that should make up this policy. It is a good practice not to modify the pre-defined policy and rule set. Users can copy an existing policy and then modify it if necessary. Double-clicking on a rule allows one to edit it. The rule can be enabled or disabled. Also the severity to be displayed when the breach occurs can be set as well.

Configuring a Policy – Path Management Example

Edit Policy

DescriptionScopeRules**Schedule**

1

Select a Schedule option and specify appropriate values from the drop-down lists to run the policy at a scheduled time

Schedule

Every day

at

00

:

00

CancelSave

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By default this policy will run at midnight every night. The schedule can also be changed if the default is not suitable. Finally select save.

Enabled Policies

All >> Operations >> Compliance >> Storage Compliance >> View Policies

Storage Compliance / View Policies

2013 » 2014, August 11, 10:22 AM EDT | Last 1 Year

Policy Name	Description	Rules	State	# of Breaches	Last Run
Array Configuration	This policy enforces best practices for hardware, software, and pathing configuration on a storage array.	4	Enabled	72	2014/08/10 00:00:09 EDT
High Availability Physical Connectivity	This policy enforces best practices for the physical connectivity to ensure high availability, optimal path traversal and avoiding IO congestion.	1	Enabled	51	2014/08/11 00:03:54 EDT
High Availability Software Configuration	This policy enforces software configuration to support high availability pathing configuration.	5	Enabled	26	2014/08/11 00:00:01 EDT
EMC Support Matrix	This policy enforces best practices for interoperability based on EMC Support Matrix.	8	Enabled	7	2014/08/11 00:03:36 EDT
EMC Best Practice Configuration	This policy enforces that there are no orphaned zones, masking, mapping entries or stranded hosts, i.e. hosts without fully established paths to any volume.	6	Enabled	0	2014/08/10 00:01:54 EDT
Host Configuration	This policy enforces best practices for hardware, software and pathing configuration on a host.	6	Enabled	0	
Path Management	This policy validates configuration to ensure connectivity and redundancy.	4	Enabled	0	2014/08/11 00:02:23 EDT
ViPR Configuration	This policy enforces best practices for configurations in ViPR.	1	Enabled	0	2014/08/10 00:00:04 EDT
Zoning Best Practices	This policy enforces best practices for zoning.	9	Enabled	0	2014/08/11 00:00:19 EDT
VPLEX Configuration	This policy enforces best practices for software, and pathing configuration on a VPLEX.	4	Disabled	0	

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After enabling the required policies and rules, the listing of policies shows the number of active breaches that have violated the policies.

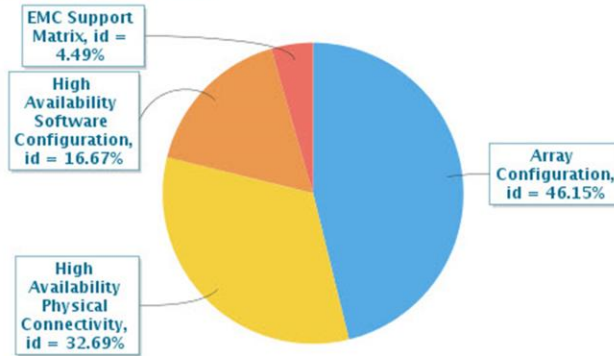
Active Breaches by Policy

All >> Operations >> Compliance >> Storage Compliance >> Breach Report

Storage Compliance / Breach Report

2013 » 2014, August 11, 10:33 AM EDT | Last 1 Year: count on real-time

Active Breaches by Policy



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This report gives a break-down of the active breaches according to the violated policies.

Active Breach – Example

All >> Operations >> Compliance >> Storage Compliance >> Breach Report >> Compliance Reports >> All Active Breaches

Compliance Reports / All Active Breaches

2013 » 2014, August 11, 10:37 AM EDT | Last 1 Year: average on real-time

Breaches (filtered)

23 elements found, displaying 1 to 5.

<< < 1 2 3 4 5 > >> Show 5

Severity	BreachName	Device	Device Type	Affected Objects	Policy	Rule	Creation Time	Last Modified Time	State
CRITICAL	I/O Path Redundancy	10.127.94.163	Hypervisor	Fabric:100000051E023364 Array:000192606327	High Availability Physical Connectivity	I/O Path Redundancy	2014/07/21 11:12:33 EDT	2014/08/11 00:03:29 EDT	ACTIVE

Breach details (filtered)

One element found.

Message	Recommendation
Fabric redundancy from host 10.127.94.163 to array 000192606327 was found to be 1 fabrics, but was defined to be greater than or equal to 2 fabrics	Verify that a redundant fabric is connected, up and running. You can manually re-discover the fabric to update the Repository; you do not have to wait for the next poll as specified in the relevant data collection policy.

Device Summary (filtered)

One element found.

Device
10.127.94.163

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Shown here is an example of a breach that has violated the I/O Path Redundancy Rule. This is an ESXi server. The rule requires that the ESXi server should be connected to two fabrics for redundancy. In this environment there is only one fabric. So this is highlighted as a single point of failure.

Inactive Breaches

All >> Operations >> Compliance >> Storage Compliance >> Breach Report >> Compliance Reports >> All Inactive Breaches

Compliance Reports / All Inactive Breaches

2014, July > August, the 11 at 11:34 AM EDT | Last 1 Month: average on real-time

Breaches

172 elements found, displaying 1 to 5.

<< < 1 2 3 4 5 6 7 > >> Show 5

Severity	BreachName	Device	Device Type	Affected Objects	Policy	Rule	Creation Time	Last Modified Time	State
CRITICAL	Unused Volume Masking Entries	Unified VNX-152	Array	LUN:LOGICAL UNIT NUMBER 11	EMC Best Practice Configuration	Unused Volume Masking Entries	2014/07/27 00:00:06 EDT	2014/08/05 14:08:16 EDT	RESOLVED
CRITICAL	Unused Volume Masking Entries	000192606327	Array	LUN:0063	EMC Best Practice Configuration	Unused Volume Masking Entries	2014/07/27 00:00:10 EDT	2014/08/05 14:08:16 EDT	RESOLVED

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When the breach is rectified, it is moved to Inactive Breaches with the state “RESOLVED”.

EMC Support Matrix Breaches

All >> Operations >> Compliance >> Storage Compliance >> View Policies >> EMC Support Matrix >> View Breaches

EMC Support Matrix / View Breaches

The layout of the report has changed: [save](#) or [cancel](#)

2013 » 2014, August 11, 10:58 AM EDT | [Last 1 Year](#)

View Breaches

7 elements found, displaying 1 to 5.

Severity	Breach Name	Device	Device Type	Affected Objects	Rule	Policy	State
MAJOR	Base Connectivity Interoperability for Hosts	10.127.94.161	Hypervisor		Base Connectivity Interoperability for Hosts	EMC Support Matrix	ACTIVE

Breach Details

One element found.

Message	Recommendation
The following properties are either not matched or multi-matched :10.127.94.161 Host Model : UCSC-C220-M3SHBA Model : LPe12000 8Gb Fibre Channel Host Adapter	Please match the un-matched/multi matched components to proper values.

Device Summary

One element found.

Device
10.127.94.161



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Shown here is an example of a breach of the EMC Support Matrix. The HBAs on this ESXi server are not matched with the ones listed in the Support Matrix.

Track Configuration Changes – Zoning Changes

All >> Operations >> Compliance >> Storage Compliance >> Track Configuration Changes

Storage Compliance / Track Configuration Changes

2014, July > August, the 11 at 11:20 AM EDT | Last 1 Month

Changed At	Description	Device	Component	# of Breaches
2014/08/05 13:34:20 EDT	The member 10000090FA180DCF has been added to the zone esx_161_vnx_152_2 in the fabric 100000051E023364	100000051E023364		0
2014/08/05 13:34:20 EDT	The member 10000090FA180DCE has been added to the zone esx_161_vnx_152_1 in the fabric 100000051E023364	100000051E023364		0
2014/08/05 13:34:20 EDT	The member 5006016F08601EBD has been added to the zone esx_161_vnx_152_1 in the fabric 100000051E023364	100000051E023364		0
2014/08/05 13:34:20 EDT	A new zone esx_161_vnx_152_2 has been added to the fabric 100000051E023364	100000051E023364		0
2014/08/05 13:34:20 EDT	The member 5006016708601EBD has been added to the zone esx_161_vnx_152_1 in the fabric 100000051E023364	100000051E023364		0
2014/08/05 13:34:20 EDT	The member 5006016F08601EBD has been added to the zone esx_161_vnx_152_2 in the fabric 100000051E023364	100000051E023364		0
2014/08/05 13:34:20 EDT	The member 5006016708601EBD has been added to the zone esx_161_vnx_152_2 in the fabric 100000051E023364	100000051E023364		0



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Configuration changes are tracked by ViPR SRM. In this environment two new zones were created to enable an ESXi server to access block storage from a VNX. The changes that were made on the Brocade switch are captured and reported.

Track Configuration Changes – Mapping/Masking

All >> Operations >> Compliance >> Storage Compliance >> Track Configuration Changes

Storage Compliance / Track Configuration Changes

2014, July » August, the 11 at 11:20 AM EDT | Last 1 Month

2014/08/06 18:34:20 EDT	The masking configuration of LUN LOGICAL UNIT NUMBER 8 in array Unified VNX-152 has been changed	Unified VNX-152	LOGICAL UNIT NUMBER 8	0
2014/08/06 18:34:20 EDT	The masking configuration of LUN LOGICAL UNIT NUMBER 62 in array Unified VNX-152 has been changed	Unified VNX-152	LOGICAL UNIT NUMBER 62	0
2014/08/06 18:34:20 EDT	The masking configuration of LUN LOGICAL UNIT NUMBER 10 in array Unified VNX-152 has been changed	Unified VNX-152	LOGICAL UNIT NUMBER 10	0
2014/08/06 18:34:20 EDT	The masking configuration of LUN LOGICAL UNIT NUMBER 2 in array Unified VNX-152 has been changed	Unified VNX-152	LOGICAL UNIT NUMBER 2	0
2014/08/06 18:34:20 EDT	The masking configuration of LUN LOGICAL UNIT NUMBER 63 in array Unified VNX-152 has been changed	Unified VNX-152	LOGICAL UNIT NUMBER 63	0
2014/08/06 18:34:20 EDT	The masking configuration of LUN LOGICAL UNIT NUMBER 6 in array Unified VNX-152 has been changed	Unified VNX-152	LOGICAL UNIT NUMBER 6	0

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LUN Mapping and Masking changes on the array are reported as well. In this environment, LUNs were created on the VNX to be provisioned to an ESXi server. This is reflected in the report shown.

Situations to Watch

All >> Operations >> Situations to Watch

Operations / Situations to Watch

August 2014, Monday 4 » Monday 11, 11:38 AM EDT | Last 1 Week

Reports

Alert: Configured Critical Devices' Alerts

Alert: Devices with Critical Alerts

Alert: High Impact Alerts

Alert: Host Impact Analysis

Availability: Disks Failed

Capacity: High FileSystem Utilization (%)

Compliance: LUN Service Level

Compliance: Pool Oversubscription

Compliance: Pools with capacity > 1TB

Compliance: Primary LUNs not Masked or not Mapped

Performance: High CPU Utilization (%)

Performance: High Memory Utilization (%)

Performance: High Traffic Utilization (%)

Performance: Worst Disk Response Times

Performance: Worst LUN Response Time

Storage Reclamation: Allocated LUNs with no I/O

Storage Reclamation: Oversized FileSystems

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There are a number of useful reports available for Situations to Watch.

Situations to Watch – Pool Oversubscription

All >> Operations >> Situations to Watch >> Compliance: Pool Oversubscription

Situations to Watch / Compliance: Pool Oversubscription

August 2014, Monday 4 » Monday 11, 11:42 AM EDT | Last 1 Week

15 elements found, displaying all elements.

Show ALL ▾

Array ▾	Pool ▾	Pool Type ▾	Total Usable ▾	Pool Enabled ▾	Pool Subscribed ▾	Pool Oversubscribed ▾	% Used ▾	% Subscribed ▾
000192606327	P1	Thin Pool	2.10 GB	2.10 GB	4.21 GB	2.10 GB	0.14	200.00 ❌
000192606304	ESXI_RAID6	Thin Pool	50.00 GB	50.00 GB	92.00 GB	42.00 GB	0.19	184.00 ⚠️
000192606327	ESXI_RAID6	Thin Pool	50.00 GB	50.00 GB	62.00 GB	12.00 GB	0.02	124.00
000192606327	BC_FC_RAID1	Thin Pool	50.52 GB	50.52 GB	50.52 GB	0.00 GB	16.51	100.00
000192606304	BC_FC_RAID1	Thin Pool	50.52 GB	50.52 GB	50.52 GB	0.00 GB	12.51	100.00
Unified VNX-200	File Pool 0	Storage Pool	11.79 TB		10.25 TB	0.00 GB	86.88 ⚠️	86.88

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Shown here is an example of the Pool Oversubscription report. Note that there are a few pools that are subscribed beyond 100%. The storage administrators of the respective arrays should watch the utilization of these pools.

Module 4: Alerting in ViPR SRM

Lesson 2: Summary

During this lesson the following topics were covered:

- Need for storage compliance monitoring and reporting
- Managing storage compliance rules and policies
- Viewing and acting on compliance breach reports



This lesson covered the Storage Compliance solution pack. The interfaces for viewing and managing policies and rules were discussed as well as a discussion on breach reports.

Lab: Examining Alerts in ViPR SRM

This lab covers :

- Navigating to alert reports
- Examining alerts to understand the sources
- Viewing compliance breaches



This lab covers Alerts and Compliance Breach reporting.

Lab Debrief: Examining Alerts in ViPR SRM

This lab covered :

- Navigating to alert reports
- Examining alerts to understand the sources
- Viewing compliance breaches

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Module 4: Alerting in ViPR SRM

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This lab covered navigating to the alert reports, examining alerts to understand the sources, and viewing compliance breaches.

Module 4: Summary

Key points covered in this module:

- Alert handling
- Sources of alerts
- Available alerts for discovered CIs
- Storage compliance reporting and compliance based alerts
- Monitoring the storage infrastructure using situations to watch



This module covered Alert and Compliance reports available in ViPR SRM.

Module 5: Service Levels and Chargeback Accounting

Upon completion of this module, you should be able to:

- List and define storage service levels for ViPR SRM
- Locate service levels for storage and storage capacity
- Modify a service level by disk technology
- Explore and interpret chargeback reports



This module focuses on the definition and modification of service levels in ViPR SRM. An overview of chargeback reporting is also covered in this module.

Module 5: Service Levels and Chargeback Accounting

Lesson 1: Service Levels

This lesson covers the following topics:

- Service level capacity
- Usable capacity by service level



This lesson covers an overview of ViPR SRM service levels and service level capacity .

Storage Service Level Definitions

Disk Technology Service Levels

Name	RAID Type	Disk Technology	Disk Size	Disk Speed
Platinum	*	Flash Drive, Enterprise Flash Drive	*	*
Gold	RAID-1	Fibre Channel	*	*
Silver	RAID-5	Fibre Channel	*	*
Bronze	*	SATA	*	*

Other Pre-defined Service Levels

Name	Criteria
System Resource	purpose=='System Resource'
Pool Contributor	purpose=='Pool Contributor'
FAST VP	FAST managed LUNs are tagged as FAST VP for this service level
Other	Thick LUNs or Non-FAST thin LUNs not already tagged with a service level



There are four default storage service levels - Platinum, Gold, Silver, and Bronze. You can see the criteria used to determine the service levels in this table. The criteria for service level definition depends entirely on Disk Technology, with the exception of Fibre Channel disks. These devices consider RAID Type protection as part of the service level definition.

There are four other default service levels. System Resource and Pool Contributor service levels are tagged for LUNs that have a 'purpose' attribute to define their service level name. The collector tags the LUN with the name during discovery. LUNs are tagged as belonging to the FAST VP service level if they are marked as FAST VP LUNs during collection, they will not otherwise be tagged with a FAST VP service level. All FAST VP LUNs are added to the generic FAST VP service level until an administrator configures more specific FAST VP filters.

Finally, the other service level is tagged for any LUNs not otherwise categorized and do not map to a service level.

Service Level Capacity

Service Level Definition for Storage

Disk groupings based on disk type, protection level, disk size, and spindle speed

Service Level Capacity

[All](#) >> [Explore](#) >> [Storage](#) >> [More Reports](#) >> [Service Level Capacity](#)

5 elements found, displaying all elements.

Service Level	Usable (GB)	Used (GB)	Free (GB)	Used Trend	% Used
Silver	288.66	40.21	248.45	40.21 —	13.93
Bronze	1,012.00	962.12	49.88	962.12 —	95.07 ✖
FAST VP	46.39	46.39		46.39 —	100.00 ✖
Other	0.00		0.00		
Gold	84.69	0.36	84.33	7.25 ↗	0.43
	1,431.75	1,049.09	382.66		

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Module 5: Service Levels and Chargeback Accounting

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Service levels across EMC storage arrays are defined as disk groupings based on disk types, protection levels, disk size, and disk spindle speed. Each group is identified by name.

Selecting 'Service Level Capacity' shows a list of Service Levels defined in the ViPR SRM along with their Usable capacity, Used space, Free space, a Used Trendline, and the percentage of the service level Used from all discovered arrays. The eight service levels shown here are predefined upon installation of the ViPR SRM. Some predefined service levels may be edited. The exceptions are: System Resource, Pool Contributor, FAST VP, and Other. These service levels are defined based on how the storage in the service level is used, rather than the disk storage type used to define other service levels. The following definitions apply to service levels which cannot be modified:

Pool Contributor: used for all data devices and save devices.

System Resource: used for gatekeepers, VCMDB, DRVs, and so on.

FAST VP: used for devices associated with a FAST Policy.

Other: used for devices that do not have characteristics such as RAID level or Disk Technology to map to Service Levels.

NOTE: The Service Level Capacity report table may also be viewed as the Usable Capacity by Service Level report in the Report Tree under Dashboards>>Storage>>Block Capacity Dashboard.

Service Level Capacity – Silver

Service Level Capacity

All >> Explore >> Storage >> More Reports >> Service Level Capacity

5 elements found, displaying all elements.

Service Level	Usable (GB)	Used (GB)	Free (GB)	Used Trend	% Used
Silver	288.66	40.21	248.45	40.21	13.93

Silver

Sum of Usable column in silver table

3 elements found, displaying all elements.

Array	Vendor	Array Model	Service Level	Usable (GB)	Used (GB)	Free (GB)	Used Trend	% Used
Unified VNX-152	EMC Corporation	VNX5400	Silver	28.21	28.21	0.00	28.21	100.00
000192606327	EMC Corporation	VMAX20K	Silver	124.23		124.23		
000192606304	EMC Corporation	VMAX20K	Silver	136.23	12.00	124.23	12.00	8.81
				288.66	40.21	248.45		



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Module 5: Service Levels and Chargeback Accounting

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The Service Level Capacity chart provides hyperlinks to expand each service level. In the example shown, the Silver service level is expanded. Each discovered array is shown in this table and the array capacity usage metrics and service level availability is recorded for the service level shown. The percentage Used column represents the amount of Service Level capacity usage for the particular array, not the Service Level as a whole. This is an important distinction as the percentage Used for the Silver service level across all discovered arrays is slightly more than half the Usable capacity, but the percentage Used for the array VNX-152 is showing that all the storage available to this array in the Silver service level is consumed.

Array By Service Level

More Storage Inventories / Array by Service Level

All >> Explore >> Storage >> More Storage Inventories >> Array by Service Level

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Click to display column definitions

14 elements found, displaying all elements.

Show ALL

Array	Serial Number	Array Type	Vendor	Array Model	Service Level	Usable (GB)	Used (GB)	Free (GB)	Used Trend	% Used
000192606327	000192606327	Symmetrix	EMC Corporation	VMAX20K	FAST VP	21.08	21.08		21.08	100.00
000192606304	000192606304	Symmetrix	EMC Corporation	VMAX20K	Gold	43.91	0.19	43.72	0.20	0.44
Unified VNX-152	APM00134303865	CLARION	EMC Corporation	VNX5400	Silver	28.21	28.21	0.00	28.21	100.00

Array	Service Level	Usable (GB)	Free (GB)	% Used
000192606327	FAST VP	21.08		100.00
000192606304	Gold	43.91	43.72	0.44
Unified VNX-152	Silver	28.21	0.00	100.00

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The Array by Service Level tab shows the usage and availability of storage in each Service Level on a per array basis for every discovered array in the system. The percentage shown in the percent (%) used column represents the amount of a particular Service Level consumed by a specific array.

Module 5: Service Levels and Chargeback Accounting

Lesson 1: Summary

During this lesson the following topics were covered:

- Service level capacity reporting in ViPR SRM
- Usable capacity reporting in ViPR SRM



This lesson covered service level definition and reporting of service level capacities in the ViPR SRM.

Module 5: Service Levels and Chargeback Accounting

Lesson 2: Modifying Storage Service Levels

This lesson covers the following topics:

- Service level definition
- Service level editing



This lesson covers an overview of modifying ViPR SRM service levels.

ViPR SRM Service Level Definitions

Service Level definitions are in Centralized Management:

- Set the context to Administration> Centralized Management (CM)
- Click on CM and in the new CM browser window open Groups Management and select Service Level by LUNs



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ViPR SRM permits storage service levels to be modified through the Groups Management utility in Centralized Management using the Service Level by LUNs option. All service levels are shown here and the LUNs that make them up.

Service Level by LUNs

Service Level

1 Service Level rules are applied in the order shown. The first matching service level is assigned.

 **Edit**  **Reorder**  **View All Service Level Rules**

System Resource

Pool Contributor

FAST VP

Platinum

Gold

Silver

Bronze

Custom1

Custom2

Custom3

Other

1 This table is only a preview. Use the search for more detailed results. Note that the search feature might take up to several minutes depending on how much data you have.

Show **10** entries

Search: (Wildcard)

Device name	Device type	Device model	RAID Type	Disk Technology	Disk Size	Component type	Component name	Storage Pool	Policy Name
000192606304	Array	VMAX20K	RAID-1	SAS	273	LUN	0028		N/A
000192606304	Array	VMAX20K	RAID-1	Fibre Channel	273	LUN	0029		N/A
000192606304	Array	VMAX20K	RAID-1	Fibre Channel	273	LUN	002A		N/A
000192606304	Array	VMAX20K	RAID-1	SAS	273	LUN	0032		N/A
000192606304	Array	VMAX20K	RAID-1	Fibre Channel	273	LUN	0033		N/A
000192606304	Array	VMAX20K	RAID-1	Fibre Channel	273	LUN	0034		N/A
000192606304	Array	VMAX20K	RAID-1	Fibre Channel	273	LUN	0035		N/A
000192606304	Array	VMAX20K	RAID-1	Fibre Channel	273	LUN	0036		N/A
000192606304	Array	VMAX20K	RAID-1	Fibre Channel	273	LUN	0037		N/A
000192606304	Array	VMAX20K	RAID-1	Fibre Channel	273	LUN	0038		N/A

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Module 5: Service Levels and Chargeback Accounting

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Each service level defined for storage, is presented in the Service Level by LUNs option of Groups Management. Service levels may be highlighted by a gray box. A service level in a gray box is one which has its definition fixed and is prevented from being modified. This is noted by the Edit function in the window being shadowed. All other service levels may be modified.

To modify a service level, simply click on the level of choice and click the Edit link. The example presented here is for the Gold service level.

Modifying the Gold Service Level

Edit Service Level

Service Level	Gold	Path : Gold
Minimum Response Time	4	
Maximum Response Time	5	
Cost per GB	0.3	

Must define units for time and cost

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The Gold service level, in addition to the Bronze, Silver, and Platinum service levels, is defined for a minimum and maximum response time as well as a cost factor per GB for the storage. These factors are defined for each service level. For example: Gold is 4,5, and .3 while Bronze is 10,12, and .1 and Platinum is 1,2,and .5

It can be noted that Bronze service level storage is rather slow and inexpensive, while Platinum service level storage is fast and the most expensive.

Gold Service Level Rules

Rule set for the Gold service level

▼ Show set of rules

Component type is LUN

AND RAID Type Starts with RAID-1

AND Disk Technology is Fibre Channel

+ Add rule

Operation

Is

Starts with

Ends with

Contains

Is empty

Wildcard

Fibre Channel

Mixed

SATA

NL SAS

SAS

N/A

OR

► Show set of rules

+ Add new rules set

Click to show query

Show Members

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The rule set shown here for the Gold service level shows that this service level is defined for LUNs configured on Fiber Channel disks in RAID-1 configurations. It does not require the disk storage to be of any certain size (density) or rotational platter speed.

Any rule set may be modified by either clicking the trash can icon next to a particular rule to delete it or by clicking the + Add rule link to permit a new rule to be created for the rule set.

There must be one rule set enforced at all times and it cannot be deleted. However, any other rule set that has been created for this service level may be deleted by clicking the trash can icon in the blue bar. New rule sets may be created by clicking on the Add new rules set button.

If the link Click to show query is used, the output will be the query used to identify storage fitting the rule set. The query strings are easily copied and pasted into other fields that will accept strings.

The Show Members button will produce a pop-up window listing all the LUNs that are members of this service level. This is the same table that was seen for the service level in the Service Level window.

Lab: Part 1 - Service Level Consumption

This lab covers :

- Service Levels

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This lab covers the use of ViPR SRM for monitoring and reporting on storage service levels.

Lab Debrief: Part 1 - Service Level Consumption

This lab covered :

Service Levels:

- Consumption rates
- Which service levels were at 100% and why

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This lab covered the use of ViPR SRM for monitoring and reporting on storage service levels.

Module 5: Service Levels and Chargeback Accounting

Lesson 2: Summary

During this lesson the following topics were covered:

- Service level definition
- Service level editing



This lesson covered the process of identifying and modifying service levels defined in the ViPR SRM application.

Module 5: Service Levels and Chargeback Accounting

Lesson 3: Chargeback Reports

This lesson covers the following topics:

- Chargeback by group
- Chargeback by host/hypervisor
- VNX chargeback



This lesson covers an overview of chargeback reporting in the ViPR SRM by group and host. Chargeback examples are also discussed for VNX.

Storage Chargeback

Chargeback

Chargeback aligns the cost of storage service delivery with business requirements.

- Chargeback reporting must identify both the storage allocated and the storage consumed by hosts and user-defined groups
- Chargeback reports may be generated for storage shared by members of a group
- Chargeback for shared storage may be made to only one member of the group, or it may be divided equally among them

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Module 5: Service Levels and Chargeback Accounting

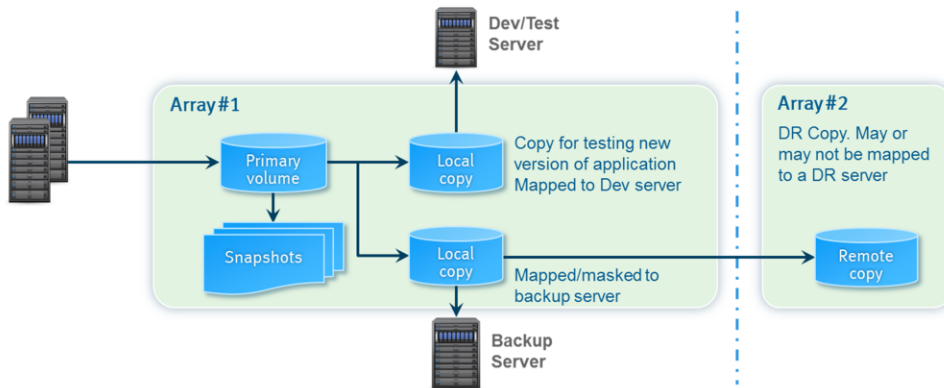
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Chargeback (or Showback) reports are effective means of aligning the cost of service delivery with business requirements. IT chargeback is meant to bring excessive storage demands in line with actual business needs which should lead to significant storage cost reductions. A company's IT organization however, may struggle with user bias toward over-allocating storage. Business units within the company over time may have come to expect an excess of storage capacity out of fear of interruption if storage capacity is depleted. Unfortunately, this practice results in very low storage utilization and poor use of capital assets. Whenever this is the case, the IT organization can use chargeback to raise users' awareness of the costs of over-allocation and under-utilization, to attain more reasonable storage allocations.

Chargeback reports will always therefore include the storage allocated and the storage consumed whether the report is generated for individual hosts or host groups sharing the storage.

Chargeback Organization

Chargeback is based on the storage allocated and the storage consumed as replicas by a host or group.



Primary storage: storage visible to the host as a LUN

Total storage: storage that includes all copies such as snapshots, clones, and mirrors

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Module 5: Service Levels and Chargeback Accounting

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Chargeback is always a measure of the storage presented (or allocated) to a host or group and the storage consumed as replicas of the presented storage. Storage is broken down into two categories: 1) Primary storage, which is storage presented to a host as one or more LUNs and 2) Total Storage which includes all copies of the primary storage such as snapshots, clones and mirrors.

If when viewing chargeback reports, it is noticed that the primary and total storage are the same value, it indicates that there are no copies of the primary storage.

If when viewing chargeback reports, it is noticed that the presented and used storage are the same for either primary or total storage, this is the ideal condition where no storage is under-utilized. Generally, however, the used value will be less than the presented value.

Chargeback Reporting by Group

Dashboards

Storage

- Enterprise Capacity Dashboard
- File Capacity Dashboard
- Virtual Storage Dashboard
- Chargeback by Group**
- Primary Used Chargeable
- Primary Presented Chargeable
- Total Used Chargeable
- Total Presented Chargeable

All >> Dashboards >> Storage >> Chargeback by Group

Chargeback by Group / Primary Used Chargeable

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Chargeback is calculated across service levels for physical and virtual hosts

Primary Used Chargeable: chargeable capacity deduplicated by shared capacity

3 elements found, displaying all elements.

Group	Host Type	Platinum	Gold	Silver	Bronze	Fast VP	VirtualStorage	Other	Primary Used Chargeable	Primary Used
Provider Tenant	Hypervisor	0.00 GB	263.00 MB	12.00 GB	962.05 GB	29.50 GB	0.00 GB	29.48 GB	1.01 TB	1.01 TB
All VM Guests	VirtualMachine	0.00 GB	143.00 MB	12.00 GB	27.00 MB	29.50 GB	0.00 GB	656.15 GB	712.56 GB	712.56 GB
All Hypervisors	Hypervisor	0.00 GB	263.00 MB	12.00 GB	962.05 GB	29.50 GB	0.00 GB	29.48 GB	1.01 TB	1.01 TB

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Chargeback by Group is located in the Storage node of Dashboards. Each group listed is separately charged for the storage it uses in each service level defined across the discovered datacenter. Service level segregation is important since disk types vary in price as well as other attributes associated with the service levels. The Primary Used Chargeable column reflects the sum of the Used Capacity for all Primary LUNs attached to the host in each service level. VirtualMachines are totaled using the sum of their LUN capacities backing the RDM devices plus the capacities of the Virtual Machine definition files (ex: vmdk).

Chargeback by Group: Primary Storage

Chargeback by Group / Primary Used Chargeable

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All » Dashboards » Storage » Chargeback by Group » Primary Used Chargeable

3 elements found, displaying all elements.

Primary Used <= Primary Presented

Group	Host Type	Platinum	Gold	Silver	Bronze	Fast VP	VirtualStorage	Other	Primary Used Chargeable	Primary Used
Provider Tenant	Hypervisor	0.00 GB	263.00 MB	12.00 GB	962.05 GB	29.50 GB	0.00 GB	29.48 GB	1.01 TB	1.01 TB
All VM Guests	VirtualMachine	0.00 GB	143.00 MB	12.00 GB	27.00 MB	29.50 GB	0.00 GB	656.15 GB	712.56 GB	712.56 GB
All Hypervisors	Hypervisor	0.00 GB	263.00 MB	12.00 GB	962.05 GB	29.50 GB	0.00 GB	29.48 GB	1.01 TB	1.01 TB

Chargeback by Group / Primary Presented Chargeable

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3 elements found, displaying all elements.

Virtual Machines –Must take into account RDM devices

Group	Host Type	Platinum	Gold	Silver	Bronze	Fast VP	VirtualStorage	Other	Primary Presented Chargeable	Primary Presented
Provider Tenant	Hypervisor	0.00 GB	21.29 GB	12.00 GB	981.97 GB	58.95 GB	0.00 GB	29.48 GB	1.08 TB	1.08 TB
All VM Guests	VirtualMachine	0.00 GB	21.17 GB	12.00 GB	27.00 MB	58.95 GB	0.00 GB	3.03 TB	3.14 TB	3.14 TB
All Hypervisors	Hypervisor	0.00 GB	21.29 GB	12.00 GB	981.97 GB	58.95 GB	0.00 GB	29.48 GB	1.08 TB	1.08 TB

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Chargeback by Group report displays the Service Level Chargeable capacities roll up for all Physical Hosts, Hypervisors and VM guests per user-defined group.

Primary Used: Sum of the capacities for all primary LUNs attached to a given host. For virtualized capacity, Primary Used is the total capacity of the Virtual Volumes directly attached or presented as RDMs plus VMDK file capacities.

Primary Presented: Presented capacities for all primary LUNs attached to a given host. For virtualized capacity, Primary Presented is the total capacity of the Virtual Volumes directly attached or presented as RDMs plus VMDK file capacities

Storage presented is always greater than or equal to the storage used for physical hosts. Primary storage presented is storage that a host is presented as LUNs from the storage array. The host may or may not consume all of this storage. It is important to the Administrator to determine how much of this storage is being consumed so that decisions about how much storage should be presented to each host and from which service level this storage should come.

Chargeback by Group: Total Used Chargeable

All >> Dashboards >> Storage >> Chargeback by Group >> Total Used Chargeable

Chargeback by Group / Total Used Chargeable

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3 elements found, displaying all elements.

Group	Host Type	Platinum	Gold	Silver	Bronze	Fast VP	VirtualStorage	Other	Total Used Chargeable	Total Used
Provider Tenant	Hypervisor	0.00 GB	267.00 MB	12.00 GB	962.05 GB	46.35 GB	0.00 GB	29.48 GB	1.03 TB	1.03 TB
All VM Guests	VirtualMachine	0.00 GB	147.00 MB	12.00 GB	27.00 MB	46.35 GB	0.00 GB	656.15 GB	729.41 GB	729.41 GB
All Hypervisors	Hypervisor	0.00 GB	267.00 MB	12.00 GB	962.05 GB	46.35 GB	0.00 GB	29.48 GB	1.03 TB	1.03 TB

Greater than Primary Used. Check for Replicas and FAST VP usage



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Total Used: The sum of the capacities for all LUNs attached to a given host including replicas and LUNs for RDMs of a given host plus VMDK file capacities. For virtualized capacity, Total Used is the minimum of used versus presented capacity for all LUNs backing the Virtual Volumes directly attached or presented as RDMs including those LUNs' replicas plus VMDK file capacities

In this example, the total used for chargeback exceeds the primary storage used by the host groups. This could be due to replicas being used by the host groups, conversely, if the total used and the primary used were the same value then replicas would not be included in the chargeable storage for the host groups. The Fast VP service level also shows more total used chargeable storage than primary used.

Chargeback by Group: Total Presented Chargeable

All >> Dashboards >> Storage >> Chargeback by Group >> Total Presented Chargeable

Chargeback by Group / Total Presented Chargeable

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3 elements found, displaying all elements.

Group	Host Type	Platinum	Gold	Silver	Bronze	Fast VP	VirtualStorage	Other	Total Presented Chargeable	Total Presented
Provider Tenant	Hypervisor	0.00 GB	25.50 GB	12.00 GB	981.97 GB	75.80 GB	0.00 GB	29.48 GB	1.09 TB	1.09 TB
All VM Guests	VirtualMachine	0.00 GB	25.39 GB	12.00 GB	27.00 MB	75.80 GB	0.00 GB	3.03 TB	3.16 TB	3.16 TB
All Hypervisors	Hypervisor	0.00 GB	25.50 GB	12.00 GB	981.97 GB	75.80 GB	0.00 GB	29.48 GB	1.09 TB	1.09 TB



Values for Gold and FAST VP in Total Presented Chargeable exceed their value in Primary Presented Chargeable

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Total Presented: Presented capacities for all LUNs attached to a given host including replicas and LUNs for RDMs of the given host plus VMDK file capacities. For virtualized capacity, Total Presented is the presented capacity for all LUNs backing the Virtual Volumes directly attached or presented as RDMs including those LUNs' replicas plus VMDK file capacities.

The Total Presented Chargeable is larger than the Primary Presented Chargeable indicating that there is storage presented to host groups that is not a part of the presented primary storage. This storage is associated with the Gold service level (which could be taken as local replicas), and the FAST VP service level.

Example: Total Used Chargeable for a Virtual Machine

All >> Dashboards >> Storage >> Chargeback by Group >> Total Used Chargeable >> All VM Guests >> W2K8R2-183, 502cacc2-fe6d-dfd7-48a5-8c38d7ee2fd7

All VM Guests / W2K8R2-183, 502cacc2-fe6d-dfd7-48a5-8c38d7ee2fd7

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For the capacity to be assigned to a service-level, the LUN providing the storage must be monitored (in the last 24h)

Physical LUN/Disks (RDM)

20 elements found, displaying all elements

Show ALL

Disk	WWN	Array Name	LUN ID	Primary Used	Total Used	Connected VMs	Service Level	Primary Used Chargeable	Local Replica SL	Local Replica Chargeable	Remote Replica SL	Remote Replica Chargeable Capacity	Total Used Chargeable	LUN Monitored	VPLEX Monitored
HARD DISK 6	60000970000192606304533030324333	000192606304	02C3	1.05 GB	2.11 GB	W2K8R2-183	FAST VP	1.05 GB	FAST VP	1.05 GB			2.11 GB	●	●
HARD DISK 7	60000970000192606304533030324334	000192606304	02C4	1.05 GB	2.11 GB	W2K8R2-183	FAST VP	1.05 GB	FAST VP	1.05 GB			2.11 GB	●	●
HARD DISK 8	60000970000192606304533030324335	000192606304	02C5	1.05 GB	2.11 GB	W2K8R2-183	FAST VP	1.05 GB	FAST VP	1.05 GB			2.11 GB	●	●
HARD DISK 9	60000970000192606304533030324336	000192606304	02C6	1.05 GB	2.11 GB	W2K8R2-183	FAST VP	1.05 GB	FAST VP	1.05 GB			2.11 GB	●	●

- Primary is a clone source
- Target replica is the same size as the source
- Total used and charged is the sum of source and target

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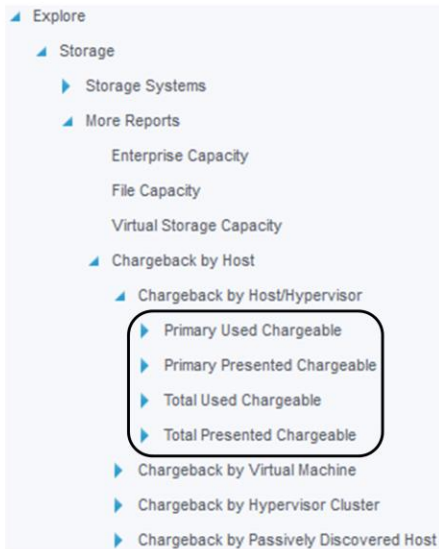
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Module 5: Service Levels and Chargeback Accounting

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Note that for the first 4 devices the total used chargeable storage is 2.11 GB, this is the result of 1.05 GB being used as Primary and its Local replica capacity is also 1.05 GB. The primary volumes are acting as clone sources and the the local replicas are acting as the clone targets. ViPR SRM calculates Total Used Chargeable storage as Primary + Local Replica which in this case is the sum of 2.11 GB

Chargeback by Host



Capacities apply to all host types:

- Hypervisor
- VM
- Hypervisor Cluster
- Passively Discovered Hosts



Chargeback costs can be generated against individual hosts using the ViPR SRM. Host categories are created to make locating hosts more convenient. The reports presented for host chargeback only include the amount of storage by capacity to charge for and not the actual cost itself.

Chargeback Reports – Primary Host Storage

All >> Explore >> Storage >> More Reports >> Chargeback by Host >> Chargeback by Host/Hypervisor >> Primary Used Chargeable

Chargeback by Host/Hypervisor / Primary Used Chargeable

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7 elements found, displaying all elements.

Host	Host Type	Platinum	Gold	Silver	Bronze	Fast VP	VirtualStorage	Other	Primary Used Chargeable	Primary Used
10.127.94.161	Hypervisor		45.00 MB		480.96 GB	21.08 GB		12.63 GB	514.72 GB	514.72 GB
10.127.94.163	Hypervisor		68.00 MB		480.96 GB	8.43 GB		16.84 GB	506.30 GB	506.30 GB
10.127.94.178	Hypervisor		33.00 MB		104.00 MB				137.00 MB	137.00 MB

Chargeback by Host/Hypervisor / Primary Presented Chargeable

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7 elements found, displaying all elements.

Host	Host Type	Platinum	Gold	Silver	Bronze	Fast VP	VirtualStorage	Other	Primary Presented Chargeable	Primary Presented
10.127.94.161	Hypervisor		45.00 MB		480.96 GB	46.32 GB		12.63 GB	539.96 GB	539.96 GB
10.127.94.163	Hypervisor		21.10 GB		480.96 GB	12.63 GB		16.84 GB	531.54 GB	531.54 GB
10.127.94.178	Hypervisor		33.00 MB		10.02 GB				10.05 GB	10.05 GB

Primary used < Primary presented

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Module 5: Service Levels and Chargeback Accounting

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Chargeback by Host or Hypervisor displays Service Level Chargeable capacities per use case: Storage definitions for Primary Used and Primary Presented follow:

Primary Used: The sum of the used capacity for all primary LUNs attached to a host. For virtualized capacity, Primary Used is the total capacity of the Virtual Volumes (RDM + Datastore) presented to the given host.

Primary Presented: Presented capacities for all primary LUNs attached to a host. For virtualized capacity, Primary Presented is the total capacity of the Virtual Volumes (RDM + Datastore) presented to the given host.

Hypervisor primary storage presented is greater than the primary storage used. Total chargeable storage to these hosts that is primary presented storage is also greater than the charge for total primary used storage. Hypervisor hosts should frequently be reviewed to determine if the storage presented is unnecessarily high and can be scaled back to keep charges in line with use. Two of the Hypervisor hosts in these tables are well matched in primary storage presented and primary storage used. One Hypervisor has 10.05GB presented to it, but is using only 137MB of that storage. This storage may be over subscribed to the Hypervisor and should be considered for scaling back. When Primary Used is equal to Primary Presented, this is ideal, since all the storage charges on the host were adequately estimated against the needs it had for capacity.

Chargeback Reports – Total Host Storage

Chargeback by Host/Hypervisor / Total Used Chargeable

2014, Friday, July 25 » Friday, August 1, 11:40 AM EDT | Last 1 Week

7 elements found, displaying all elements.

Host	Host Type	Platinum	Gold	Silver	Bronze	Fast VP	VirtualStorage	Other	Total Used Chargeable	Total Used
10.127.94.161	Hypervisor	0.00 GB	49.00 MB	0.00 GB	480.96 GB	33.71 GB	0.00 GB	12.63 GB	527.35 GB	527.35 GB
10.127.94.163	Hypervisor	0.00 GB	68.00 MB	0.00 GB	480.96 GB	12.64 GB	0.00 GB	16.84 GB	510.51 GB	510.51 GB
10.127.94.178	Hypervisor	0.00 GB	33.00 MB	0.00 GB	104.00 MB	0.00 GB	0.00 GB	0.00 GB	137.00 MB	137.00 MB

Chargeback by Host/Hypervisor / Total Presented Chargeable

2014, Friday, July 25 » Friday, August 1, 11:40 AM EDT | Last 1 Week

7 elements found, displaying all elements.

Host	Host Type	Platinum	Gold	Silver	Bronze	Fast VP	VirtualStorage	Other	Total Presented Chargeable	Total Presented
10.127.94.161	Hypervisor	0.00 GB	4.25 GB	0.00 GB	480.96 GB	58.95 GB	0.00 GB	12.63 GB	552.59 GB	552.59 GB
10.127.94.163	Hypervisor	0.00 GB	21.10 GB	0.00 GB	480.96 GB	16.84 GB	0.00 GB	16.84 GB	535.75 GB	535.75 GB
10.127.94.178	Hypervisor	0.00 GB	33.00 MB	0.00 GB	10.02 GB	0.00 GB	0.00 GB	0.00 GB	10.05 GB	10.05 GB

Larger than the Primary storage tables

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Module 5: Service Levels and Chargeback Accounting

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Storage definitions for Total Used and Total Presented follow:

Total Used: Total used capacity of all LUNs attached to a host including replicas. For virtualized capacity, Total Used is the capacity of all LUNs backing the Virtual Volumes presented to a host including those LUNs' replicas.

Total Presented: Presented capacities for all LUNs attached to a host including replicas. For virtualized capacity, Total Presented is the presented capacity for all LUNs backing the Virtual Volumes presented to the given host including those LUNs' replicas.

The total capacity presented is slightly larger than the total capacity used in these tables. The same is true for primary primary presented and used storage. and for the physical host this is best situation. The physical host entirely used the total presented storage as primary storage and none was left over and it was charged accordingly.

Total Presented Chargeable and Total Used Chargeable capacities for a Host/HyperVisor will not include any Snapshot capacities(VDEVs) of the Primary LUNS.

Chargeback Reports – Primary Virtual Machine Storage

All >> Explore >> Storage >> Chargeback by Host >> Chargeback by VirtualMachine

Primary Used Chargeable

37 elements found, displaying 1 to 25.

<< < 1 2 > >> Show 25

Virtual Machine	VM Profile	IP	Platinum	Gold	Silver	Bronze	Fast VP	VirtualStorage	Other	Primary Used Chargeable	Primary Used
sun175	VM	10.127.94.175	0.00 GB	12.00 MB	0.00 GB	0.00 GB	12.00 MB	0.00 GB	7.69 GB	9.82 GB	9.82 GB
sun176	VM	10.127.94.176	0.00 GB	12.00 MB	0.00 GB	0.00 GB	12.00 MB	0.00 GB	7.69 GB	9.82 GB	9.82 GB
SRM35	VM	10.127.94.180	0.00 GB	0.00 GB	0.00 GB	0.00 GB	0.00 GB	0.00 GB	32.32 GB	32.32 GB	32.32 GB

Total capacity seen by the host

Primary Presented Chargeable

37 elements found, displaying 1 to 25.

<< < 1 2 > >> Show 25

Virtual Machine	VM Profile	IP	Platinum	Gold	Silver	Bronze	Fast VP	VirtualStorage	Other	Primary Presented Chargeable	Primary Presented
sun175	VM	10.127.94.175	0.00 GB	12.00 MB	0.00 GB	0.00 GB	12.63 GB	0.00 GB	12.20 GB	26.95 GB	26.95 GB
sun176	VM	10.127.94.176	0.00 GB	12.00 MB	0.00 GB	0.00 GB	12.63 GB	0.00 GB	12.20 GB	26.95 GB	26.95 GB
SRM35	VM	10.127.94.180	0.00 GB	0.00 GB	0.00 GB	0.00 GB	0.00 GB	0.00 GB	148.09 GB	148.09 GB	148.09 GB

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Module 5: Service Levels and Chargeback Accounting

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These reports show Chargeback by Virtual Machine with displays of Service Level Chargeable capacities per use case.

Definitions of Primary used and presented follows:

Primary Used: This is the sum of capacities for all primary LUNs including RDMs of the given host plus VMDK file capacities.

Primary Presented: This is the sum of the presented capacities for all primary LUNs including RDMs of the given host plus VMDK file capacities.

The total Primary Presented storage is much greater than the total Primary Used storage. Ideally, you want to use the storage you are presented with so that there is no idle storage in the system. Typically, however storage will be over requested and under utilized.

Chargeback Reports – Total Virtual Machine Storage

Total Used Chargeable (including RDM replica)

37 elements found, displaying 1 to 25.

1 2 >> Show 25

Virtual Machine	VM Profile	IP	Platinum	Gold	Silver	Bronze	Fast VP	VirtualStorage	Other	Total Used Chargeable	Total Used
sun175	VM	10.127.94.175	0.00 GB	16.00 MB	0.00 GB	0.00 GB	12.00 MB	0.00 GB	7.69 GB	9.82 GB	9.82 GB
sun176	VM	10.127.94.176	0.00 GB	12.00 MB	0.00 GB	0.00 GB	12.00 MB	0.00 GB	7.69 GB	9.82 GB	9.82 GB
SRM35	VM	10.127.94.180	0.00 GB	0.00 GB	0.00 GB	0.00 GB	0.00 GB	0.00 GB	32.32 GB	32.32 GB	32.32 GB

Same totals as for Primary. No apparent replicas for these VMs

Total Presented Chargeable (including RDM replica)

37 elements found, displaying 1 to 25.

1 2 >> Show 25

Virtual Machine	VM Profile	IP	Platinum	Gold	Silver	Bronze	Fast VP	VirtualStorage	Other	Total Presented Chargeable	Total Presented
sun175	VM	10.127.94.175	0.00 GB	4.22 GB	0.00 GB	0.00 GB	12.63 GB	0.00 GB	12.20 GB	26.95 GB	26.95 GB
sun176	VM	10.127.94.176	0.00 GB	12.00 MB	0.00 GB	0.00 GB	12.63 GB	0.00 GB	12.20 GB	26.95 GB	26.95 GB
SRM35	VM	10.127.94.180	0.00 GB	0.00 GB	0.00 GB	0.00 GB	0.00 GB	0.00 GB	148.09 GB	148.09 GB	148.09 GB

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Module 5: Service Levels and Chargeback Accounting

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Definitions for the totals used and presented follows:

Total Used: This is the sum of the capacities for all LUNs (including replicas) and RDMs plus VMDK file capacities

Total Presented: Presented capacities for all LUNs (including replicas) for RDMs plus VMDK file capacities.

Since the totals here are the same as they were for the Primary storage, the virtual machines have no replica attachments they are being charged to use.

Example: Primary Presented and Used for a VM

All >> Dashboards >> Storage >> Chargeback by Group >> **Primary Presented Chargeable** >> All VM Guests >> sun175, 502c2b74-d396-e942-f317-5434e5645bf1 >> Physical LUN/Disks (RDM)
sun175, 502c2b74-d396-e942-f317-5434e5645bf1 / Physical LUN/Disks (RDM)

August 2014, Thursday 14 > Thursday 21, 2:54 PM EDT | Last 1 Week

For the capacity to be assigned to a service-level, the LUN providing the storage must be monitored (in the last 24h)

20 elements found, displaying all elements.

Disk	WWN	Array Name	LUN ID	Service Level	Primary Presented	Connected VMs	Primary Presented Chargeable	LUN Monitored
HARD DISK 9	60000970000192606304533030324145	000192606304	02AE	FAST VP	1.05 GB	sun175	1.05 GB	✓
HARD DISK 15	60000970000192606304533030324234	000192606304	02B4	FAST VP	1.05 GB	sun175	1.05 GB	✓

All >> Explore >> Storage >> More Reports >> Chargeback by Host >> Chargeback by Virtual Machine >> **Primary Used Chargeable** >> sun175, 502c2b74-d396-e942-f317-5434e5645bf1
Primary Used Chargeable / sun175, 502c2b74-d396-e942-f317-5434e5645bf1

August 2014, Thursday 14 > Thursday 21, 3:03 PM EDT | Last 1 Week: average on 1 day

For the capacity to be assigned to a service-level, the LUN providing the storage must be monitored (in the last 24h)

Physical LUN/Disks (RDM)

For the capacity to be assigned to a service-level, the LUN providing the storage must be monitored (in the last 24h)

20 elements found, displaying all elements.

Disk	WWN	Array Name	LUN ID	Service Level	Primary Used	Connected VMs	Primary Used Chargeable	LUN Monitored
HARD DISK 9	60000970000192606304533030324145	000192606304	02AE	FAST VP	1.00 MB	sun175	1.00 MB	✓
HARD DISK 15	60000970000192606304533030324234	000192606304	02B4	FAST VP	1.00 MB	sun175	1.00 MB	✓

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Module 5: Service Levels and Chargeback Accounting

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Primary Presented for the LUNs is 1.05 Gb which is the size of the device from the host perspective. But these devices have not been used and are viewed in the global dashboard for Primary Presented Chargeable. The Primary Used Chargeable view is available in the Explore node where they are registered as just 1.00 MB. This is a round-up from 768 KB which is the one extent allocated for a Thin Device when it is bound to aThin Pool. So the end user has a choice, charge for what is presented or charge for what is consumed.

Chargeback Reports – Primary Hypervisor Cluster Storage

All >> Explore >> Storage >> More Reports >> Chargeback by Host >> Chargeback by Hypervisor Cluster

Primary Used Chargeable

7 elements found, displaying all elements.

Cluster	Hosts	Host Type	Platinum	Gold	Silver	Bronze	Fast VP	VirtualStorage	Other	Primary Used Chargeable	Primary Used
10.127.94.161	10.127.94.161	Hypervisor		45.00 MB		480.96 GB	21.08 GB		12.63 GB	514.72 GB	514.72 GB
10.127.94.163	10.127.94.163	Hypervisor		68.00 MB		480.96 GB	8.43 GB		16.84 GB	506.30 GB	506.30 GB
10.127.94.178	10.127.94.178	Hypervisor		33.00 MB		104.00 MB				137.00 MB	137.00 MB

FAST VP is presented larger storage than is used in this service level

Primary Presented Chargeable

7 elements found, displaying all elements.

Cluster	Hosts	Host Type	Platinum	Gold	Silver	Bronze	Fast VP	VirtualStorage	Other	Primary Presented Chargeable	Primary Presented
10.127.94.161	10.127.94.161	Hypervisor		45.00 MB		480.96 GB	46.32 GB		12.63 GB	539.96 GB	539.96 GB
10.127.94.163	10.127.94.163	Hypervisor		21.10 GB		480.96 GB	12.63 GB		16.84 GB	531.54 GB	531.54 GB
10.127.94.178	10.127.94.178	Hypervisor		33.00 MB		10.02 GB				10.05 GB	10.05 GB

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Module 5: Service Levels and Chargeback Accounting

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FAST VP thin devices presented to the host have not been fully used. The entries for the hypervisors are also totals for the capacity of all thin devices presented to them. Each capacity entry for FAST VP therefore may represent more than one thin device.

Chargeback Reports – Total Hypervisor Cluster Storage

Total Used Chargeable

7 elements found, displaying all elements.

Cluster	Hosts	Host Type	Platinum	Gold	Silver	Bronze	Fast VP	VirtualStorage	Other	Total Used Chargeable	Total Used
10.127.94.161	10.127.94.161	Hypervisor		49.00 MB		480.96 GB	33.71 GB		12.63 GB	527.35 GB	527.35 GB
10.127.94.163	10.127.94.163	Hypervisor		68.00 MB		480.96 GB	12.64 GB		16.84 GB	510.51 GB	510.51 GB
10.127.94.178	10.127.94.178	Hypervisor		33.00 MB		104.00 MB				137.00 MB	137.00 MB

Total Used >= Primary Used
Total Presented >=Primary Presented

Total Presented Chargeable

7 elements found, displaying all elements.

Cluster	Hosts	Host Type	Platinum	Gold	Silver	Bronze	Fast VP	VirtualStorage	Other	Total Presented Chargeable	Total Presented
10.127.94.161	10.127.94.161	Hypervisor		4.25 GB		480.96 GB	58.95 GB		12.63 GB	552.59	552.59 GB
10.127.94.163	10.127.94.163	Hypervisor		21.10 GB		480.96 GB	16.84 GB		16.84 GB	535.75	535.75 GB
10.127.94.178	10.127.94.178	Hypervisor		33.00 MB		10.02 GB				10.05	10.05 GB

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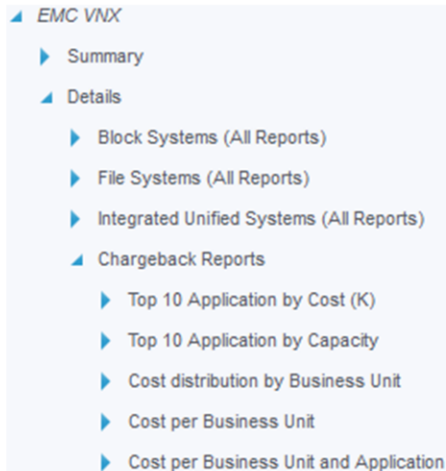
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Module 5: Service Levels and Chargeback Accounting

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The total storage presented to and used by the cluster is only slightly greater than or may be equal to the Primary storage presented to and used by this cluster. Indicating that very little of this storage is used for redundancy.

Chargeback Reports - VNX



Business Units, Application Name, and Owner definitions can be created in Groups Management

- VNX chargeback reports
- Top 10 Application by Cost (K) and Top 10 Application by Capacity include:
 - ▶ Business Unit (s)
 - ▶ Application name
 - ▶ Application owner
 - ▶▶ TeraByte consumption over time
 - ▶▶ Associated LUNs with tier capacity and performance
- Cost distribution for each business unit for comparative analysis
- Cost per business unit and application per month

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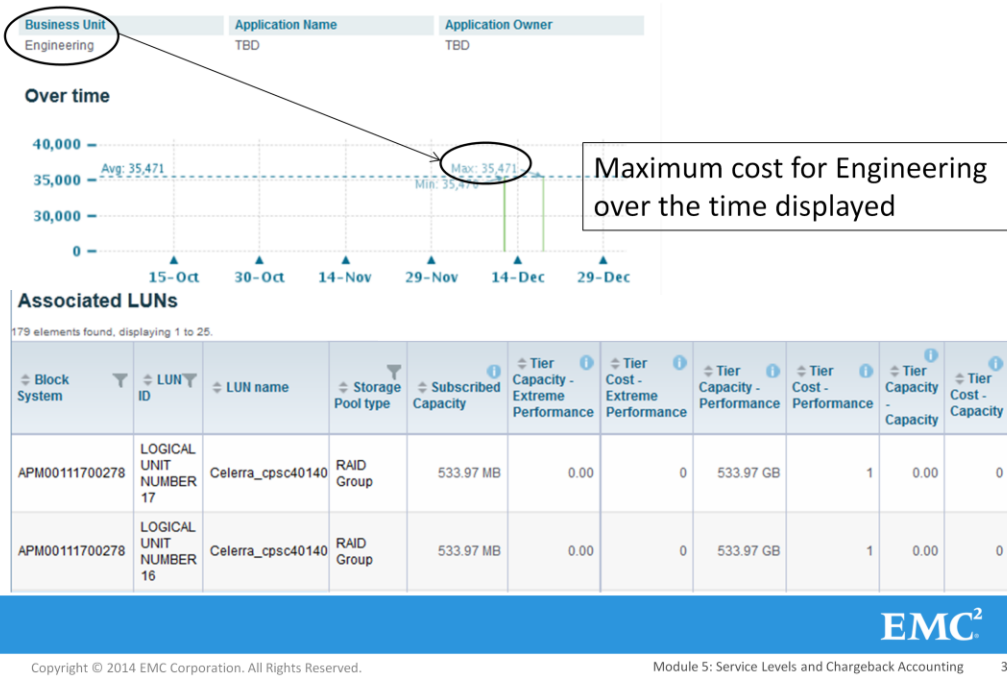
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Module 5: Service Levels and Chargeback Accounting

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VNX chargeback reports are grouped into business units and applications. The top 10 application reports include the Business Units, Application Names, and Application Owners consumption of storage over time with the associated LUNs that are reported by tier capacity and performance. Cost distribution is reported for each business unit for comparative analysis and the cost per month is given for each business unit and their applications.

Top 10 Application by Cost and Capacity



The VNX has registered two business units. They are Engineering and Sales. Engineering is shown here, it has no registered applications but it is generating I/O and over time it is showing that more than 35k (UNITS) as an average over the quarter shown. The LUNs associated with this business unit and its application(s) are shown in the table and each LUN has field entries for the tier capacity and tier cost that it is contributing to this business unit.

Cost per Business Unit and Application

Chargeback Reports / Cost per Business Unit

January 2014, [Wednesday 1](#) » [Thursday 2](#), 12:00 AM EST | [Last 1 Day](#)

2 elements found, displaying all elements.

Business Unit	Provisioned Usable Capacity	Cost By Month [October]	Cost By Month [November]	Cost By Month [December]	Cost By Month [January]
Engineering	53 GB			35,471	35,433
Sales	43 GB			11,546	11,548

Chargeback Reports / Cost per Business Unit and Application

January 2014, [Wednesday 1](#) » [Thursday 2](#), 12:00 AM EST | [Last 1 Day](#)

2 elements found, displaying all elements.

Business Unit	Application	Application Owner	Provisioned Usable Capacity	Cost By Month [October]	Cost By Month [November]	Cost By Month [December]	Cost By Month [January]
Engineering	TBD	TBD	53 GB			35,471	35,433
Sales	TBD	TBD	43 GB			11,546	11,548

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Module 5: Service Levels and Chargeback Accounting

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The cost per Business Unit and the Cost per Business Unit and Application are the same for the months shown since there is no registered application for which the cost could further be evaluated. Only the provisioned capacity is considered here as the capacity that costing is charged against.

Lab: Part 2 - Chargeback Reporting

This lab covers :

- Chargeback Reporting

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Module 5: Service Levels and Chargeback Accounting

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This lab covers the use of ViPR SRM for monitoring and reporting on chargeback to users consuming storage resources.

Lab Debrief: Part 2 - Chargeback Reporting

This lab covered :

- Chargeback Reporting
 - Presented chargeable
 - Primary
 - Total
 - Used chargeable
 - Primary
 - Total
 - What factors influence chargeable rates

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Module 5: Service Levels and Chargeback Accounting

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This lab covered the use of ViPR SRM for monitoring and reporting on chargeback to users consuming storage resources.

Module 5: Service Levels and Chargeback Accounting

Lesson 3: Summary

During this lesson the following topics were covered:

- Chargeback by group
- Chargeback by host
- VNX chargeback



This lesson covered the features of chargeback in the ViPR SRM. Focus was given to storage group chargeback and host chargeback. Examples of chargeback were discussed for VNX storage arrays and the ViPR storage management application.

Module 5: Summary

Key points covered in this module:

- Listed and defined the data storage service levels available in ViPR SRM
- Located and reviewed the reported data storage service levels in ViPR SRM
- Used Group Management to view a service level and describe the service level edit options
- Defined and explored chargeback reporting by groups, hosts, and arrays



This module covered the concept of service levels as they are defined in the ViPR SRM. An example of using the Group Management features in ViPR SRM was shown for modifying the a service level. The concept of chargeback reporting was also discussed as it is applied to groups, hosts, and storage arrays.

Module 6: Performance Reporting

Upon completion of this module, you should be able to:

- Navigate to different performance graphs for the CIs



This module focuses on performance metrics available for different discovered objects in ViPR SRM.

Module 6: Performance Reporting

Lesson 1: Performance Metrics and Graphs

This lesson covers the following topics:

- Performance graphs for VMAX
- Performance graphs for VNX – Block
- Performance graphs for VNX – File
- Performance graph for Brocade Switch



This lesson covers performance metrics for VMAX and VNX arrays and accessing performance graphs for VMAX and VNX arrays as well as switches.

Accessing VMAX Performance Dashboard

The screenshot displays the EMC VMAX Performance Dashboard interface. On the left, a navigation pane shows a tree structure: 'Explore' > 'Storage' > 'Storage Systems' > '000192606304'. The '000192606304' node is highlighted with a red box, and an arrow points from it to the breadcrumb path at the top of the main content area. The breadcrumb path is 'All >> Explore >> Storage >> Storage Systems >> 000192606304'. Below the breadcrumb path, the main content area shows the title 'Storage Systems / 000192606304' and a date range '2014, Monday, July 28 » Monday, August 4, 10:50 AM EDT | Last 1 Week'. Below this, the identifier '000192606304' is displayed. A message states '6 elements found, displaying all elements.' Below this message is a table with a header 'Category Name' and a list of categories: 'Attributes', 'Enterprise Capacity Dashboard', 'Enterprise - Path Details & Storage Connectivity', 'Alerts', 'VMAX - Inventory Details', and 'VMAX - Performance Dashboard'. The 'VMAX - Performance Dashboard' category is highlighted with a red box. The bottom of the page features the EMC logo and copyright information: 'Copyright © 2014 EMC Corporation. All Rights Reserved.' and 'Module 6: Performance Reporting 3'.

Explore
Storage
Storage Systems
000192606304
Topology Map
Device Summary
000192606304
Attributes
Enterprise Capacity Dashboard
Enterprise - Path Details & Storage Connectivity
Alerts
VMAX - Inventory Details
VMAX - Performance Dashboard

All >> Explore >> Storage >> Storage Systems >> 000192606304

Storage Systems / 000192606304

2014, Monday, July 28 » Monday, August 4, 10:50 AM EDT | Last 1 Week

000192606304

6 elements found, displaying all elements.

Category Name
Attributes
Enterprise Capacity Dashboard
Enterprise - Path Details & Storage Connectivity
Alerts
VMAX - Inventory Details
VMAX - Performance Dashboard

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VMAX performance graphs can be accessed in many ways. Two of them are shown here. Note that performance graphs for any managed CI can also be accessed from the respective reports in the reports library.

Performance Categories for VMAX

▲ VMAX - Performance Dashboard

- ▶ Requests (IOPS)
- ▶ Throughput (/s)
Cache WP (%)
- ▶ Front-End Directors Summary
- ▶ Storage Groups Summary
- ▶ Device Performance

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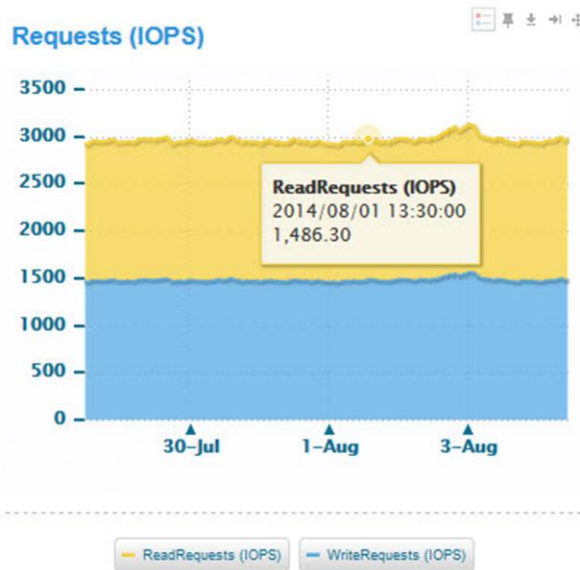
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Module 6: Performance Reporting

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Shown here are the categories for which VMAX Performance metrics are available.

VMAX – Requests (IOPS)



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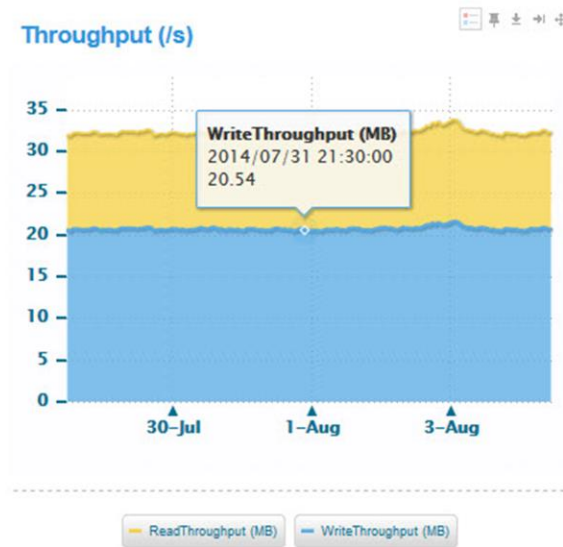
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Module 6: Performance Reporting

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From the previous slide, going down the categories in order, here we have Requests for this VMAX. This gives the number of read and write requests coming in to this array. As with any other graph, moving cursor over area of interest will pop-up the relevant box with the numbers. In this example I have set up a 50/50 workload of Read/Write. We can see that the total is 3000 IOPS and about 50% of it is Read and the other is Write.

VMAX – Throughput (/s)



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Module 6: Performance Reporting

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The read/write throughput is also available.

VMAX – Cache Utilization



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Module 6: Performance Reporting

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This chart gives the Cache WP% for the VMAX.

VMAX – Front-End Directors Summary

Front-End Directors Summary

6 elements found, displaying all elements.

Director	Busy (%)	Requests (IOPS)	Throughput (/s)	System WP Events (/s)	Device WP Events (/s)
FA-7F	24.77	1,735.58	16.18 MB	0.00	0.00
FA-8F	22.96	1,715.05	16.09 MB	0.00	0.00
FA-7E	0.22	0.00	0.00 MB	0.00	0.00
SE-8G	0.04	0.00	0.00 MB	0.00	0.00
FA-8E	0.04	0.05	1.07 KB	0.00	0.00
SE-7G	0.01	0.00	0.00 MB	0.00	0.00

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Module 6: Performance Reporting

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Shown here is the Front-End Directors Summary where we see two active Front-end directors. Workload has been set up from the ESXi with NMP and therefore the two active directors are performing the same amount of workload.

VMAX – Storage Groups Summary

Storage Groups Summary

30 elements found, displaying 1 to 10.

<< < 1 2 3 > >> Show 10

Name	Response Time (ms)	IOPS	Throughput (/s)	IO Density	Device count	Capacity
esx161_FAST_SG	6.56	5,701	62 MB	54.35	48	50.531 GB
esx161_parent	6.56	2,949	32 MB	5.01	81	428.142 GB
esx161_rdm	6.56	2,949	32 MB	40.76	64	67.375 GB
N/A		0	1 KB		0	0.000 GB
esx178USM_sg	0.07	0	1 KB	0.00	3	10.006 GB
w2k8r2-194_parent	0.00	0	2 B	0.00	6	18.000 MB
w2k8r2-194_gk	0.00	0	2 B	0.00	6	18.000 MB
esx251_SG-BC	0.00	0	0 MB	0.00	3	22.000 GB
win173_gk	0.00	0	0 MB	0.00	6	18.000 MB
win170_gk	0.00	0	0 MB	0.00	6	18.000 MB

30 elements found, displaying 1 to 10.

<< < 1 2 3 > >> Show 10

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Module 6: Performance Reporting

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Storage administrators can get reports on the storage groups performance.

VMAX – Device Performance

Device Performance

830 elements found, displaying 1 to 10.

Array	Device Name	Alias	Type	Configuration	Purpose	Read Response Time	Write Response Time	Read Requests	Write Requests	Read Throughput	Write Throughput
000192606304	02DA		Thin	TDEV	Primary	24.38	2.10	37.07	38.20	0.29	0.30
000192606304	02D9		Thin	TDEV	Primary	24.21	2.04	37.39	38.77	0.29	0.30
000192606304	02D4		Thin	RDF1+TDEV	Primary	23.93	1.98	38.08	37.21	0.30	0.29
000192606304	02D3		Thin	RDF1+TDEV	Primary	23.91	2.02	38.06	37.34	0.30	0.29
000192606304	02C6		Thin	TDEV	Primary	23.68	2.52	37.61	35.76	0.29	0.56
000192606304	02D8		Thin	TDEV	Primary	23.56	2.00	38.41	39.66	0.30	0.31
000192606304	02CE		Thin	TDEV	Primary	23.54	2.52	38.00	36.10	0.30	0.56
000192606304	02CC		Thin	TDEV	Primary	23.48	2.57	37.83	35.96	0.30	0.56
000192606304	02D7		Thin	TDEV	Primary	23.43	2.01	38.59	39.61	0.30	0.31
000192606304	02D5		Thin	RDF1+TDEV	Primary	22.67	2.03	39.99	38.58	0.31	0.30

830 elements found, displaying 1 to 10.

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Module 6: Performance Reporting

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This report can contain more detail than is needed for the initial analysis. However metrics are available on a per-LUN basis as well.

Accessing VNX Block Performance Details

Explore

- Storage
 - Storage Systems
 - 000192606304
 - 000192606327
 - APM00134303866**
 - Topology Map
 - Device Summary
 - Unified VNX-152
 - Attributes
 - Enterprise Capacity Dashboard
 - Enterprise - Path Details & Storage Connectivity
 - File Capacity Dashboard
 - File - Path Details & Storage Connectivity
 - VNX Block - Performance Details**

All >> Explore >> Storage >> Storage Systems >> APM00134303866

Storage Systems / APM00134303866

2014, Monday, July 28 » Monday, August 4, 1:05 PM EDT | Last 1 Week: average on 1 hour

Unified VNX-152

6 elements found, displaying all elements.

Category Name
Attributes
Enterprise Capacity Dashboard
Enterprise - Path Details & Storage Connectivity
File Capacity Dashboard
File - Path Details & Storage Connectivity
VNX Block - Performance Details

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Module 6: Performance Reporting

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VNX Block performance graphs can be accessed in many ways. Two of them are shown here. Note that performance graphs for any managed CI can also be accessed from the respective reports in the Reports Library.

Available VNX Block Metrics

VNX Block - Performance Details

3 elements found, displaying all elements.

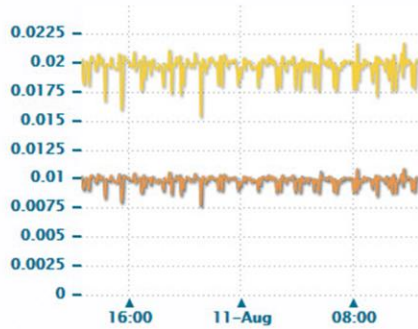
 Name 
Array Performance
Storage Processor
User LUNs Performance



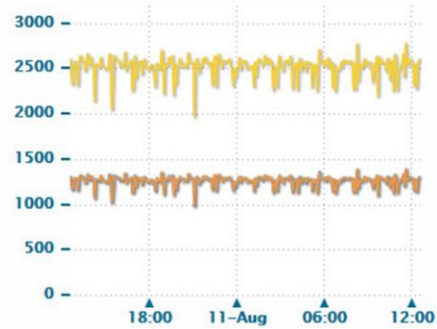
Shown here are the metrics available for VNX Block.

VNX Block – Array Performance

Read / Write Bandwidth (MB/s)



Read / Write IOPS (IO/s)



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Module 6: Performance Reporting

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The Array performance gives the bandwidth and the IOPS.

VNX Block – Storage Processors Performance

VNX Block - Performance Details / Storage Processor

August 2014, Sunday 10 » Monday 11, 12:53 PM EDT | Last 1 Day

An important SP performance metric is SP Utilization. Ideally, in a production environment with strict requirements for high availability and consistent performance, the SP CPU utilization should be around 50 percent. This way, if an failure triggers an SP failover, the peer SP can easily accommodate its own processing load and the failed-over load. When the SP becomes the bottleneck, the utilization will be at or close to 100%. An increase in workload will have no further impact on the SP throughput, but the I/O response time will start increasing more aggressively.

Click to display column definitions

2 elements found, displaying all elements.

SP	IP	Revision	LUNs	Total IOPS	Total Bandwidth (MB/s)	Utilization (%)	Cache Dirty Pages (%)
SP B	10.127.94.111	05.33.000.5.035	18	1,261.94	0.01	11.73	4,264.00
SP A	10.127.94.110	05.33.000.5.035	4	1,259.41	0.01	11.88	4,221.00

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Module 6: Performance Reporting

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The SP performance gives, among other things, the utilization percentage. As explained in the product, the concept is to keep the utilization under 50% for each SP.

VNX Block – User LUNs Performance

LUN Name	LUN ID	Availability (%)	Storage Group	Storage Pool	Storage Pool type	RAID Level	Capacity	IOPS	Bandwidth (MB/s)	Utilization (%)	Service Time (ms)	Response Time (ms)	Queue Length
NLSAS-R6_2	62	100.00	ESX161	2	RAID Group	RAID-6	5.00 GB	115.71	0.90	97.90	8.46	8.48	0.98
NLSAS-R6_1	61	100.00	ESX161	2	RAID Group	RAID-6	5.00 GB	113.15	0.88	97.78	8.64	8.66	0.98
NLSAS-R6_4	64	100.00	ESX161	2	RAID Group	RAID-6	5.00 GB	110.62	0.86	97.77	8.84	8.86	0.98
NLSAS-R6_0	60	100.00	ESX161	2	RAID Group	RAID-6	5.00 GB	114.90	0.90	97.68	8.50	8.52	0.98
NLSAS-R6_3	63	100.00	ESX161	2	RAID Group	RAID-6	5.00 GB	116.85	0.91	97.65	8.36	8.38	0.98
SAS-R10_0	100	100.00	ESX161	1	RAID Group	RAID-10	5.00 GB	375.33	2.93	92.69	2.47	2.47	0.93
SAS-R10_4	104	100.00	ESX161	1	RAID Group	RAID-10	5.00 GB	378.84	2.96	92.55	2.44	2.45	0.93
SAS-R10_2	102	100.00	ESX161	1	RAID Group	RAID-10	5.00 GB	388.58	3.04	92.52	2.38	2.39	0.93
SAS-R10_3	103	100.00	ESX161	1	RAID Group	RAID-10	5.00 GB	459.44	3.59	90.48	1.97	1.97	0.91

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Module 6: Performance Reporting

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As with VMAX, LUN level performance is available as well. While this might be too granular for a macro analysis from SRM, it is nevertheless interesting to see that we can report on these metrics. Of some curiosity here is the distinct separation between two classes of LUNs. For the purpose of this course, identical workload has been setup on these LUNs. Notice how the performance of RAID-6 SATA LUNs differs from RAID-10 FC LUNs.

Accessing VNX File Performance Details

Explore

- Storage
 - Storage Systems
 - 000192606304
 - 000192606327
 - APM00134303866
 - APM00134401136**

Topology Map

- Device Summary
 - Unified VNX-200
 - Attributes
 - Enterprise Capacity Dashboard
 - Enterprise - Path Details & Storage Connectivity
 - File Capacity Dashboard
 - File - Path Details & Storage Connectivity
 - Alerts Summary
 - VNX Block - Performance Details
 - VNX File - Performance Details

Storage Systems / APM00134401136

August 2014, Monday 4 → Monday 11, 1:09 PM EDT | Last 1 Week: average on 1 hour

Unified VNX-200

8 elements found, displaying all elements.

Category Name
Attributes
Enterprise Capacity Dashboard
Enterprise - Path Details & Storage Connectivity
File Capacity Dashboard
File - Path Details & Storage Connectivity
Alerts Summary
VNX Block - Performance Details
VNX File - Performance Details

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VNX File performance graphs can be accessed in many ways. Two of them are shown here. Note that performance graphs for any managed CI can also be accessed from the respective reports in the Reports Library.

Available VNX File Performance Details

Unified VNX-200 / VNX File - Performance Details

August 2014, [Monday 4](#) » [Monday 11](#), 1:24 PM EDT | *Last 1 Week: average on 1 hour*

VNX File - Performance Details

VNX File - Performance Details

3 elements found, displaying all elements.

 Name
FileSystems
IOPS
Throughput (/s)

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Module 6: Performance Reporting

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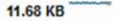
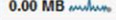
There are three categories of metrics available for VNX File.

VNX File – Filesystems Performance

File Systems

Note: Space saved is only available if File deduplication feature is turned on.

2 elements found, displaying all elements.

FileSystem	Utilization (%)	Capacity	IOPS	Throughput (/s)	Space Saved	Older CheckPoint	Oldest CheckPoint at
test_fs	25.40 	1,008.37 GB	585.75 	11.68 KB 			
RG_fs	0.00 	1,008.37 GB	0.00 	0.00 MB 			

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Module 6: Performance Reporting

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Filesystems report gives the metrics for the configured filesystems.

VNX File – Filesystems Metrics



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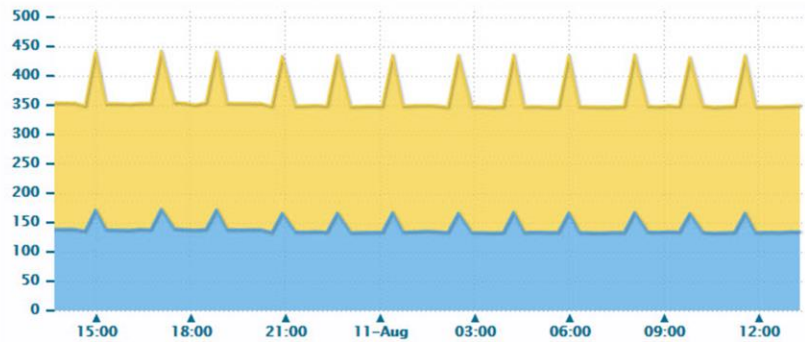
19

Show here are the metrics reported for VNX File System.

VNX File – IOPS

VNX File - Performance Details / IOPS

August 2014, Sunday 10 » Monday 11, 1:34 PM EDT | Last 1 Day: average on real-time



lower bound: -0.044354 upper bound: 510.0713

Optimize

Invert

All



ReadRequests (IOPS)

WriteRequests (IOPS)

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Module 6: Performance Reporting

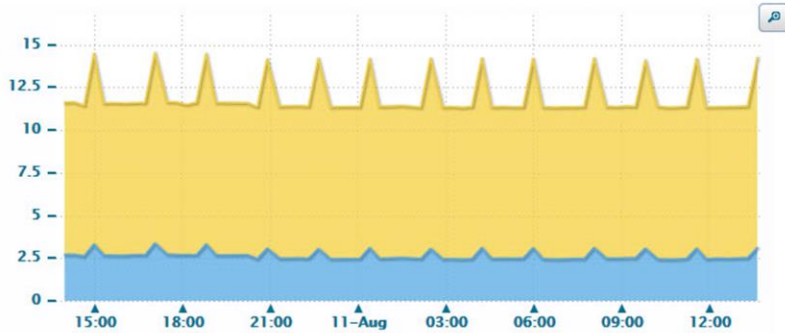
20

Here are some details about the IOPS to the Filesystem test_fs.

VNX File – Throughput

VNX File - Performance Details / Throughput (/s)

August 2014, Sunday 10 » Monday 11, 1:45 PM EDT | Last 1 Day: average on real-time



lower bound: -0.001453 upper bound: 16.7177

Optimize

Invert

All



ReadThroughput (MB)

WriteThroughput (MB)

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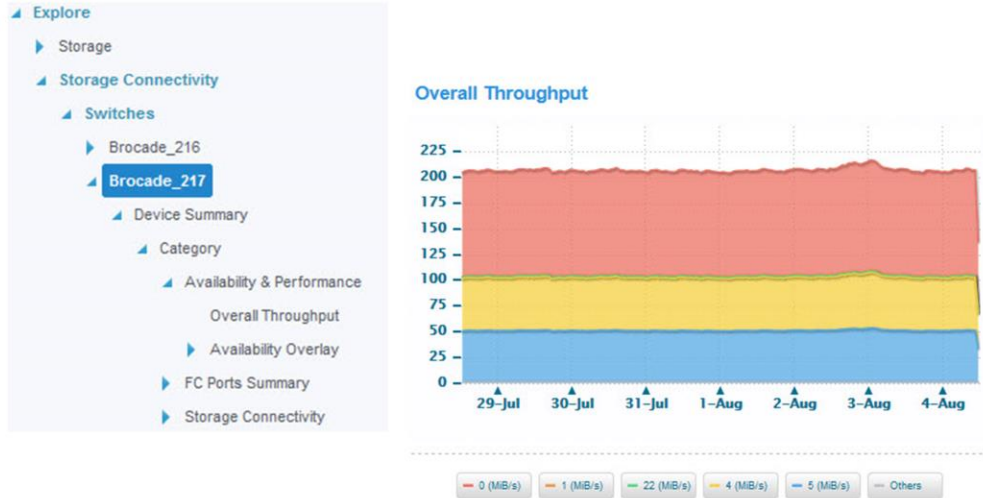
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And here is a report on the throughput to the filesystem.

Switch Performance Reports



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Module 6: Performance Reporting

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Some performance metrics are available for FC SAN switches. This is a graph showing the overall throughput to one of the Brocade switches in the environment.

Module 6: Performance Reporting

Lesson 1: Summary

During this lesson the following topics were covered:

- Performance graphs for VMAX
- Performance graphs for VNX – Block
- Performance graphs for VNX – File
- Performance graph for Brocade Switch



This lesson covered performance metrics for VMAX and VNX arrays and accessing performance graphs for VMAX and VNX arrays as well as Switches.

Lab: Performance Reporting and Analysis

This lab covers :

- Analyzing performance metrics for VMAX array
- Analyzing VNX Block performance metrics
- Analyzing VNX File performance metrics

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Module 6: Performance Reporting

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This lab covers monitoring and analyzing performance data for VMAX and VNX arrays.

Lab Debrief: Performance Reporting and Analysis

This lab covered :

- Analyzing performance metrics for VMAX array
- Analyzing VNX Block performance metrics
- Analyzing VNX File performance metrics

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Module 6: Performance Reporting

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This lab covered monitoring and analyzing performance data for VMAX and VNX arrays.

Module 6: Summary

Key points covered in this module:

- Navigating to different performance graphs for the CIs



This module covered performance metrics available for different discovered objects in ViPR SRM.

Module 7: Report Customization in ViPR SRM

Upon completion of this module, you should be able to:

- Describe the tasks and tools used in custom reporting
- Modify an existing report
- Create simple table and chart type reports
- Create a dashboard



This module focuses on the concepts of custom reporting in ViPR SRM. Creating dashboards, and modifying reports are explored in this module.

Module 7: Report Customization in ViPR SRM

Lesson 1: Basics of Reporting

- Aggregates and time range selection
- Charts and tables
- Metric values and properties



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Module 7: Report Customization in ViPR SRM

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This lesson covers using ViPR SRM to select time aggregates and a time range for how data will be presented in a graph. Selections for chart and table report types are explored and the impact this has on data presentation. The metric values and their properties which populate the graphs is also discussed.

Time Range Selection

The screenshot displays the EMC ViPR SRM main panel. At the top, a blue header bar contains the text "Welcome (logged in as admin)" on the left, the date "Friday, July 25, 2014" in the center, and navigation links "Settings", "Administration", and "Help" on the right. Below the header, a secondary bar includes "EDIT MODE" with a search icon, a "DISPLAY" button (highlighted with a red box), "EXPORTS", and "TOOLS".

The main content area is titled "All" and shows a time range of "July 2014, Thursday 24 - Friday 25, 1:25 PM EDT | Last 1 Day". A large heading "Start with Display" is positioned on the right. The left sidebar lists navigation options: "Scheduled Reports", "Stored Reports", "Favorite Reports", "Dashboards", "Explore", "Operations", "Planning", "Report Library", and "My Reports".

The central area features several report categories, each with an icon and description:

- Dashboards**: View high-level summaries for storage and networks.
- Operations**: Monitor and validate alerts, compliance, service level agreements, and situations to watch.
- Report Library**: Browse reports from installed SolutionPacks.
- Explore**: Investigate CIs and their configuration and performance data.
- Planning**: Analyze capacity trends and plan for future growth.
- My Reports**: View your custom reports.

The bottom of the page has a blue footer bar with the EMC logo on the right. Below this bar, a white footer line contains "Copyright © 2014 EMC Corporation. All Rights Reserved." on the left, "Module 7: Report Customization in ViPR SRM" in the center, and the page number "3" on the right.

Welcome to the ViPR SRM main panel. At the highest level of the report tree is “All”. Here the end user may begin with how reports are to be displayed using the Display feature in this panel.

The ViPR SRM Display Utility

The screenshot shows the 'EDIT MODE' interface for the ViPR SRM Display Utility. It features a top navigation bar with 'EDIT MODE', 'DISPLAY', 'EXPORTS', and 'TOOLS'. The main content area is divided into three columns: 'Report Type', 'Time Selection', and 'Actions'. The 'Report Type' column has settings for 'Display' (two reports per line), 'Report' (icons), 'Rendering' (static charts), and 'Summary Statistics' (None). The 'Time Selection' column has settings for 'Display' (real-time), 'Using' (average), 'Over' (last), and a 'Time Range Quick Switch' (1 day). The 'Actions' column has a 'View in Full Page' button and a 'Revert to Default Report' button. An 'Apply' button is located at the bottom right of the 'Time Selection' column.



Time parameters for display values and aggregation are configured in the 'Time Selection' area.

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Module 7: Report Customization in ViPR SRM

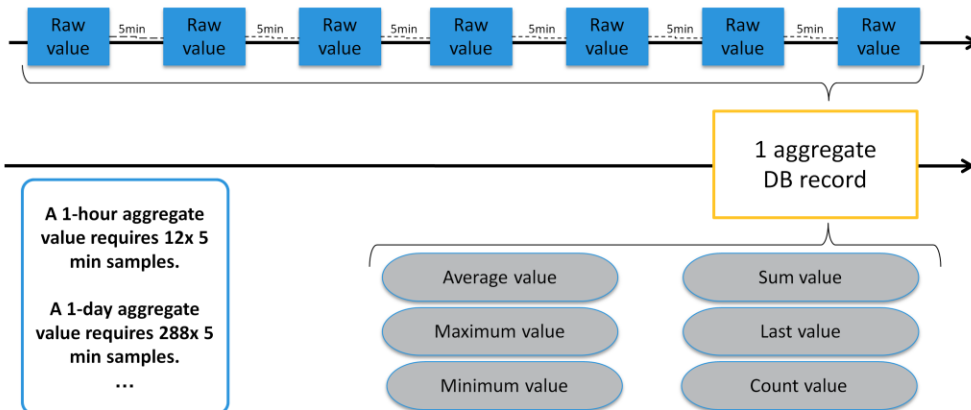
4

The display utility is used to define how data will be presented in the output of a report. The format and type of report structure may be altered here as well as how time is managed to compute data points for the output and the range of time over which the data will be presented. The specifics of the parameters for each of the three blocks in the display utility are discussed in a later lesson.

Display Aggregates

Definition

An aggregate is a data record summarizing a group of values that reduce the sampling rate. ViPR SRM compensates for the effects of aggregation by providing several statistical details.



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Module 7: Report Customization in ViPR SRM

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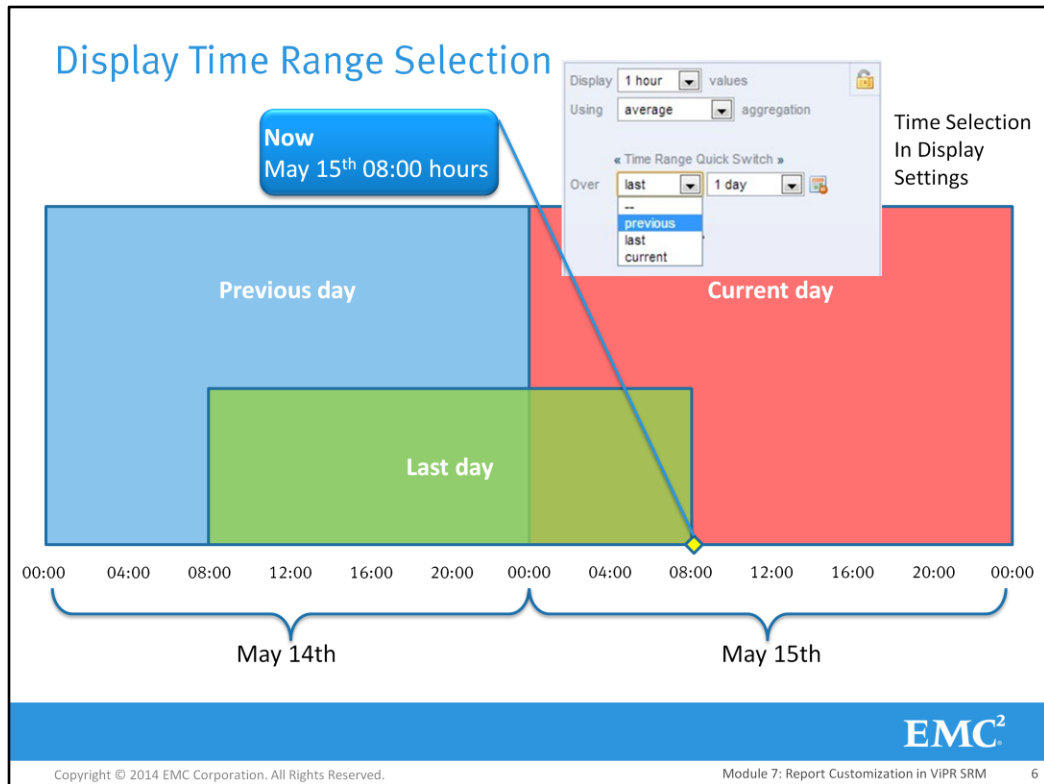
An important concept in SRM is that of aggregates.

Note: that it is the backend's responsibility to compute and populate aggregates from real-time values. SRM keeps both real-time and aggregated values in its database. Real-time values are those of metrics as they are collected. They represent 1 data point in time and are collected on the collector's polling cycle.

Aggregated values are a compounded summary of several real-times values put together in order to improve the reports performance and save disk space. The SRM default defines these aggregates:

- **1-hour:** the SRM polling cycle is 5 minutes and it takes 12 samples to generate one single aggregate record for a given metric.
- **1-day:** the SRM polling cycle is 5 minutes and it takes 288 samples to generate one single aggregate record for a given metric.
- **1-week:** the SRM polling cycle is 5 minutes and it takes 288*7 samples to generate one single aggregate record for a given metric.

Aggregated values are created and updated as real-time values are collected and received by the APG-Backend module. This way, aggregated values are always up-to-date and precise.



SRM bases its time range selector settings using either “previous”, “current”, or “last” over the time period selected. For example: 1 day.

From the display menu and when using the report editor, you have to choose among these options:

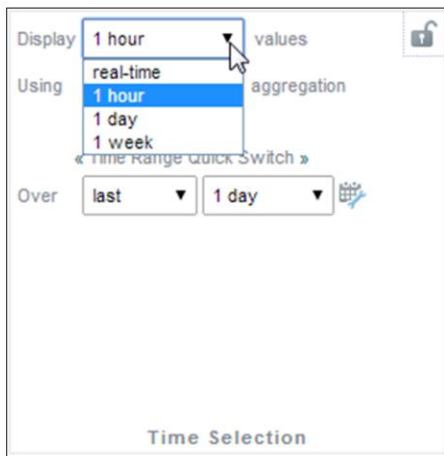
- **Previous:** Selects the entire and complete previous time period for the selected time range. The previous time period is determined according to the period boundaries.
- **Last:** Selects one complete historical time period beginning at the present time for the selected time range.
- **Current:** Selects the current time period over the selected time range. The beginning of the current time period is determined by the period boundaries.

Let’s assume the current date and time is: 15th of May, 08:00 AM:

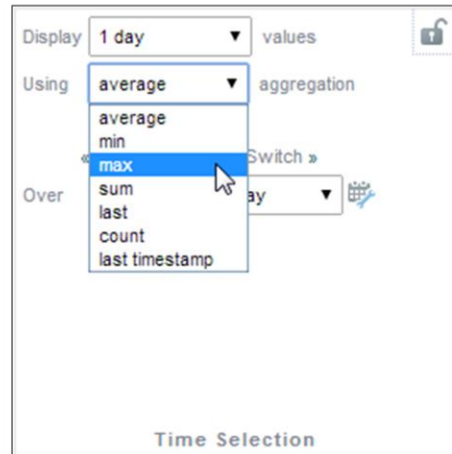
- The previous day (24 hours) boundaries are set exactly at: May 14th from 00:00AM start of the day to May 15th 00:00AM start of the day inclusive. This could be thought of as selecting yesterday for the time range.
- The last day (24 hours) boundaries become exactly: May 14th 08:00AM to May 15th 08:00AM inclusive. This could be thought of as selecting the last 24 hours from the present time.
- The current day boundary is exactly: May 15th 00:00AM to May 16th 00:00 inclusive (some projection into the future, could be useful for trending and forecasting using the report time range selection). This could be thought of as selecting the complete present time period definition (present day). If the current time period is not completed (for example: 8AM is 16 hours before the end of the day), then data will be available in the graph up to the present time while the remaining time on the graph for the current time period will be blank.

The same concept applies for weeks, months, years, quarter, semester, or any custom time period defined in the display utility.

Using The Display Utility For Aggregates



Select the time value for the data points to be displayed



Select the aggregation method for data values

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Module 7: Report Customization in ViPR SRM

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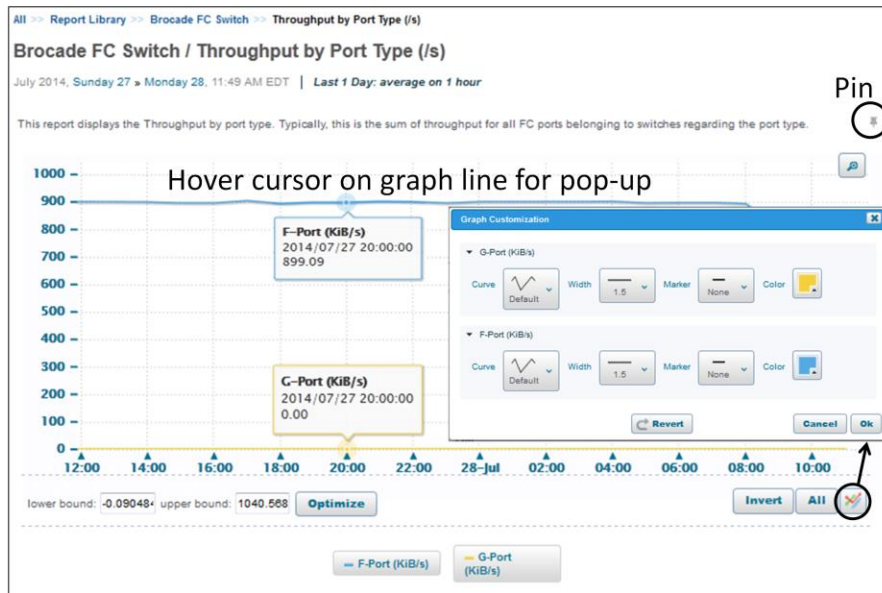
The main reason to use aggregated values is to improve and optimize both report generation and calculation performance. Also, real-time values are most often used for data collection periods of short time duration, typically last 1-day (or 24 hours) as opposed to aggregated values which are more suitable for a longer time range in reporting and trending.

Aggregated values might work well in a case where a yearly report is generated. In this case there would be 105 thousand dataset values possible, each representing an individual 5 minute period for 365 days. A report using aggregated weekly averaged values is likely to be more effective.

Note: A retention policy may result in data not being available if a time period selection is longer than the retention policy setting.

Also remember that aggregate computation settings (average, min, max, sum, etc.) are available only when selecting a display aggregate (1-hour, 1-day or 1-week). Aggregation settings have no effect on real-time selection.

ViPR SRM Chart Example



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Module 7: Report Customization in ViPR SRM

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Dynamic graph charts produce pop-ups when the cursor is placed over a point on a graph line. The pop-up box will yield details for the point in time and include the value of the metric. In the lower right corner of a graph chart there is a graph customization button that will pop-up a dialog box for modifying the curve lines, width of the lines, graph line markers, and color of the line for each metric. Changes may be reversed by clicking on the Revert button.

Graph lines may be removed or added to the chart by clicking on the appropriate rectangular boxes at the bottom of the chart.

The upper and lower bounds of the Y axis on the graph may be manually selected and enforced by clicking on the optimize button. To keep the changes, click on the pin icon to create a link to this graph in a personal view. Otherwise refreshing the view will abandon the changes.

ViPR SRM Table Example

Traffic by Domains (/s)

Filter Reorder (1-4 or 4-1)

4 elements found, displaying all elements.

Information icon declares the aggregate used for calculation

Domain ID	Devices	Nb. of Fabrics	Nb. of FC Ports	Current Traffic	Avg. Traffic
4	SRM-Brocade-05	1	32	494.6 KiB/s	406.9 KiB/s
3	SRM-Brocade-04	1	32	189.1 MiB/s	187.1 MiB/s
2	SRM-Brocade-03	1	32	68.8 MiB/s	68.0 MiB/s
1	SRM-Brocade-01, SRM-Brocade-02	2	32	35.0 MiB/s	34.7 MiB/s

Nb. of Fabrics
This column displays the last value of the average sampling using the real-time or higher aggregate over the values of the last 1 day.

- Filter may be used on a single object or a range of objects
- Wildcard characters * and % may also be used

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Module 7: Report Customization in ViPR SRM

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Some reports in ViPR SRM are run as tables. Tables are generally easy to read and are flexible. The following properties hold for all tables:

1. All tables have property columns, and these columns in a table may be filtered. Columns in a table holding value based data may not be filtered. Filtering on a column is permitted for a single object or a range of objects. If specific data is not known for fields in column data you wish to filter, then wildcards may be used. The allowable wildcards are % and *. For example: to filter on Domain IDs between 10 and 19, the filter could be set up as 1* (assuming no IDs exceed 99). Filtering may be canceled by selecting the *cancel filter* next to the report title.
2. All column data may be reordered on a column by column basis. Reordering is permitted only for top to bottom and bottom to top changes. For example: Domain IDs 1-4 may be ordered that way using the up arrow, or they may be ordered 4-1 using the down arrow.
3. All value based columns have an information icon which can be used to retrieve basic information about how the values for the column were calculated.

ViPR SRM Metrics

Definition

A metric is the smallest unit of data you can regularly poll from a given instance of an object, device, service, or system.

Examples:

- Disks are contained in a storage array. A given SRM collector is configured to retrieve metrics (data units) from each disk reported by the array's interface:
 - ▶ ReadOperations
 - ▶ WriteOperations
 - ▶ [...]
- Disks are configured to present LUNs to hosts. A given SRM collector is configured to retrieve metrics (data units) from each LUN reported by the array's interface:
 - ▶ ReadOperations
 - ▶ WriteOperations
 - ▶ [...]



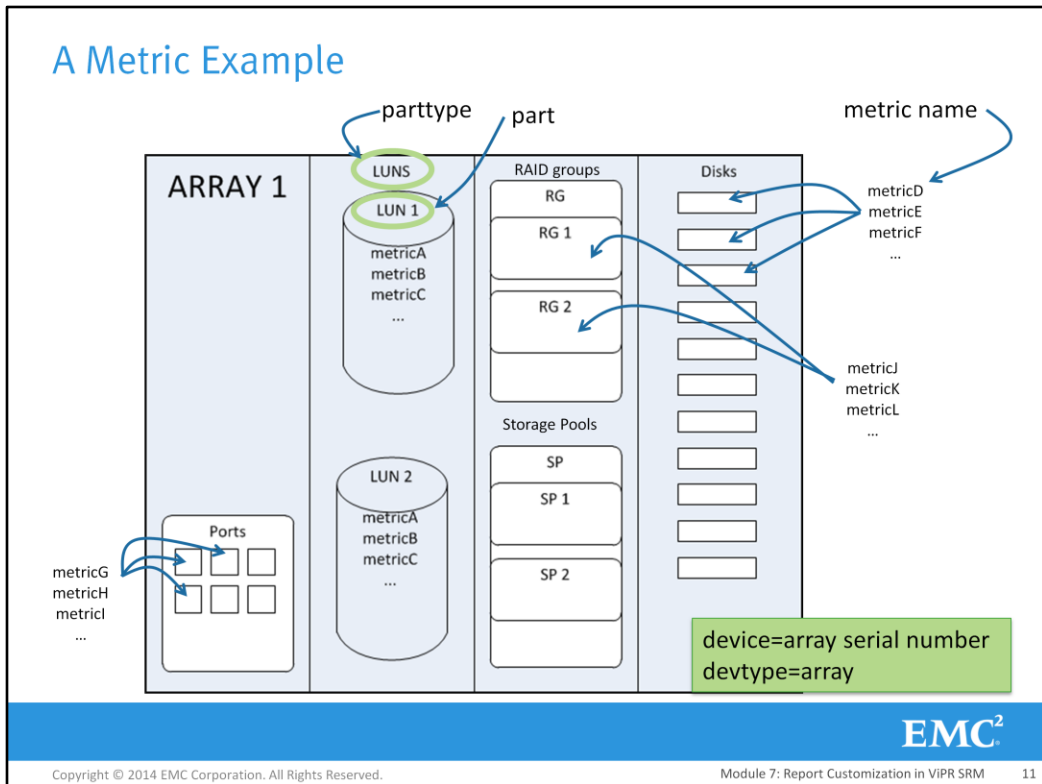
The term “metric” refers to the basic unit of collected data that can be collected from an object, device, service, or system. It is used in each module of the SRM platform. A metric represents the raw value unit extracted from a given object of a targeted system. It is important in the context of SRM to distinguish Key Performance Indicators (KPIs) from metrics. KPIs in some cases could be a large number of aggregated metrics.

SRM collects and stores metrics that the report generator uses when creating reports. The values in the reports are KPIs, they are the final result that can be compared and evaluated to make reasonable judgements about the state of the discovered environment that SRM knows about. You can also consider some raw metrics to be KPIs.

A metric is always described by its context and its context is described by its properties. In order to be meaningful, a metric must have properties, which are fundamental to SRM collection and reporting.

From the slide above, we have two examples: one is from a Disk context and the second from a LUN context. Each use the same metric properties but that does not mean the properties are the same value. The context for each differentiates the value, which is key to understanding the metrics. “Disk” and “LUN” are object types in different contexts, and you can have multiple object instances of each type (identified by a Disk ID, or LUN address).

The array's interface refers to the way to get the metrics from the array. As an example, with EMC SAN products, SRM gets VMAX metrics through Solution Enabler and Unisphere.



Here is a visual example of defining the metric concept of context.

An Array is a physical entity that comprises several objects of various types. In the diagram depicted above, we can identify the following object types: Ports, LUNs, Raid Groups (RG), Storage Pools (SP), and Disks. The common property name for such object types is defined as the property named “parttype”. So we have parttype=“Disk” or parttype=“LUN” which would identify an element of a metric’s context.

For each type of object, we can have one or many “instances”, for example: there are 6 ports, 2 LUNs, 2 RAID Groups, 2 Storage Pools, and 11 Disks. Each of these objects can be uniquely identified by an address (Disk’s case), or label. With SRM the common property used to designate an instance of an object is the “part” property name.

For each object we can have one or more metrics. As depicted above, the same metric name is used for many object instances of the same object type. For example: each LUN object has metrics A, B, and C. With SRM, the common property name for a metric name is “name”.

In order to have a more complete picture, a property named “device” is added to each single metric of the above to better reference the group. This will be used to differentiate the metric set of this array device name from another array device name.

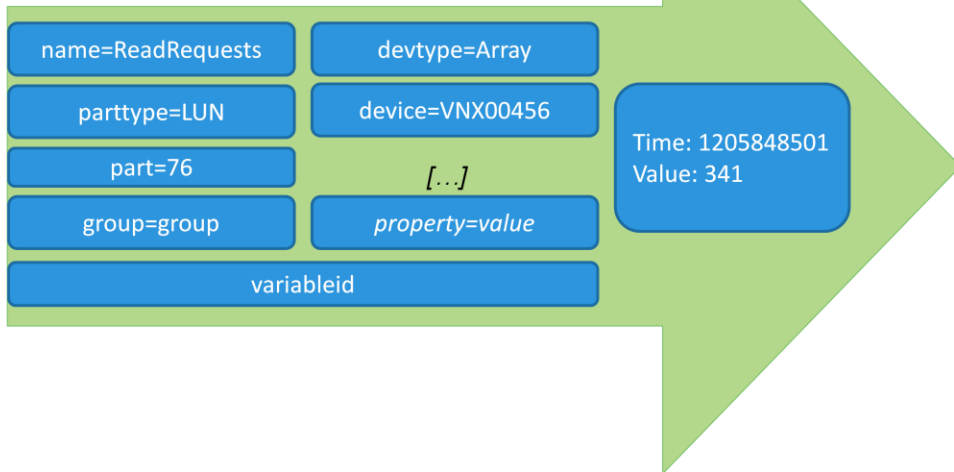
Note: the serial number is used as the device name in identifying the array.

Using the same concept as previously, a property named “devtype” is added to each single metric of the above in order to differentiate the metric set from another device type such as a SAN Switch or from any other device types in the infrastructure such as a host, vCenter server, etc.

This way, you can have multiple arrays, multiple array types, or a mixed-environment of data sources such as physical hosts, VM hosts, SAN Switches, Routers, Firewalls, Network switches, etc.

Metric Common Conventions

A raw data element
generated by a collector:



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Module 7: Report Customization in ViPR SRM

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The fundamental element of the data model is the raw value. A raw value represents a floating point value at a specific date and time for a specific metric. A raw value can also be joined with meta-data about the metric. These meta-data are termed the properties.

From above, in the properties list, we can easily locate the origin of a raw value describing ReadRequests: it contains the name of the device (devtype) and its value is linked to the type of object (parttype), the object instance (part), and several other properties. This is a simple example of a collection. Now let's consider a ViPR SRM platform which is collecting many thousands of metrics from the infrastructure (a small deployment). When looking at a report, it should relate back to the infrastructure.

Internally, ViPR SRM is a flat data model: it does not have any knowledge about the relationship among metrics. Only the metric's properties can help in creating the organization of the data.

As an example would be: successively grouping by devtype, then by device, then by parttype, then by part would delineate the data collection in a logical manner. At first, it may appear as a drawback but actually, it is a major advantage since there is no implicit hierarchy between data properties. It doesn't make any assumptions such as "a device contains ports which contains several indicators" limiting collection to this schema. The suite can collect data from heterogeneous sources and still organize them in a convenient way in the Frontend, at report time. Furthermore, thanks to this, users may define their own hierarchical data model, according to their needs.

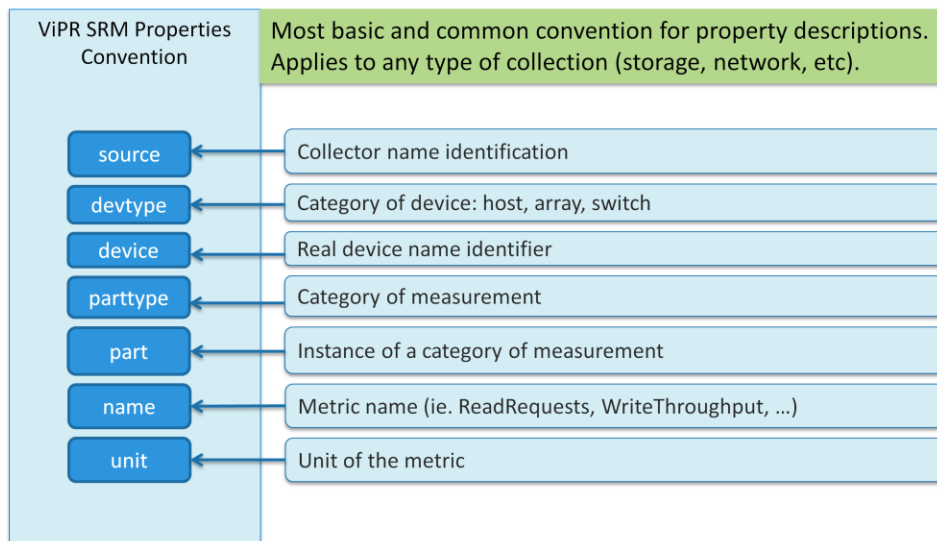
The format of such properties is specific: on the left-hand side, there is a "property name" and on the right-hand side we have the "property value". This forms a pair.

The "[...]" sign in the above slide means that the number of property name and value pairs are unlimited in number to describe the metric.

The "variableid" depicted is a text string that uniquely identifies a metric. It is generally composed of a selection of multiple property values.

The "group" property is a mandatory field set in the collection configuration and is used by the APG-Backend module. It is mainly used to give data a retention scheme. These details of Backend functionality are covered in an advanced course of ViPR SRM.

Common Metric Property Conventions



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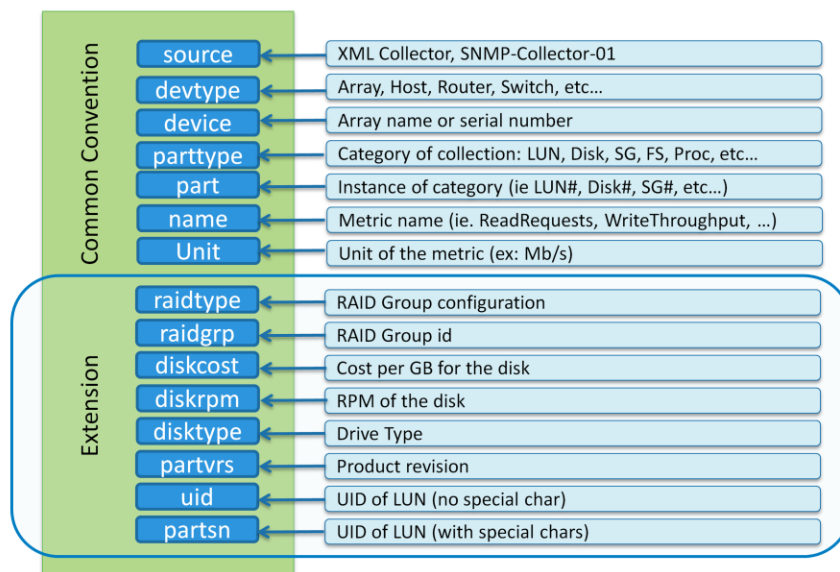
Module 7: Report Customization in ViPR SRM

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Building on our model of metric conventions, we can see that the model is unlimited and can be used to describe any object (type, size, flavor, etc) for which ViPR SRM has a metric definition. It is also possible to more adequately describe metrics by creating additional properties, or your own data property names and definitions.

Although there is a lot of flexibility, ViPR SRM uses the “Common Convention” concept in order to set a base common property naming convention. This concept ensures that any collection being developed can re-use some of the generic report layouts provided in a base report installation. The common convention defines the properties as shown in the above slide and are strongly suggested to be in each collection.

Expanding the Metric Common Convention



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Module 7: Report Customization in ViPR SRM

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ViPR SRM uses a flat data model and can be expanded to add, remove, or change properties of collected metrics. This is what gives ViPR SRM its unique flexibility to provide a unified view across many different technologies & vendors. A metric may have one or more properties attached, but not all metrics require the same set of attached properties.

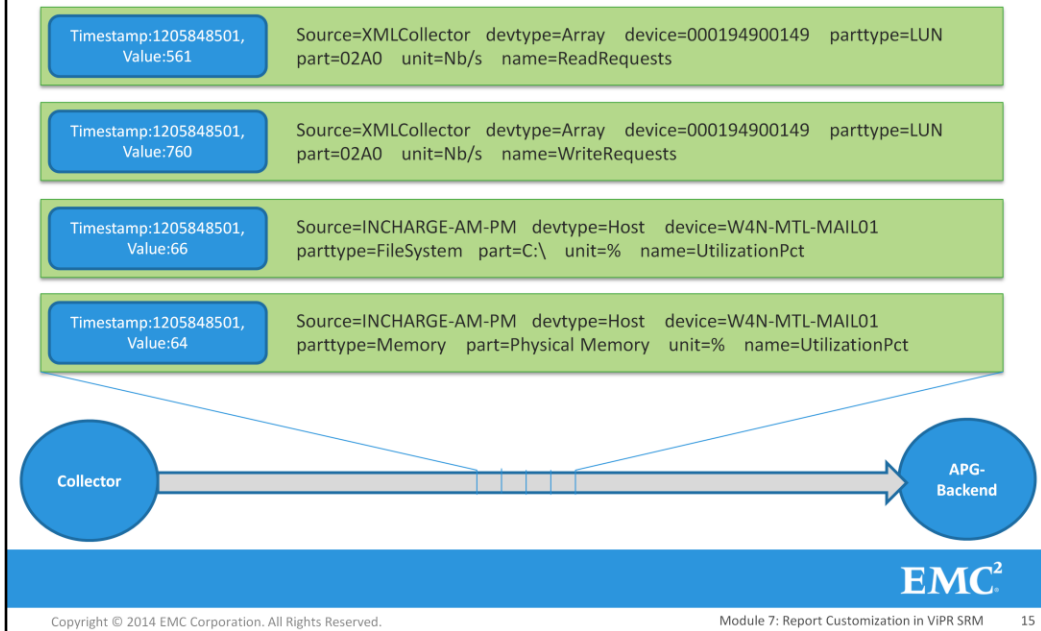
In the above slide, there is an extension of the metric property set for a storage application.

Note: not all objects from Storage make use of the above illustration, the context of the collection will define the scope. This is just an example of expanding the common convention and showing how flexible the model is.

With the Data Enrichment concept, it can be noted that we're adding a new property key and value pair to the extensible model. This feature allows you to tag or label the collected data based on some rules. Adding such information to metrics will allow for further customization of the reports.

Metric Values and Properties

What is collected?



Now let us see how this works in the implementation. The above figure shows a collection of four raw data metrics in transit from the Collector to the APG-Backend. Each metric is a packet record and travels from the Collector to the APG-Backend. A packet record contains the complete property set along with metadata for values and timestamps. This facilitates the APG-Backend processing of data correctly. It also helps decide if updates in the database are required, saving on costly data storage operations and performing aggregation based on the information that joins the value of the metric. Now, the data is “finalized” with its complete set of properties when leaving the Collector. It will not be possible to alter the content of the database or any collected data residing in the APG-Backend.

The contents of a data packet record include:

- A timestamp. This is the moment in time when the value was collected.
 - ▶ Collection uses the UNIX timestamp which is the number of seconds since January 1st, 1970, at midnight GMT.
- A value. This is the value of the metric collected at a given timestamp.
 - ▶ Values can be displayed in graphs, as aggregated averages.
- Several properties. Properties are used to better identify a metric. Units such as Numbers/second (Nb/s) for read or write requests are an example showing how the metrics are measured.

Sample Metrics Property Set

Available properties x	Available properties x	Available properties x	Available properties x																																																																																																																																																																																
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The above is an example of what you would find in the property database for a sample of four randomly chosen separate metrics. No matter how many properties there are, the minimum of the common convention is always present. The convention includes: source, devtype, device, parttype, part, name, unit.

Take note of the variety and number of properties for each metric. Simply by reading the “property card”, you can perfectly and precisely identify where this data comes from when referring to the whole infrastructure.

Defining the property for a given collection is already done for you when implementing a SolutionPack.

Note: the above samples include (left to right) the following:

- a VMAX Disk metric
- a VNX Storage Pool metric
- a VMAX LUN metric (1)
- a VMAX LUN metric (2 – same object but 2nd metric)

Metric properties may be found in ViPR SRM in the path:
Administration>>Modules>>Management of Database Metrics.

Here metrics are selected through a filter for the device type or part type of interest. In later versions, this utility allows for the deletion of metrics, so this must be used with caution.

Module 7: Report Customization in ViPR SRM

Lesson 1: Summary

During this lesson the following topics were covered:

- Aggregates and time range selection
- Charts and tables
- Metric values and properties



This lesson covered the basic concepts of using chart and table reports from data collected by ViPR SRM. A close examination of metrics used in the collection of data from devices, their properties, and values was presented.

Module 7: Report Customization in ViPR SRM

Lesson 2: Report Wizard Overview

This lesson covers the following topics:

- Metric selection
- Report options
- Creating a chart
- Creating a table



This lesson covers use of the Report Wizard in ViPR SRM. An example of creating a chart and a table is shown.

SRM User Settings

[Settings](#) [Administration](#) [Help](#) [?](#) [⏻](#)

User Settings

[User Data](#) [Preferences](#) [Custom Tree](#)

The following settings deal with some automatic behaviors.

Language	Default Language ?
Root Display	two reports per line ?
Root Report	 ? Drop down box to see report formats
Auto Refresh Rate	seconds ?
Background Reports	No Background Reports ?
Stored Reports	Don't Send the Completion Email ?

[Cancel](#) [Save](#)



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User preferences may be set for a variety of SRM behaviors, including the root report. Using the drop-down window for report formats will display all of the default report types.

ViPR SRM Chart Options

- User settings preferences:
 - ▶ ViPR SRM reports are displayed in one of the following formats:
 - ▶ **Tables** – presents data as a list or in various table styles
 - ▶ **Graphs** – presents data in line graph or bar charts
 - ▶ **Aggregated** – data is aggregated in stacked charts, guages, or maps
 - ▶ **TopN** – use for bar graphs or pie charts
 - ▶ **Misc** – presents data in a topology, or icons, or with external sources
 - ▶ **Mixed** – mixed report formats and overlays are used to show data
 - ▶ Root Report – mixed reports, mixed using defaults
 - ▶ Several report styles exist for each of the report formats listed
- Individual reports permit selection of allowed report styles from a particular format in the display menu area of the tool bar
- Reports are populated with collected metric information



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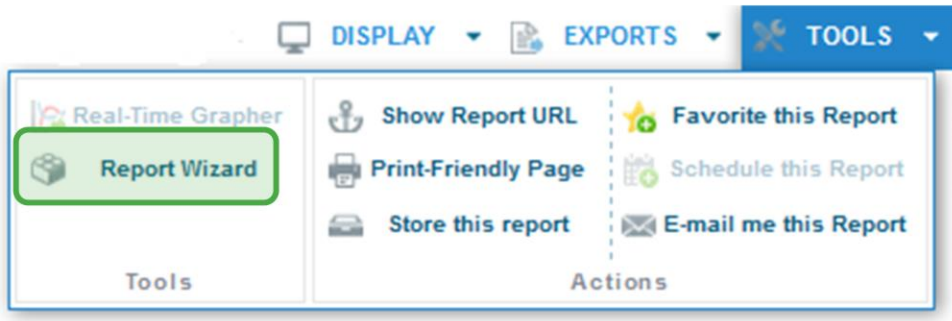
Module 7: Report Customization in ViPR SRM

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ViPR SRM permits data to be displayed in any one of 27 different report styles. These report styles are grouped into 6 different formats. All report styles may be viewed in the Preferences tab under User Settings in ViPR SRM application. They are viewed by selecting the report mode for the root report.

Selecting a report in the report tree will show the type or types of report styles used to create the report. Selecting the Display menu and dropping down the Report window will allow you to view the options available for any particular report.

Report Wizard Overview



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ViPR SRM provides a complete set of tools that can make your life easier managing and customizing the base reports available with the ViPR SRM application. One of these tools is the “Report Wizard”. The Report Wizard allows you to quickly build a report. It is located in the “Tools” menu.

Report Wizard – Metrics Selection for Chart

The screenshot shows the 'Report Wizard' interface with the 'Device Browser' view type selected. The wizard consists of several panels:

- Device Types:** Shows a list of device types. 'Host' is selected (indicated by a yellow circle 1).
- Hostname:** Shows a list of hostnames. 'SRMRHEL1' is selected (indicated by a yellow circle 2).
- Component Types:** Shows a list of component types. 'Disk' is selected (indicated by a yellow circle 3).
- Components:** Shows a list of components. '/dev/emcpowerv' is selected (indicated by a yellow circle 4).
- Available Metrics:** Shows a list of metrics. 'Throughput' is selected (indicated by a yellow circle n#).

A blue arrow points from the 'Device Types' panel to the 'Available Metrics' panel. The 'Add Metrics' button is highlighted at the bottom right of the wizard.

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Module 7: Report Customization in ViPR SRM

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The Report Wizard includes a View Type selector. The View Type selector allows you to tell the Report Wizard the pre-defined way to describe your report. Although the default is set to “APG Topology”, it is more convenient to start with “Device Browser” [CLICK]. As you select an element from a frame, the next related frame opens up, allowing you to choose among a list of attached sub-components. For example: Starting with Device Types [CLICK], choose Host, then in Hostname [CLICK], choose SRMRHEL1, then in Component Types [CLICK], choose Disk. Several disk devices will now be present in the components column. [CLICK] Choose /dev/emcpowerv. [CLICK] The last column will display the Available Metrics for this component.

This pre-defined, guided selection within the Device Browser view allows you to drill down to the last frame where you can select the metrics to be displayed in your report.

Once you are done with the selection of all entries up to and including the metrics, confirm your selection by clicking the “Add Metrics” button.

You can then continue with the report options: Selected Metrics, and Optional Report Settings. You may also start over in order to join other metrics to the report you are building.

Report Wizard – Optional Report Settings

- Time-range selection
- Aggregation level
- Type of report – select chart

▼ 1 Selected Metrics

Represent all the currently selected metrics. Bear in mind that each displayed metric is related to an underlying set of selected components (that are not displayed here).

Throughput

▼ Optional Report Settings

Display: real-time aggregation: average over: last time range: 1 day

Automatic report type selection

Table Simple graph Child graph Stacked chart Bar graph

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Once you are done with the metrics selection, you can review the list under the “Selected Metrics” section.

Under “Optional Report Settings”, you have options that allow you to specify a time-range coverage for your report, along with the aggregation level (real-time, 1-hour, 1-day, 1-week) and aggregation function, if required.

Finally, you can select a report type among:

- **Table:** selected elements will be organized in a table view (1 row per object, metrics are displayed in the table columns)
- **Simple graph:** 1 data curve per metric (data point is linked)
- **Child graph:** 1 child graph per metric (simple graph is available for each metric)
- **Stacked chart:** each metric on top of the other, aligned per data point in time (meaningful for 1 metric type across multiple objects of same type)
- **Bar graph:** 1 bar per object of same type, per metric (meaningful for 1 metric type)

Report Wizard – New Metric Selection for the Chart

The screenshot displays the 'Report Wizard' interface with the following selections:

- View Type:** Device Browser (1)
- Device Types:** Host (2)
- Hostname:** SRMRHEL1 (3)
- Component Types:** Processor (4)
- Components:** CPU
- Available Metrics:** CurrentUtilization (n#)

Buttons at the bottom: Run, Save in "My Reports", Add Metrics, Run, Quit Wizard.

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In the Report Wizard, once again, start with “Device Browser” [CLICK]. Select elements from each frame as shown for [CLICK] Device Types and [CLICK] Hostname and [CLICK] component types. The Processor Components chosen [CLICK] will be limited to only the CPU [CLICK] and the Available Metrics associated with the CPU will be CurrentUtilization.

Once finished with the selection of all entries up to and including the metrics, confirm your selection by clicking the “Add Metrics” button for each separately chosen metric.

Then continue with the report options: Selected Metrics, and Optional Report Settings.

In the Optional Report Settings section, both CurrentUtilization and Throughput should appear in the main axis group. Once confirmed the Table report icon may be selected for a table report to be generated over the selected time period.

Report Wizard - Axis

Case for multiple metric selection of a different magnitude:

▼ 2 Selected Metrics

Represent all the currently selected metrics. Bear in mind that each displayed metric is related to an underlying set of selected components (that are not displayed here).

CurrentUtilization Throughput

● Main Axis

Scaling mode:

CurrentUtilization

● Secondary Axis

Throughput

Scaling mode:

Drag and drop the metrics from the other axis...

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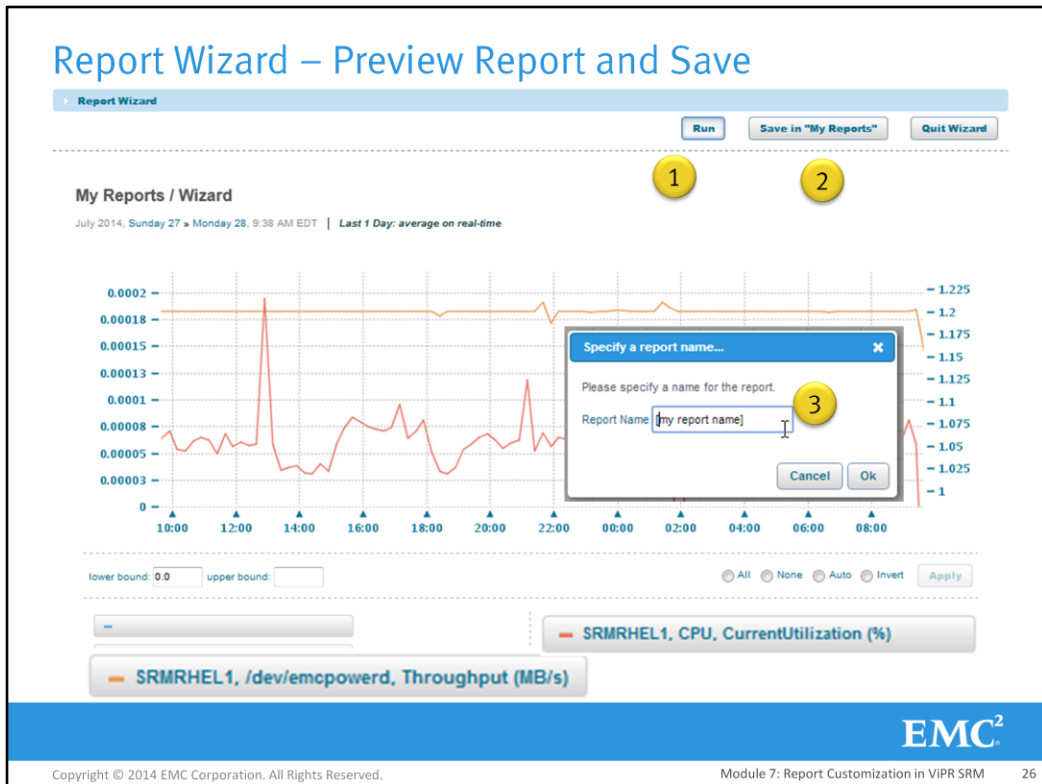
Module 7: Report Customization in ViPR SRM

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When choosing a graph type report with multiple metrics in your selection, the graph may be split in two Y-axis groups. This allows you to easily compare metrics that are different magnitudes (such as DiskSpace and CPU usage (%)). As show above, selection of Throughput (of a Disk) can be much higher than CurrentUtilization (from a CPU). Correlating in a single graph with the same Y-axis reference would be difficult, so a second Y-axis is created to show line activity in proximity to each other.

To accomplish this, simply click “Add a Secondary Axis” and then pick and move the metric(s) from the Main Axis to the Secondary Axis.

Scaling is another option. This permits you to transform value by performing simple math over the series.



Once satisfied with the settings:

1. [CLICK] Hit the “Run” button. This will generate the report and show you a preview.
2. [CLICK] If satisfied, click “Save in “My Reports””.
3. [CLICK] This will open a pop-up asking you to provide a report name. Supply the report name and click Ok. The report will be saved under your report sandbox.

NOTE: this particular output drops off suddenly at the right side of the graph and the graph markers are showing very low activity.

Report Wizard – Selecting a Table Report Format

Type of report – select table

▼ 2 Selected Metrics

1 Represent all the currently selected metrics. Bear in mind that each displayed metric is related to an underlying set of selected components (that are not displayed here).

CurrentUtilization Throughput

▼ Optional Report Settings

Display real-time average over last 1 day

Automatic report type selection

Main Axis

Scaling mode -None-

CurrentUtilization

Throughput

Add a Secondary Axis

Secondary axis not necessary for a table

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Review the metrics selection list under “Selected Metrics”.

Under “Optional Report Settings”, the defaults have not been changed.

Select the **Table** entry for viewing the wizard output.: selected metrics will be organized in the table view (1 row per object with devices displayed in the table columns)

When the settings are complete:

Hit the “Run” button and if satisfied with the report preview, click “Save in “My Reports”.

Provide a report name in the pop-up and click Ok. The report will be saved under My Reports.

Report Wizard – Table Creation

- Add both CPU CurrentUtilization and disk throughput as metrics to the table
- The devices for CPU and disk appear in the columns with their associated values

My Reports / Wizard

July 2014, Sunday 27 » Monday 28, 9:47 AM EDT | Last 1 Day

2 elements found, displaying all elements.

Name	SRMRHEL1,CPU	SRMRHEL1,/dev/emcpowerd	Unit
CurrentUtilization	1.05		%
Throughput		0.00	MB/s

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Selecting the Table icon in the Report Settings produces a report of the same data used earlier but in Table format as opposed to a Chart format. It is noticeable here that the disk data throughput is too low for ViPR SRM to be able to register it above zero mega bytes per second.

Lab : Part 1 – Using the Report Wizard

The purpose of this lab is to:

- Create a report chart using the Report Wizard
- Create a report table using the Report Wizard

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This lab covers creating both a stacked chart and a table from the same metrics using the Report Wizard.

Lab Debrief: Part 1 - Using the Report Wizard

This lab covered :

- Creating a stacked chart report for a Brocade Switch
- Creating a table report for the Brocade Switch

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This lab covered creating both a stacked chart and a table from the same metrics using the Report Wizard. It should have been noted that the same metric data appeared in both reports but in different formats.

Module 7: Report Customization in ViPR SRM

Lesson 2: Summary

During this lesson the following topics were covered:

- Metric selection
- Report options
- Creating a chart
- Creating a table



This lesson covered creating a custom report using the report wizard. Option selections for the report view type were discussed and examples of creating a graph chart and a table were described.

Module 7: Report Customization in ViPR SRM

Lesson 3: Modifying Reports

This lesson covers the following topics:

- Report Edition mode
- Copy and paste a report
- Altering a table report
- My View: my custom dashboard



This lesson covers the concepts of Edit mode for reporting in the SRM application. The concepts of filtering, expansion, report configuration, setting the details for a graph or table style report, copying and pasting reports, creating links to my view, and altering table reports by moving, deleting, and copying columns are discussed.

Introduction to Edit Mode

The screenshot displays the 'Edit Mode' interface for report customization. It features two main panels, each with a tabbed interface at the top. The first panel, 'Filtering & Expansion', has tabs for 'Filtering & Expansion', 'Report Configuration', 'Report Details: Table', 'Formula', and 'UI Wiring'. The 'Filtering & Expansion' tab is active, showing a 'Name' field with the text 'List of Virtual Machines' and a 'Filter' section with a logical expression: 'devtype is VirtualMachine and customer is present'. The second panel, 'Report Configuration', also has the same tabs. The 'Report Configuration' tab is active, showing settings for 'Display Mode' (set to 'default display'), 'Report Type' (set to 'standard table'), and 'Report Rendering' (set to 'static charts by default').

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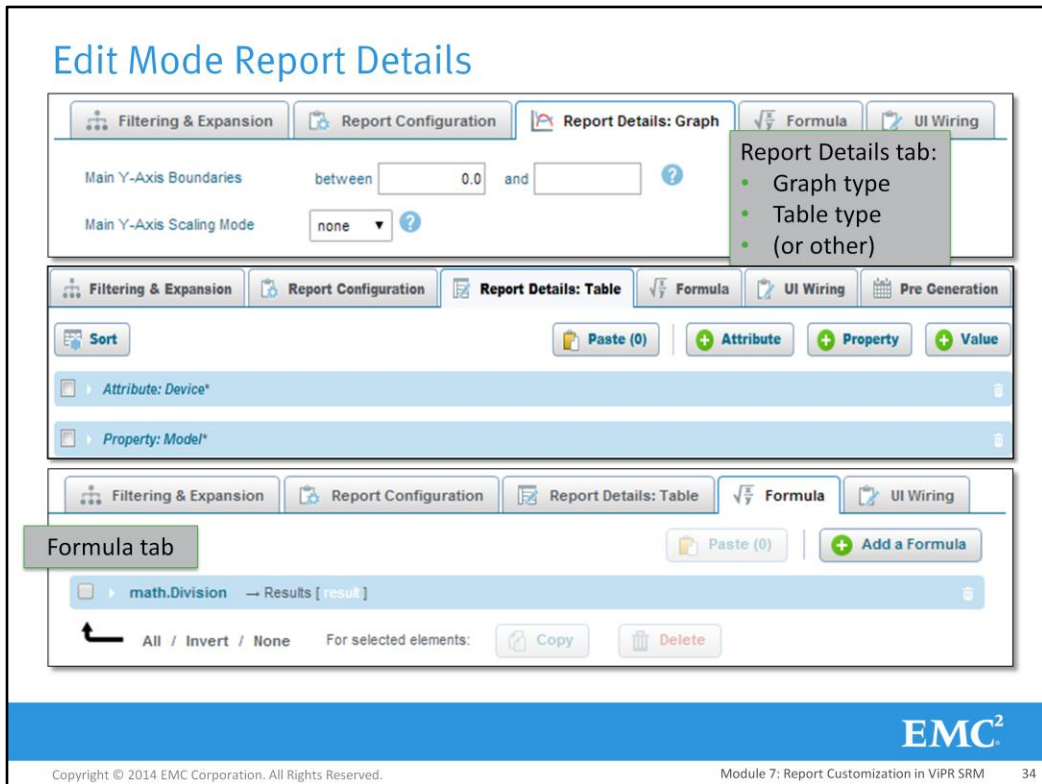
Edit Mode allows you to set parameters for your current report node. From the main panel, you will notice five main tabs:

- Filtering & Expansion
- Report Configuration
- Report Details: [Graph | Table | ...]
- Formula
- UI Wiring

A good practice in report design is to satisfy the requirements responding to inputs as you tab from left to right.

Filtering & Expansion tab: first and leftmost configuration tab. Use parameters here to set a report node's name and a filter (if required, depending on your report design and goal). You will set the metric scope in this tab using the filter for the report you are editing. By default the filter is set to pass everything through to the report.

Report Configuration tab: Second tab from left. This is where you set the report type to either a Graph or a Table.



This slide shows details of two Report Detail tabs: **Graph and Table**. The Report Details tab will show Graph or Table depending on the selection in the Report Configuration tab.

A Graph report has options for Y-Axis boundaries, Threshold definitions for values, metric customization, and legend properties.

A table report created in the Report Configuration tab, permits you to set attributes, properties, and values in the Report Details: Table tab to complete definition in your report.

Also shown is the Formula tab. It is displayed with a formula already selected for this node. Formula is for advanced usage of data manipulation and/or aggregation. Many possibilities are available when using this feature. Those possibilities are left for a Reporting course.

UI Wiring permits you to dictate the interactivity rules in a dashboard report (a click in a report updates the related reports, within the same single report page). This however, is an advanced subject left for a Reporting course.

Steps to Copy a Report

Step	Description
1	Create a new static report node in Edit Mode. For example: create a report named "my VM Report", directly under the node "My Reports".
2	In edit mode, drill down as shown into VMware under the Report Library (follow the link when required): Report Library>>VMware vCenter>> TEMPLATES >> VM Select report node named "Virtual Machines"
3	Select the "Copy the selected Report" icon from the node edit buttons.
4	Select your destination node.
5	Select the "Paste as Child Report" icon.
6	Change the report name to: "List of Virtual Machines".



The purpose of this demonstration is node manipulation. The six basic steps to copy a report will help you understand report node manipulation. Later you will have the opportunity to practice in a lab.

Copy a Report – Step 1

The screenshot illustrates the process of creating a new report in the EMC ViPR SRM interface. It is divided into four numbered steps:

- (a) **Locate "My Reports" tree.** The interface shows a sidebar with a "My Reports" section containing "Dynamic Reports" and "Static Reports".
- (b) **Create a new report node** A toolbar with various icons is shown, with a callout box pointing to the "Create a new Report" button.
- (c) **Assign new report as "my VM Report"** The "New Report" button is highlighted in the sidebar. In the main area, the "Filtering & Expansion" tab is active, and the "Report Configuration" tab is also visible. The "Name" field is populated with "my VM Report".
- (d) **Save the report!!** The "Report Configuration" tab is shown with the "Name" field containing "my VM Report".

The EMC logo is visible in the bottom right corner of the interface.

The first step to create a new report in the receiving report node under "My Reports". This later report entry is a personal sandbox used for experimenting, testing, and developing reports. This area of reports is personal to the user and cannot be shared among other users of the portal.

Notice where you highlight the parent report before adding a new report node. Adding a new report node is always placed as a child report. The default name of that new report is "New Report". It will need to be renamed.

Copy a Report – Steps 2, 3

The screenshot displays the EMC ViPR SRM web interface. On the left, a navigation tree shows the path: Network > Datacenters Summary > Situations to Watch > Inventory > Events & Tasks > <<TEMPLATES>> > <<ESX>> > <<EVENTS>> > <<ROOT>> > <<VM>> > Virtual Machines. The 'Virtual Machines' node is highlighted. A tooltip 'Copy the Selected Report' is visible over the 'Copy' icon in the top toolbar. On the right, a yellow box contains the following steps:

2. Drill-down as follow: Report Library>>VMware vCenter>> TEMPLATES >> VM >> Virtual Machines
3. Select the report and click “Copy the selected Report” icon from node edition buttons

Below the yellow box, the breadcrumb path is shown: All >> VMware vCenter >> <<TEMPLATES>> >> <<VM>> >> Virtual Machines. The main content area shows the 'Virtual Machines' report configuration. The 'Filtering & Expansion' tab is active, showing a filter 'devtype is VirtualMachine' and a display policy 'always show the node'. The 'Expansion' dropdown is set to 'expansion only'.

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Before copying a report template, you must locate it. Drill-down the report tree as depicted above. We are interested in copying the report that shows the list of virtual machines. Once selected, you can click the button to take an in-memory copy of the report template. Then move on to the succeeding steps.

Copy a Report – Steps 4, 5, and 6

4. Select your destination node (my VM Report)

5. Select “Paste as Child Report” icon

6. Edit report name (and Save)

Before pasting the report template, you must select a location to place the report. Drill down in your personal sandbox (under “My Reports”), select the new report node you created previously (that will highlight it) and click on the paste button. This will place the copied report template right under the highlighted node, as a child report.

Although this step is optional, it is recommended, and once completed you can change the report name. Be sure not to confuse yourself with the original report name.

Copy a Report – the Final Result

my VM Report / List of Virtual Machines

August 2014, Monday 4 » Tuesday 5, 10:10 AM EDT | Last 1 Day

31 elements found, displaying 1 to 15.

<< < 1 2 3 > >> Show 15

Name	VM Profile	IP	Host	Resource Pool	Guest OS	State	Status	Nb. of vCPU	Memory Size	Memory (%)	CPU Usage (GHz)	CPU (%)
Linux-SRM1	VM	10.126.66.12	10.126.66.51, 10.126.66.55, 10.126.66.53	Resources	SUSE Linux Enterprise 11 (64-bit)	Powered On	Normal	2	8 GB	2	0.04	1
Linux-SRM2	VM	10.126.66.14	10.126.66.54	Resources	SUSE Linux Enterprise 11 (64-bit)	Powered On	Normal	2	8 GB	2	0.04	1
Linux-SRM10	VM	10.126.66.30	10.126.66.51	Resources	SUSE Linux Enterprise 11 (64-bit)	Powered On	Normal	2	8 GB	1	0.03	1
Win-SRM8	VM	10.126.66.25	10.126.66.51	Resources	Microsoft Windows Server 2008 R2 (64-bit)	Powered On	Normal	4	12 GB	2	0.19	2
Win-SRM2	VM	10.126.66.13	10.126.66.51	Resources	Microsoft Windows Server 2008 R2 (64-bit)	Powered On	Normal	4	12 GB	3	0.10	1

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Now in order to see the result, return back to “Browse Mode” and select the report from your sandbox (under “My Reports”).

You can use “Filter” funnel and use “*SRM*” expression in order to limit scope of the VM names to those containing SRM.

Table Report – Base Concept in Browse Mode

BROWSE MODE

my VM Report / Virtual Machines

February 2014, Tuesday 25 » Wednesday 26 » 1:05 PM EST | Last 1 Day

31 elements found, displaying 1 to 15

Name	IP	Host	Guest OS	State	VCPUs	Memory Size	Memory (%)	CPU Usage (GHz)	CPU (%)
Linux-SRM1	10.126.66.12	10.126.66.52, 10.126.66.51, 10.126.66.54, 10.126.66.53	SUSE Linux Enterprise 11 (64-bit)	Powered On, Normal	2	8 GB	0	0.02	0
Linux-SRM2	10.126.66.14	10.126.66.51, 10.126.66.55	SUSE Linux Enterprise 11 (64-bit)	Powered On, Normal	2	8 GB	0	0.02	0
Linux-SRM10	10.126.66.30	10.126.66.51, 10.126.66.55	SUSE Linux Enterprise 11 (64-bit)	Powered On, Normal	2	8 GB	0	0.02	1
Win-		10.126.66.52,	Microsoft Windows	Powered					

Defined as a Table Report

Rows

Properties

Values

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Table – Base Concept

When you create a table report, you need to determine what will be displayed in both the rows and the columns.

Rows : Typically, table report rows are populated with metrics from child report nodes. Thus, you have to create a child report node and configure it. Usually, the child report node is set to be the expansion of a property.

Columns : Columns display the values and properties. The table report's columns are defined in the Edit mode Table tab.

Note : When you create a new node, this new node is by default a list table report with one column displaying the sub node name.

The above screenshot shows a table report, containing several routers, one per row. These routers come from the sub node that has been expanded on the “device” property.

It is IMPORTANT TO UNDERSTAND that data from the Child reports/nodes populates a table.

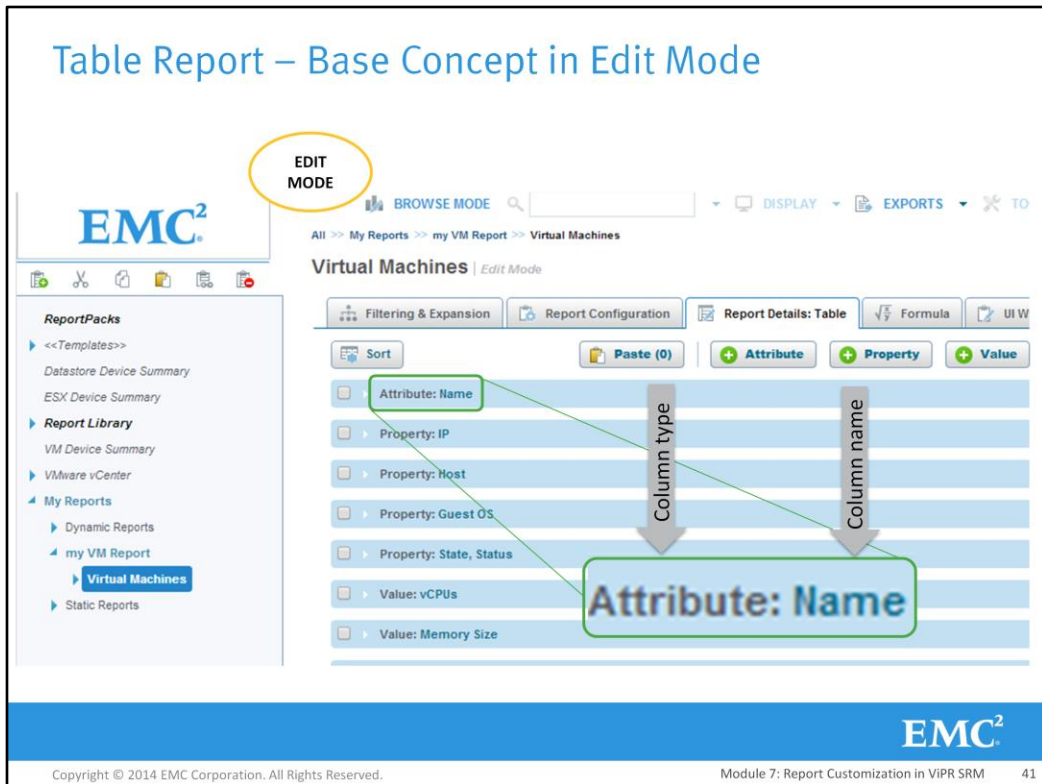


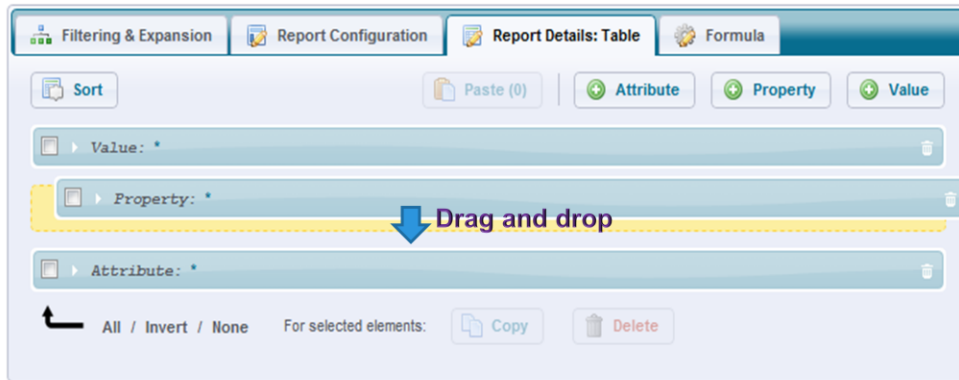
Table – Base Concept

The screen capture above shows the same report as the previous slide, but this time in Edit Mode.

We can see that there are several columns defined in the main section. These are called “Attribute : Name”; “Property : IP” and so on. There are three types of columns available in table reports:

- **Attribute:** Display attributes about the node. You can select these following node information -> Node ID, global ID, node name, global name, expansion name array, node filter, global filter, child count and other. Attribute is very useful for troubleshooting.
- **Property:** Display a property such as device, source, part etc.
- **Value:** Display a metric value that can be calculated over a specified time period.

Moving and Deleting Columns in Table Reports



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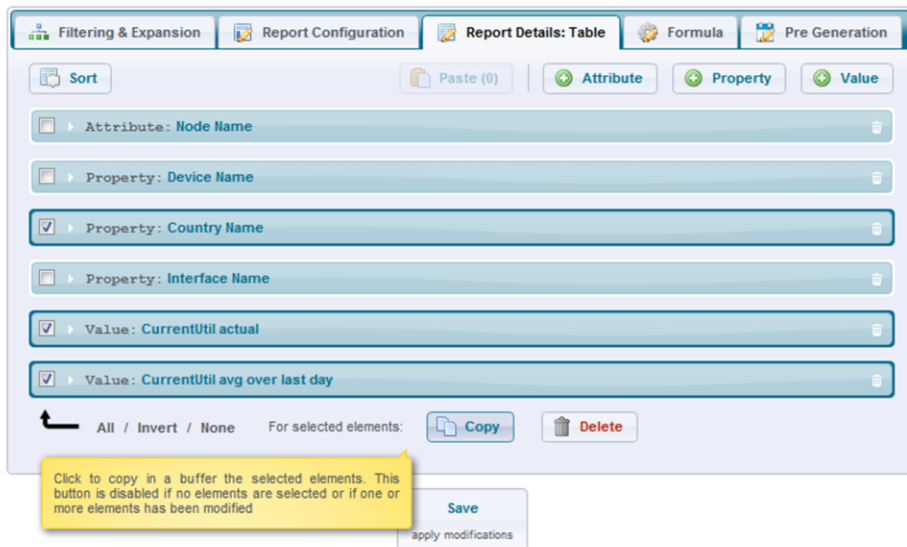
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You can change the sequence of columns by drag and drop action:

- **Drag and Drop:** drag a column to its new location and drop it there.

It is easy to delete a column - simply click on the trash bin icon in the column's header bar at the far right.

Copying Table Report Columns



You can copy columns from one report node to another report node or within the same table.

Select (using the check box) the column(s) you are interested in copying and click “Copy”. Watch the “Paste” button that updates with the number of row(s) copied to the buffer.

You can click Paste on the same report or you may move to another report node and “Paste” there. Always look at the “Paste” button status to confirm you have row(s) buffered and ready to paste in.

Changing Table Values

Value: Unconfigured Capacity

Value: Hot Spares Capacity

Value: Unusable Capacity

Click white arrow facing right

A value column fetches a value from the database. You can specify the value with a filter, or as a formula result, such as the amount of your CPU utilization, and can express the value in the format you choose, such as percentage or bits per second.

* Column Name: Unusable Capacity

Selected Value: UnusableCap

Use time settings from: this column

Time Management

Value settings

Advanced Properties

Summary settings

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To edit the parameters associated with table values, click the right facing arrow next to the value of interest and select the parameters of choice to edit. Time Management and Value settings are two of the parameter groups we will look more closely at in this module.

Time Management

Each value type column defined in a table report can display values over different time periods.

The screenshot shows the 'Time Management' configuration section. It includes a help message: 'The Time Management section controls the aggregation and time periods of the selected values. If more than one time period is defined, the values will be represented by several columns in Browse mode.' Below this are several settings:

- Sampling Period:** A dropdown menu set to 'real-time'.
- Sampling Type:** A dropdown menu set to 'average'.
- Column Time Range(s):** A dropdown menu set to 'use a fixed time range', followed by 'previous' and '1 day'.
- Recover...:** A dropdown menu with options 'the last value only' (selected) and 'all the values in the time range'.
- Time Threshold:** A text input field set to '600 seconds'.

Two yellow callout boxes with blue brackets provide additional context:

- Select aggregation:** Points to the 'Sampling Type' dropdown.
- Select time period:** Points to the 'Column Time Range(s)' and 'Recover...' dropdowns.

At the bottom, a dropdown menu for 'Column Time Range(s)' is expanded, showing options: 'inherit report time range' (selected), 'inherit report time range', 'use a fixed time range', and 'generate a column on the'.

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Table – Time Management

Sampling Period: The Sampling Period works with the already computed temporal aggregates in the database which you have chosen to use. This option is especially relevant when you use a long time range. For example: when the time range is a month or year, selecting a day or week aggregate instead of real-time, dramatically increases the speed of the report generation. With longer time ranges, a fine grain detail (with a multitude of dots appearing along the graph) of time is not necessary.

Sampling Type: This is the aggregate computation type you want to use for the sampling period.

Column Time Range(s): There are three options to choose from in the column time range: use "inherit report time range", "use a fixed time range" or "generate a column on the". The first one uses default's report time range definition whereas the second one is used to specify a specific time range independently overwriting the default report time range. The third option is used to generate multiple column time periods.

Recover ... There are two options: "the last value only" or "all the values in the time range". The last value only retrieves the last value whereas the second option retrieves all the values in the report time range. The second option results in several values, requiring an aggregate to calculate a single value to display in the table report. Use the Temporal Aggregation to do this. A drop-down list appears.

Time Threshold: The interval of time relative to the report time value which acts like a tolerance interval for data retrieval. If you select real-time, the threshold is in seconds. If you select an aggregate sampling type, the time threshold is a number of periods.

Note: In this example, the real-time values are used thus "Sampling Type" does not apply.

Value Settings

Display all values:

Value settings

1 Sets up the format for displaying values and the specific thresholds for the column. Values may not automatically display themselves the way you want, have too many decimal numbers, not be in the desired unit or visual alerts must be triggered.

Use Rounding ☒ 0 decimals ?

Scaling Mode none ?

Value Display display all values ?

1 Thresholds define Severity ranges. Ranges are defined by their lower boundary value, their upper boundary being defined by the next value in the Threshold sequence. Boundary values are inclusive if the Threshold Severity is greater than its neighbour. Only the last definition is kept in case of duplicate values. Duplicate names may be used. Values are mandatory and must be in decimal format, including -Infinity and Infinity.

Thresholds Definition

[Add a new threshold](#)

Level	Normal	Major	Critical
Normal			
Major		95.0	
Critical			120.0

Legend

- ✔ Normal
- ⚠ Major
- ✖ Critical

Allocated Memory %

This column displays the average sampling using the 1 hour or higher aggregate over the values of the last 1 day.

Severity Normal set to Minus Infinity.
Severity Major set to 95.
Severity Critical set to 120.

List of Hosts

17 elements found, displaying all elements. VMware inventory Show ALL

ESX Name	Datacenter	Total CPU Ghz	Total Memory	Allocated Memory %
lgba046.lss.emc.com	CSE-Hopkinton	106	24 GB	80 ✔
lgac019.lss.emc.com	CSE-Hopkinton	9	32 GB	13 ✔
lppa149.lss.emc.com	CSE 176 Lab	32	48 GB	177 ✖
lppa220.lss.emc.com	CSE 176 Lab	30	48 GB	133 ✖
lppa058.lss.emc.com	CSE 176 Lab	42	96 GB	104 ⚠

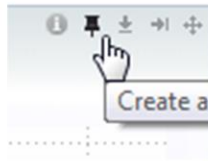
For each defined value in a column, there may be three levels of criticality that could trigger **visual alerts**. Threshold definitions are embedded under the “Value Settings” definition. To enable this feature, you simply set a value in one or more of the “Level” fields.

Values Display: The options include:

- Display all values
- Display normal and severity values
- Display unknown severity and above
- Display minor severity and above
- Display major severity and above
- Display critical severity

For instance, by changing to “display critical severity”, the report displays only rows that fit the critical level condition.

Using the “My View” Custom Dashboard for a Report



Appears when the mouse pointer is hovered over a chart, graph, or table. Use the “push pin” icon to pin the element to your “My View” branch of the report tree.

Create a link to this element in “My View”

Clicking the “push pin” brings the following under “My View”. All that is needed is to re-organize the report list, names, and layout. “My View” is by default defined as a “three reports per line” layout.



NOTE: Pinning a report creates a link to the report. It does NOT copy the full report definition into the tree.

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Using the pin icon in a report will create a report entry named “My View” under “My Report” (which is your report sandbox”) and then copy the selected report definition back under “My View”... what has been shown manually is now done automatically!

Be aware, this creates a link to the report, it does not bring a full copy of the report definition. You can change the report name but not the linked instance. The benefit of doing things this way is that if the original report gets updated, this will be reflected in your custom dashboard (“My View”), if the report has not been moved under a different level.

Lab : Part 2 – Create, Copy, and Modify Reports

The purpose of this lab is to:

- Create a new report
- Copy and paste a Table Report
- Modify a Table Report

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Module 7: Report Customization in ViPR SRM

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This lab covers creating reports, copying reports, and modifying tables in ViPR SRM Edit Mode.

Lab Debrief: Part 2 - Create and Copy (cut and paste) Reports

This lab covered :

- Creating a new report
- Copy and pasting a Table Report
- Modifying a Table Report

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Module 7: Report Customization in ViPR SRM

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This lab covered the use of ViPR SRM Edit Mode for creating a new report. Copying reports and pasting them as child reports into a personal dashboard is performed and finally, a table report is modified.

Module 7: Report Customization in ViPR SRM

Lesson 3: Summary

During this lesson the following topics were covered:

- Report edition mode
- Copy and paste a report
- Altering a table report
- My View: my custom dashboard



This lesson covered the functions and capabilities available in ViPR SRM Edit Mode. Details were provided for copying, pasting, and modifying reports. This lesson concludes with a review of the My View dashboard option in report management.

Module 7: Report Customization in ViPR SRM

Lesson 4: Key Concepts of Reporting

This lesson covers the following topics:

- Display policy
- Filtering concept



This lesson covers setting a display policy for reports, and how to use the SRM filter to limit the metrics used in a report.

Display Policy

Display policy determines how report data will be displayed in terms of data aggregation, time range, the number of reports per line, report style, and the rendering of data in the report.

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The Display tab allows you to alter the view of the current report. Three sections can be identified under Display tab as was shown earlier: Report Type, Time Selection, and Actions.

Actions: this section shows action once you are done with other sections.

- **View in Full Page:** displays current report in full page, in a new window.
- **Revert to Default Report:** brings the report back to its default settings after you have made changes.
- **Apply:** applies the changes you set in the Report Type and/or Time Selection sections.

Time Selection: this second section groups Time range selection options of our current report.

- **Display [...] values:** used to change the time base value for the chosen aggregation method to be used. Time base values may be real-time values or may be larger than real-time to aggregate data in some way.
- **Using [...] aggregation:** used to select the method of aggregation (average, max, etc)
- **Over [...]:** used to change the time range selection of the report.
- **Padlock icon:** toggles the lock. When locked, the modified Time Selection is kept while browsing other reports for ease of comparison.
- **Time Range Quick Switch:** defined by clicking the opening or closing double arrow sign. The Time Range Quick Switch arrows allow you to jump backward or forward in time. Once clicked, the time selection shows linked calendar icons to select date-time start or date-time end pop-up calendars where you can set the exact time range you desire in your report. Then using the time range quick switch arrows for previous and next, you can jump from one range to another.
- **Report Type:** this third section groups options based on the default format for this report. This section will allow you to change some options in your current report which will determine how the report is presented.
- **Display:** used to change the number of reports per line when presented in the report pane. Especially useful for mixed reports.
- **Report:** used to change the report style. This option depends on the default report's currently set format type.
- **Rendering:** Some graphics can be rendered either in static mode or in dynamic mode. In dynamic mode, hovering the mouse pointer over any spot on a graph in a chart will pop-up a tip tool containing the exact value at that point with the date and time. Bar charts will show a pop-up with the metric measurement and the total measurement for all metrics in the bar chart. While dynamic charts look nicer and are easier to use, static charts may be quicker to load.
- **Summary Statistics:** used to overlay useful information on your report type. This includes statistics information, pin points, trending, etc.

Setting a Filter Using the Filter Wizard

Filtering & Expansion | Report Configuration | Report Details: Table | Formula

Name: New/Report

Filter

devtype is Array and parttype is Disk or parttype is LUN

devtype=="Array" & (parttype=="Disk" | parttype=="LUN")

Use the filter of this node for: expansion only

Display Policy: always show the node

Expansion

The specified properties will be used for the expansion of the current node

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An important concept in report customization and creation is to select the proper metric scope and context. This is achieved by setting a filter. The filter selects the data metrics that will be included for report computation. A tool that helps in creating the filter expression is the Filter Wizard.

The filter wizard is extensively used throughout SRM, not just for report customization.

The filter wizard can be defined as the GUI tool that allows you to work with a filtering expression. The blue shape over the above snapshot delimits the filter wizard working area.

Here is a list of some of other UI tools that use the filter wizard:

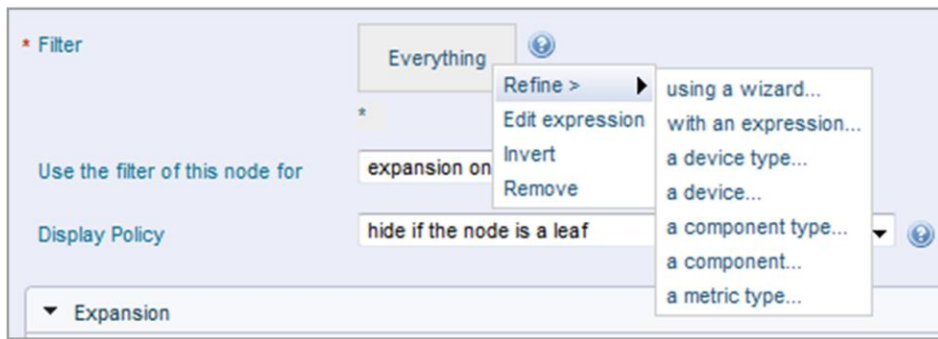
- **Report Edition:** Use in report filtering, metric selection in table columns, and formulas.
- **Search Engine:** Assists in selecting a metric scope.
- **Alerting Engine:** Permits selecting a metric in the analysis process.
- **Management of Database Metric:** Use to select a metric for deletion or for reference.

The filter wizard shows up as a series of related logical boxes, each one containing one or more properties and value expressions linked together by logical operators such as AND and OR.

As a filter is built, filter boxes pop up as the assembly evolves to reveal your filter expression.

At the bottom of the graphical filter view, the statement builds in text to show the filter expression.

Limiting Metrics Using the Filter Wizard



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The Initial state of a new filter expression shows the filter setting as “everything”. This means the current context selects all metrics for report computation. In order to limit the scope of the report context, you will need to create a filter expression. The filter works only with metric properties.

To filter on a given property, hover the mouse on the box and left-click on the “Everything” box, a contextual menu will appear, and choose “Refine ► using a wizard...”. This will launch the Refine Wizard.

Other Refine menu items available include:

- **“with an expression...”**:this allows you to type in the filter’s expression manually
- **“a device type...”**:this launches the Refine Wizard and sets the left-hand side of the expression with the “devtype” property
- **“a device...”** :this launches the Refine Wizard and sets the left-hand side of the expression with the “device” property
- **“a component type...”** :this launches the Refine Wizard and sets the left-hand side of the expression with the “parttype” property
- **“a component...”** :this launches the Refine Wizard and sets the left-hand side of the expression with the “part” property
- **“a metric type...”** :this launches the Refine Wizard and sets the left-hand side of the expression with the “name” property

Filter Wizard Operator and Property Value Choices

The screenshot illustrates the Filter Wizard interface. At the top, a context menu is open for the expression 'devtype=='. The menu options include 'And', 'Or', 'Edit expression', 'Edit using wizard', 'Invert', and 'Remove'. The 'Edit using wizard' option is selected, leading to the 'Device Type' dialog box. This dialog box has a search bar with 'devtype==' and a list of operators: 'is', 'is not', 'is like', 'is not like', 'is present', 'is not present', 'starts with', 'doesn't starts with', 'ends with', 'doesn't ends with', 'contains', and 'doesn't contains'. The 'is' operator is selected. To the right, the 'Component Type' dialog box is shown, titled 'Refine devtype=="Array"'. It has a search bar with 'parttype is' and a list of property values: 'Access', 'AccessToLUN', 'Application', 'Controller', 'Disk', 'Host', 'Initiator', 'LUN', 'Memory', and 'MetaMember'. The 'Access' property value is selected. A yellow callout box points to the 'is' operator in the 'Device Type' dialog, stating: 'Click on "is" to pull down the list of operators'. Another yellow callout box points to the 'Access' property value in the 'Component Type' dialog, stating: 'The Wizard automatically suggests from a list of available property values'. The bottom of the slide features the EMC² logo and the text 'Copyright © 2014 EMC Corporation. All Rights Reserved.' and 'Module 7: Report Customization in ViPR SRM 55'.

Once you have chosen the property name (at the left side of the expression), you have to enter or select a property value. Again, just type in and the Wizard will provide you with a list of matched suggestions.

When using the filter wizard, the default operator is set to an exact match (for example, the "is" keyword) between property name and property value.

If the selected operator is not what you want, you may change it.

To change the operator, click the "is" keyword between the property name and the property value input text box, a drop-down menu will appear, presenting you with a list of available operators. Choose the proper operator you want to define the relation between the property and its value.

The operator must be one of:

- **"is"**: an exact match of a property value
- **"is not"**: negation of an exact match of a property value
- **"is like"**: is a flexible match of a property value
- **"is not like"**: a negation of the "is like"
- **"is present"**: no matter what a property value is, match if value is present
- **"is not present"**: negation of the "is present"
- **"starts with"**: flexible match of a property value, constrain by the start of the text string
- **"doesn't start with"**: negation of "starts with"
- **"ends with"**: flexible match of a property value, constrain by the end of the text string
- **"doesn't end with"**: negation of "ends with"
- **"contains"**: flexible match of a property value, constrain by the middle part of the text string
- **"does not contain"**: negation of "contains"

Filter Operands

Operation	Operand
AND	&
OR	(pipe)
NOT	!
Is like	=
Strictly is	==
Wildcard (many characters, including no character)	%
Wildcard (one character)	_ (underscore)
Priority, expression grouping	()



Example: `devtype=='Array' & (parttype=='Disk' | parttype=='LUN')`

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Any filter expression created using the filter wizard becomes a textual expression that is similar to the SQL query language.

For the more advanced user, it is sometimes faster to type in the filter expression without using the filter wizard. To type in the expression, a user would have to select the “Edit expression” option in the filter wizards’ contextual menu. The above table shows the available operand characters to use for the desired operation.

Lab : Part 3 – Create and Modify a Personal Dashboard

The purpose of this lab is to:

- Create a new personal dashboard
- Modify the display values for the dashboard

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Module 7: Report Customization in ViPR SRM

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This lab covers creating a new personal dashboard and modifying its display values in ViPR SRM Edit Mode.

Lab Debrief: Part 3 - Create and Modify a Personal Dashboard

This lab covered :

- Creating a new personal dashboard
- Modifying the display values for the dashboard

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This lab covered creating a new personal dashboard and modifying the display values for the new report. A conclusion is drawn from the impact of changing the display values.

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Lesson 4: Summary

During this lesson the following topics were covered:

- Report structure
- Filtering concept
- Expansion concept
- Display policy

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Module 7: Report Customization in ViPR SRM

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This lesson covered the report structure in SRM. A focus is given to report management through the Edit mode features of SRM. Discussion of the functions in the various menu tabs in Edit mode were given including the filtering and expansion mode concepts. The Browse mode features available for creating a policy governing a reports display were also presented.

Module 7: Summary

Key points covered in this module:

- Describe the tasks and tools used in custom reporting
- Modification of an existing report using edit mode to copy, paste, or alter a report
- Create simple table and chart type reports using the report wizard
- Create a dashboard for my view



This module covered the management of custom reporting. Use of the Report Wizard to create reports, and Edit Mode to modify or copy reports was discussed. The key concepts of reporting were examined including report structure, expansion, and filtering. This module concluded with a discussion on ReportPacks.

Course Summary

Key points covered in this course:

- Describe the architecture and benefits of ViPR SRM
- Use of the ViPR SRM dashboard to manage storage
- Capacity planning in the storage environment
- Monitoring and analysis of performance indicators
- Exploring and maintaining storage service levels and chargeback accounting
- Storage configuration compliance management with ViPR SRM
- Using operational alerts for awareness of storage conditions
- Creating and customizing reports as needed in user dashboards



This course covered the tasks ViPR SRM can assist storage administrators to perform in the management of a cloud ready data center environment.

Thank You!



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