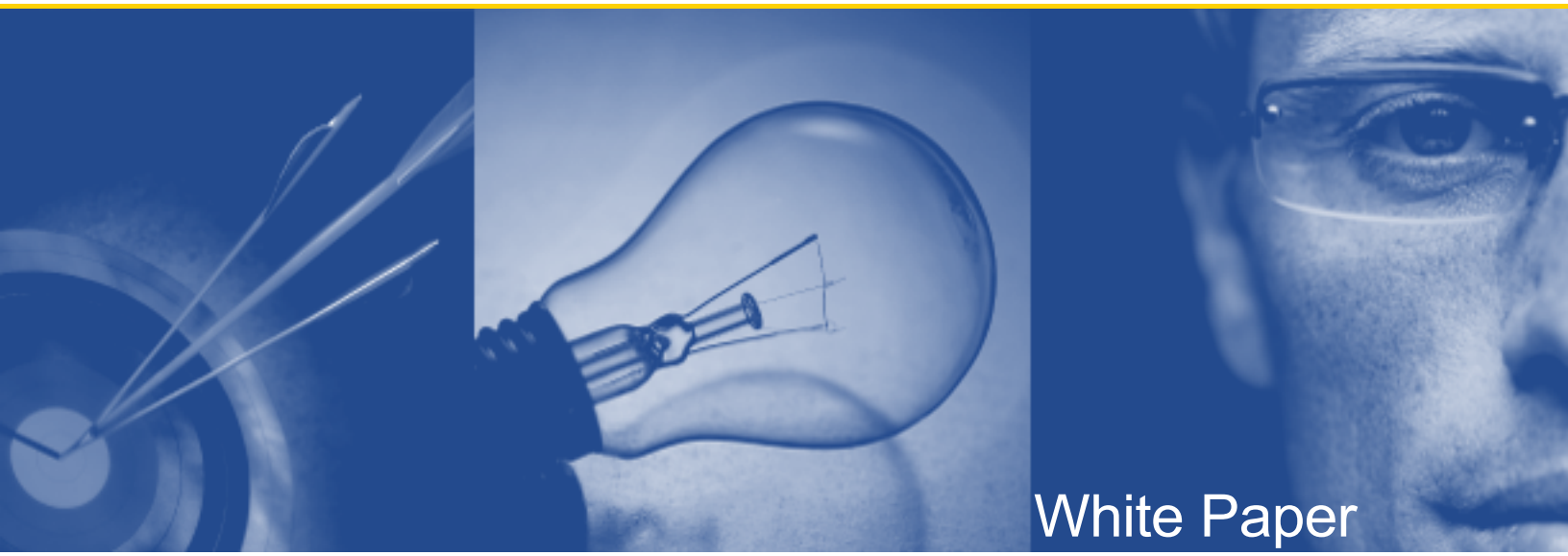
QUEST SOFTWARE®

De-Mystifying VMware® Storage Consumption

Written by
Quest Software, Inc.



WARRANTY

The information contained in this document is subject to change without notice. Quest Software makes no warranty of any kind with respect to this information. QUEST SOFTWARE SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTY OF THE MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Quest Software shall not be liable for any direct, indirect, incidental, consequential, or other damage alleged in connection with the furnishing or use of this information.

TRADEMARKS

World Headquarters
5 Polaris Way
Aliso Viejo, CA 92656
www.quest.com
e-mail: info@quest.com

Please refer to our Web site (www.quest.com) for regional and international office information.

Updated—January 16, 2009

CONTENTS

STORAGE INEFFICIENCIES UNDERMINE VMWARE CAPITAL REDUCTION BENEFITS 1

HOW STORAGE HORIZON® HELPS VMWARE ENVIRONMENTS 2

VMware Storage Relationships and Utilization Details 2
Forecast Future Storage Usage 5
Analysis and Reports 6
Automated Capacity Plans 8

INCREASE SERVER UTILIZATION AND STORAGE UTILIZATION 9

ABOUT QUEST SOFTWARE, INC. 10

Contacting Quest Software 10

STORAGE INEFFICIENCIES UNDERMINE VMWARE CAPITAL REDUCTION BENEFITS

Host virtualization products such as VMware have become increasingly popular for many reasons, with the primary economic benefit being the decrease of capital spending on server hardware. However, virtualized host environments introduce new levels of abstraction, further obfuscating already complex storage entity associations. From direct analysis of petabytes of live production data at Global 3000 companies, Quest has found that storage utilization—defined as the percent of physical storage with application and protection data written to it—often decreases dramatically with the introduction of host virtualization. Therefore, without a comprehensive storage capacity management solution in place, decreased storage utilization compromises the return on investment that host virtualization brings to IT.

A major hindrance for administrators of both the ESX servers and the storage arrays in VMware environments is that they cannot intuitively understand actual virtual machine (VM) storage consumption of the array. This is due to the additional VMware abstractions—VMware file systems (VMFS), VMware virtual disks (VMDK), shared storage, thin provisioning, non-persistent storage, VMmotion, etc—which make understanding true storage utilization even more difficult. This typically results in dramatic storage over-provisioning to ensure that neither the ESX Servers nor any of the VMs run out of storage. This additional over-provisioning of storage often reduces or eliminates overall IT savings in server hardware reductions.

HOW STORAGE HORIZON® HELPS VMWARE ENVIRONMENTS

The Storage Horizon storage capacity management solution solves this problem for VMware server environments by helping storage teams understand to what extent and how rapidly applications running on VMs are consuming storage at the array level so that they can safely operate at much higher storage utilization levels. Storage Horizon can:

- Provide utilization details and relationships of ESX server with underlying storage and VMs
- Forecast future VMware storage usage
- Analyze and report on VMware storage environments
- Provide automated storage capacity plans

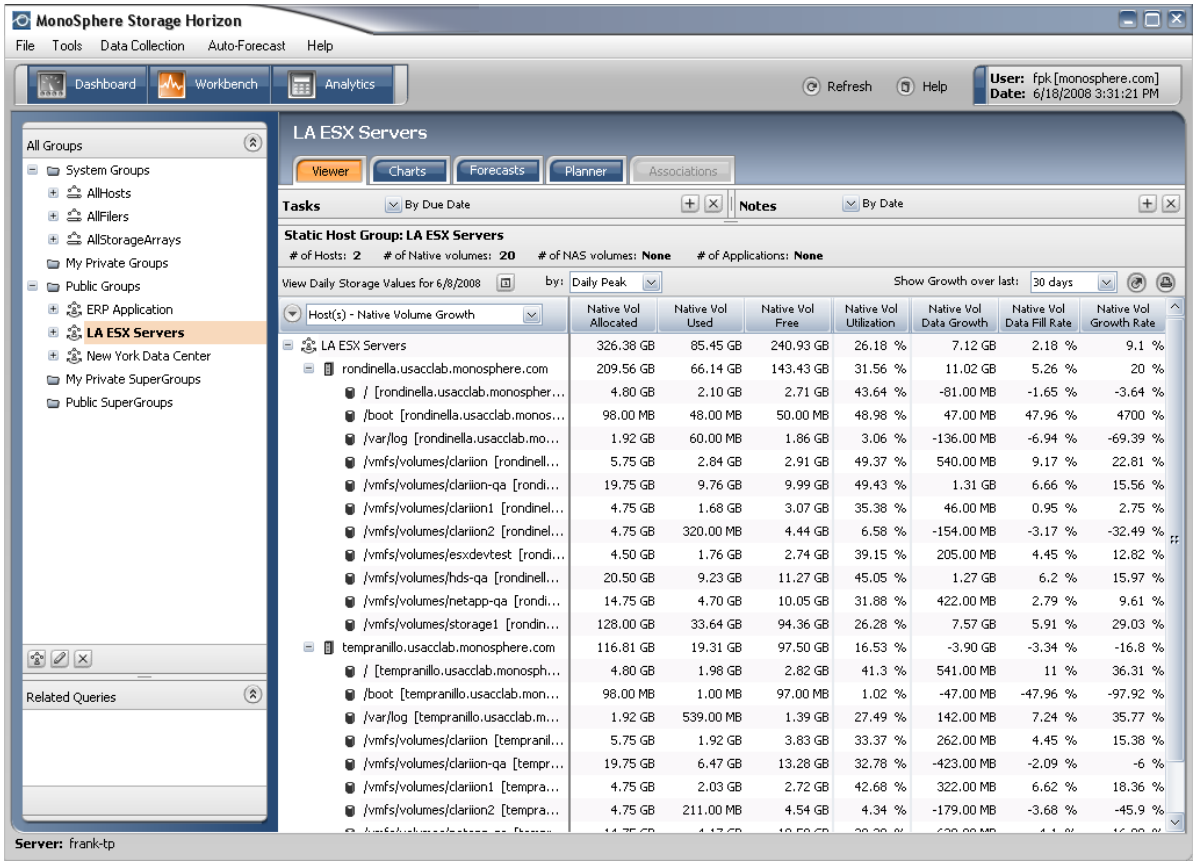
The VMware and Storage Horizon combination provides increased utilization of server and storage environments, enabling IT teams to dramatically reduce capital spending and operating expenditures for energy and data center floor space.

VMware Storage Relationships and Utilization Details

Thru agent-less data collection, Storage Horizon gathers storage related information from ESX servers using industry standard Secure Shell (SSH) and the Storage Management Initiative-Specification (SMI-S) protocols; and VMware VMs using Windows Management Instrumentation (WMI) for Windows and SSH for Linux. Storage Horizon then provides storage teams with critical information:

- Size, usage, and usage growth of ESX servers, VMFSs, and VMDKs storage
- Size, usage, and usage growth of VM file systems and raw partitions
- The relationships between array LUNs, ESX servers, VMFSs, VMDKs, VMs, and VMs file systems and raw devices.

This allows storage teams understand to what extent and how rapidly applications running on VMs are consuming storage at the array level.

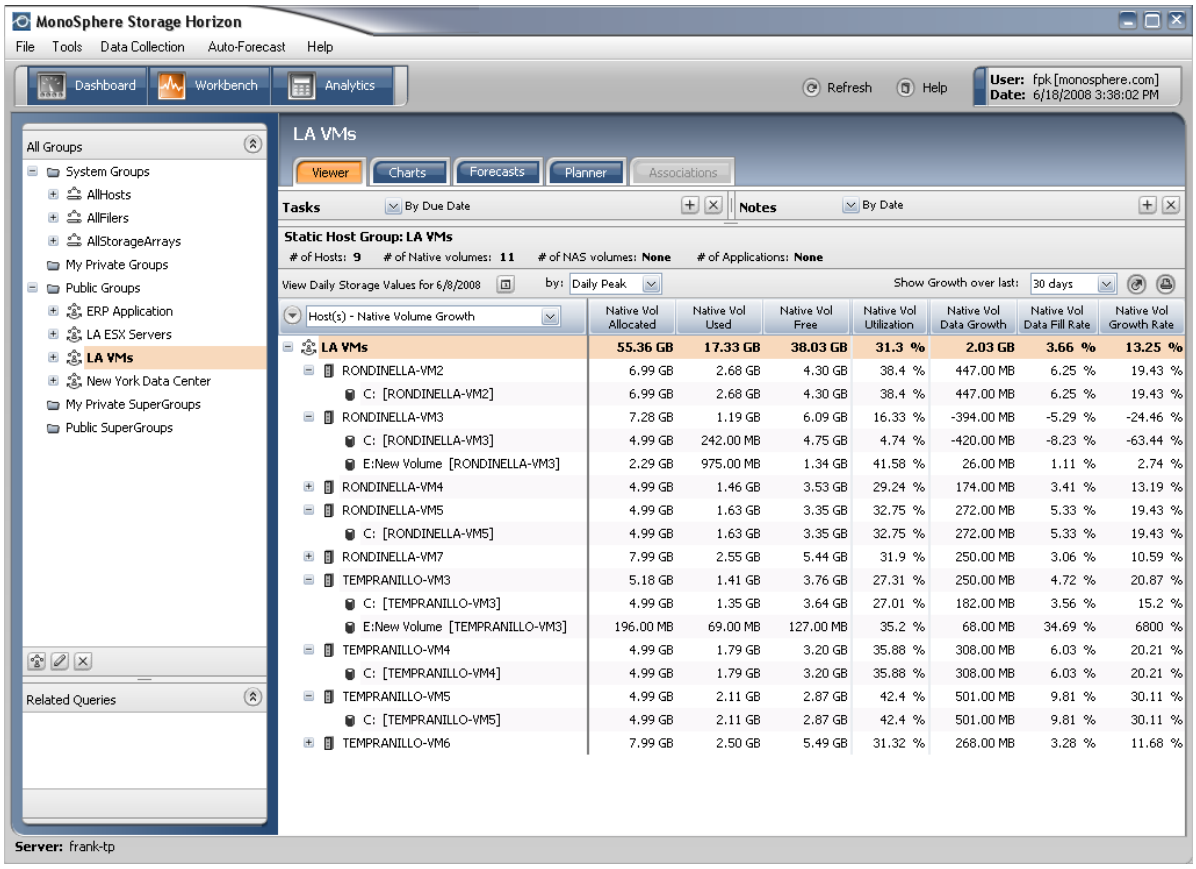


The Storage Horizon Viewer provides storage allocation, usage, utilization, and usage growth statistics for every VMFS and ESX server.

Virtualization Server Name	Datastore	Array/Filer	Lun	Files	Capacity	VM	Device Name	Device Allocated	Device Used
SHARED: tempranillo...	/vmfs/volumes/clariion-qa				19.75 GB				
		APM00064702270	LUN 213		19.99 GB				
				/vmfs/volumes/clariion-qa/tempranil...		TEMPRANILLO-VM4	C:	4.99 GB	1.79 GB
				/vmfs/volumes/clariion-qa/tempranil...					
				/vmfs/volumes/clariion-qa/tempranil...					
				/vmfs/volumes/clariion-qa/tempranil...		TEMPRANILLO-VM5	C:	4.99 GB	2.11 GB
				/vmfs/volumes/clariion-qa/thin.vmdk		TEMPRANILLO-VM3	E:New Volume	196.00 MB	69.00 MB
				log (Rollup)					
				swap (Rollup)					
SHARED: tempranillo...	/vmfs/volumes/netapp-qa				14.75 GB				
		pegasi	/vol/esxqa...		15.00 GB				
				/vmfs/volumes/netapp-qa/rondinell...		RONDINELLA-VM4	C:	4.99 GB	1.46 GB
				/vmfs/volumes/netapp-qa/rondinell...		RONDINELLA-VM5	C:	4.99 GB	1.63 GB
				log (Rollup)					
				swap (Rollup)					

Storage Horizon discovers the relationship between the storage, VMFS, VMDK, VM, and VM file systems and raw partitions which enable storage teams to efficiently provision storage in VMware environments.

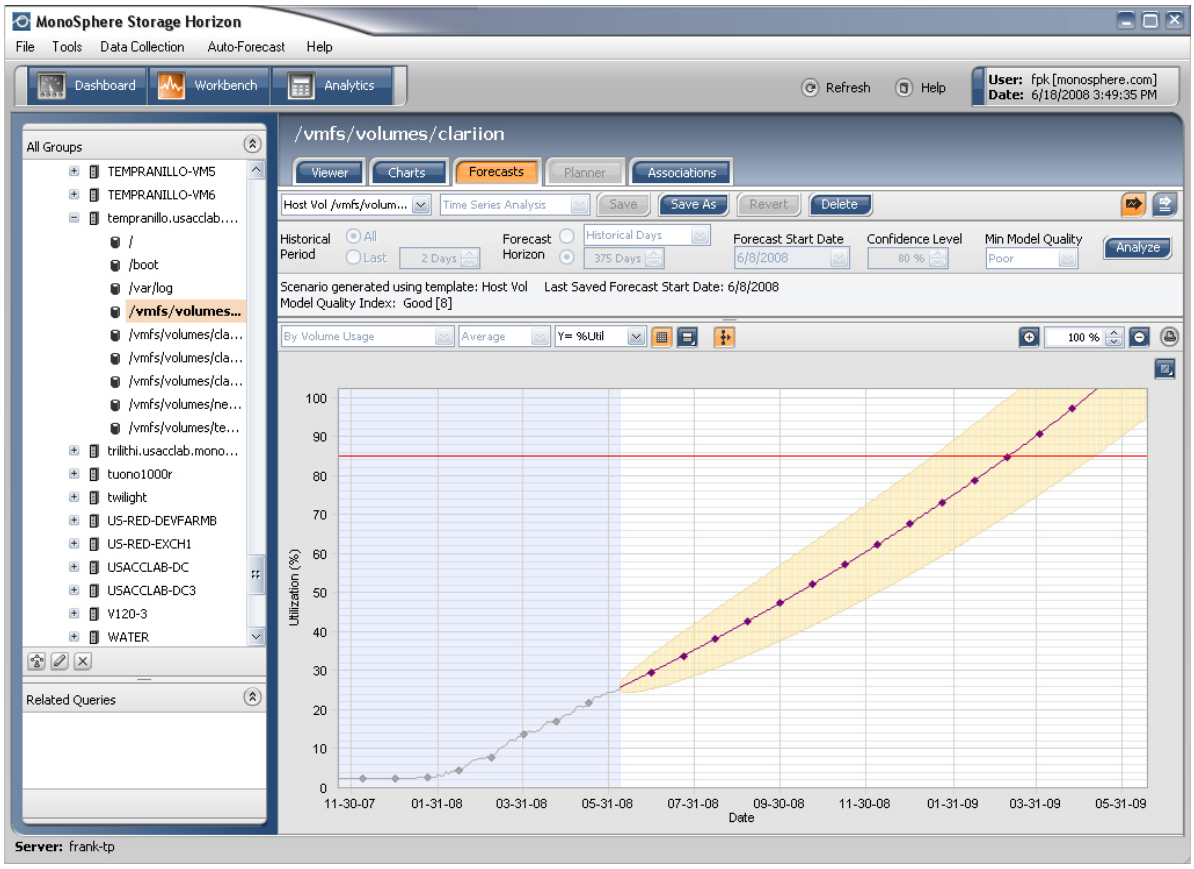
In large IT environments, administrators often need to organize their VMware environment in smaller management groups. Storage Horizon provides administrators the capability to establish custom groups that allow them to categorize storage elements associated with users, business units, applications, storage tiers etc. into logical views. Storage Horizon provides users with advanced and highly flexible capabilities to create their own static or dynamic groups.



The VMs located in the Los Angeles data center are grouped together to provide customized views for easier management.

Forecast Future Storage Usage

Storage Horizon applies sophisticated predictive analytics to project future storage usage growth for individual or groups of VMFSs, ESX servers, VM file systems or raw partitions, and the VMs. These forecasts are automatically generated and are saved in the Storage Horizon database for further analysis and reporting. This allows users to determine when and where to add the right amount of new capacity, transforming the administrator from reactively fighting fires to proactively managing growth through efficient storage hardware provisioning.

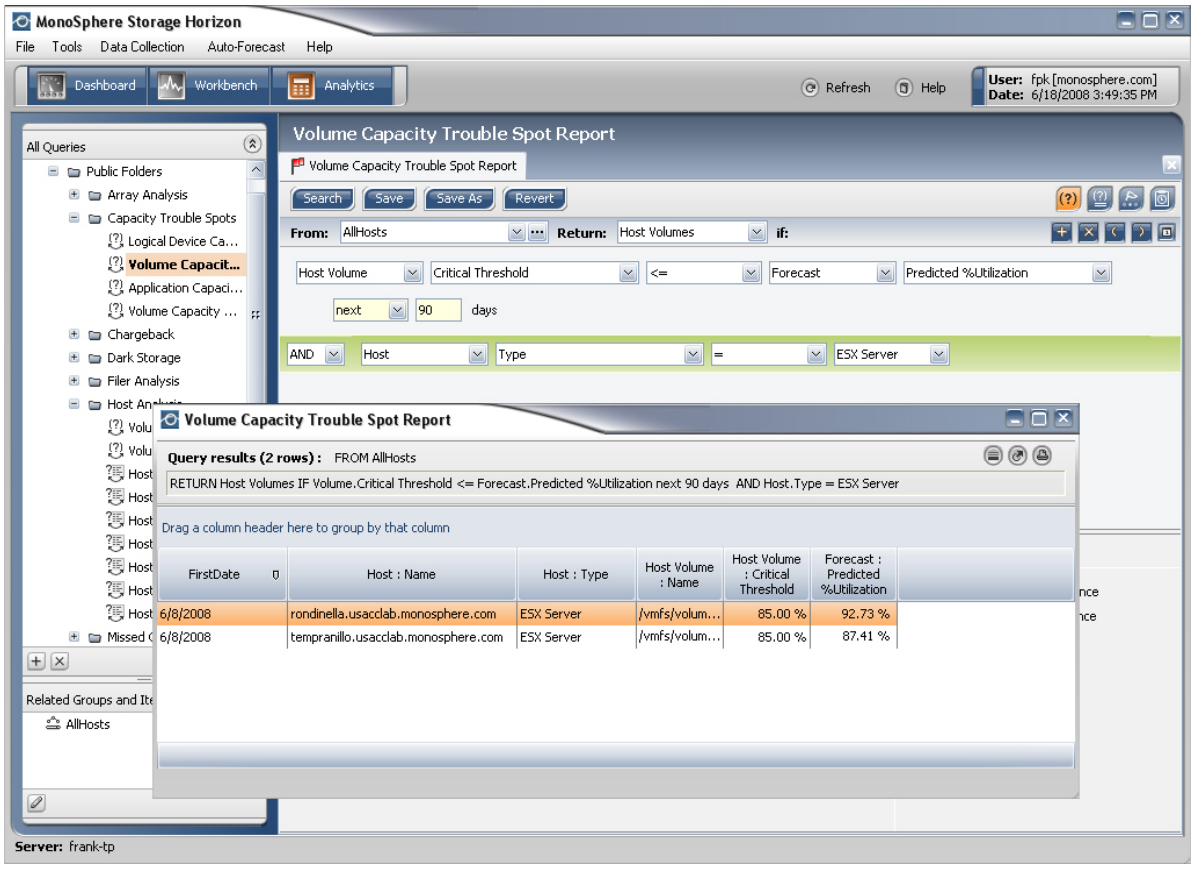


Advanced statistical analysis of historical data generates accurate projections of future utilization growth. Growth rates can be linear, exponential, or seasonal depending on historical behavior.

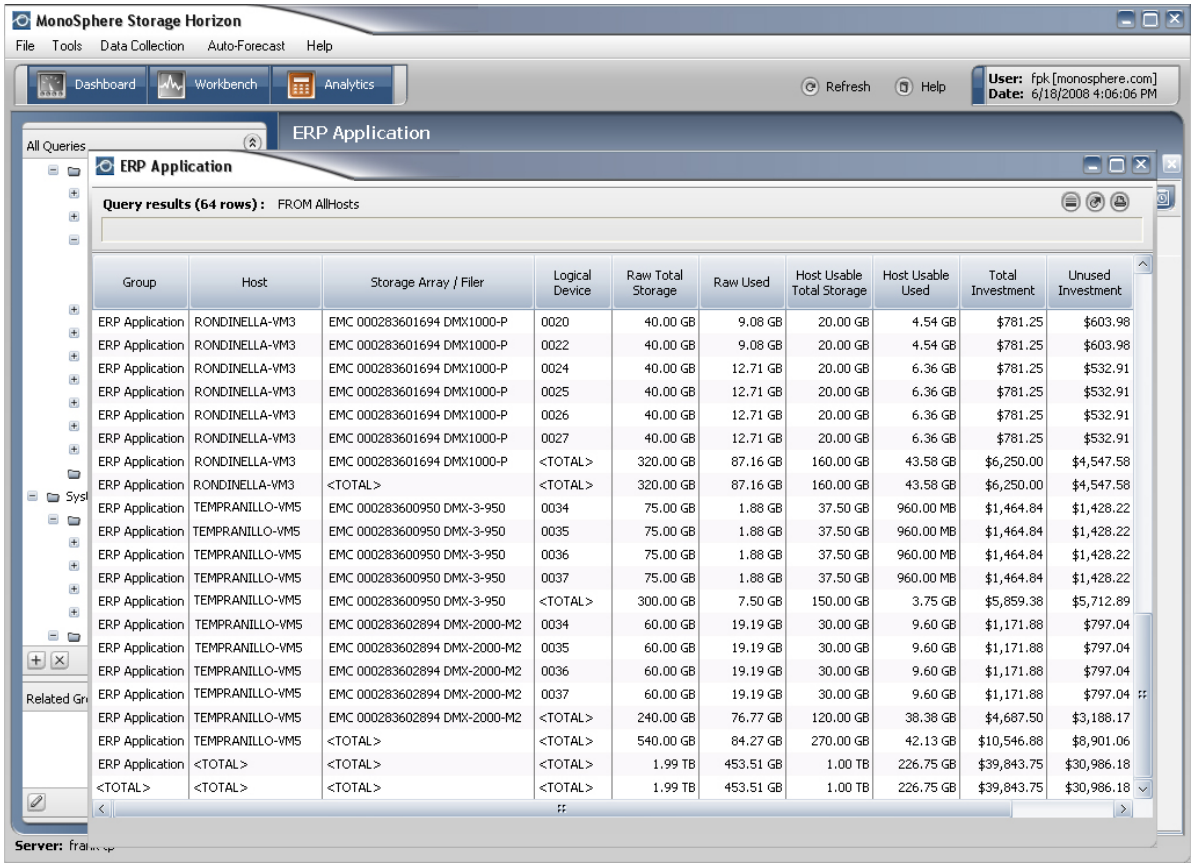
Analysis and Reports

Storage teams need accurate, timely, and easy-to-understand analysis of their storage infrastructure in order to efficiently manage their rapidly growing and changing environment. Storage Horizon provides users with unique and insightful analysis and the ability to generate powerful custom reports through its Report Builder.

Storage Horizon can analyze and report on storage relationships, usage, and forecasts of individual or groups of VMFSs, VMDKs, ESX servers, VM file systems or raw partitions, and the VMs.



Storage Horizon identifies the VMFSs that are forecasted to exceed a critical threshold in the next 90 days.

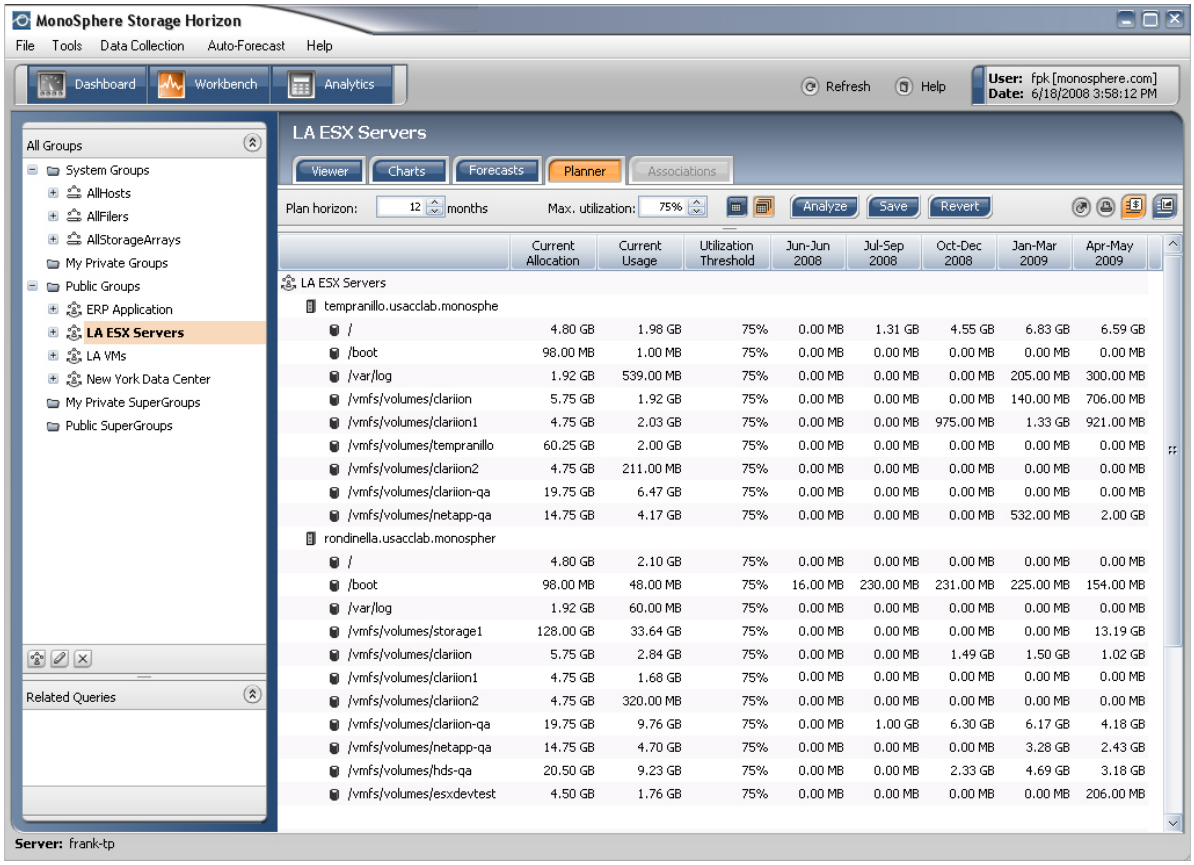


Group	Host	Storage Array / Filer	Logical Device	Raw Total Storage	Raw Used	Host Usable Total Storage	Host Usable Used	Total Investment	Unused Investment
ERP Application	RONDINELLA-VM3	EMC 000283601694 DMX1000-P	0020	40.00 GB	9.08 GB	20.00 GB	4.54 GB	$781.25	$603.98
ERP Application	RONDINELLA-VM3	EMC 000283601694 DMX1000-P	0022	40.00 GB	9.08 GB	20.00 GB	4.54 GB	$781.25	$603.98
ERP Application	RONDINELLA-VM3	EMC 000283601694 DMX1000-P	0024	40.00 GB	12.71 GB	20.00 GB	6.36 GB	$781.25	$532.91
ERP Application	RONDINELLA-VM3	EMC 000283601694 DMX1000-P	0025	40.00 GB	12.71 GB	20.00 GB	6.36 GB	$781.25	$532.91
ERP Application	RONDINELLA-VM3	EMC 000283601694 DMX1000-P	0026	40.00 GB	12.71 GB	20.00 GB	6.36 GB	$781.25	$532.91
ERP Application	RONDINELLA-VM3	EMC 000283601694 DMX1000-P	0027	40.00 GB	12.71 GB	20.00 GB	6.36 GB	$781.25	$532.91
ERP Application	RONDINELLA-VM3	EMC 000283601694 DMX1000-P	<TOTAL>	320.00 GB	87.16 GB	160.00 GB	43.58 GB	$6,250.00	$4,547.58
ERP Application	RONDINELLA-VM3	<TOTAL>	<TOTAL>	320.00 GB	87.16 GB	160.00 GB	43.58 GB	$6,250.00	$4,547.58
ERP Application	TEMPRANILLO-VM5	EMC 000283600950 DMX-3-950	0034	75.00 GB	1.88 GB	37.50 GB	960.00 MB	$1,464.84	$1,428.22
ERP Application	TEMPRANILLO-VM5	EMC 000283600950 DMX-3-950	0035	75.00 GB	1.88 GB	37.50 GB	960.00 MB	$1,464.84	$1,428.22
ERP Application	TEMPRANILLO-VM5	EMC 000283600950 DMX-3-950	0036	75.00 GB	1.88 GB	37.50 GB	960.00 MB	$1,464.84	$1,428.22
ERP Application	TEMPRANILLO-VM5	EMC 000283600950 DMX-3-950	0037	75.00 GB	1.88 GB	37.50 GB	960.00 MB	$1,464.84	$1,428.22
ERP Application	TEMPRANILLO-VM5	EMC 000283600950 DMX-3-950	<TOTAL>	300.00 GB	7.50 GB	150.00 GB	3.75 GB	$5,859.38	$5,712.89
ERP Application	TEMPRANILLO-VM5	EMC 000283602894 DMX-2000-M2	0034	60.00 GB	19.19 GB	30.00 GB	9.60 GB	$1,171.88	$797.04
ERP Application	TEMPRANILLO-VM5	EMC 000283602894 DMX-2000-M2	0035	60.00 GB	19.19 GB	30.00 GB	9.60 GB	$1,171.88	$797.04
ERP Application	TEMPRANILLO-VM5	EMC 000283602894 DMX-2000-M2	0036	60.00 GB	19.19 GB	30.00 GB	9.60 GB	$1,171.88	$797.04
ERP Application	TEMPRANILLO-VM5	EMC 000283602894 DMX-2000-M2	0037	60.00 GB	19.19 GB	30.00 GB	9.60 GB	$1,171.88	$797.04
ERP Application	TEMPRANILLO-VM5	EMC 000283602894 DMX-2000-M2	<TOTAL>	240.00 GB	76.77 GB	120.00 GB	38.38 GB	$4,687.50	$3,188.17
ERP Application	TEMPRANILLO-VM5	<TOTAL>	<TOTAL>	540.00 GB	84.27 GB	270.00 GB	42.13 GB	$10,546.88	$8,901.06
ERP Application	<TOTAL>	<TOTAL>	<TOTAL>	1.99 TB	453.51 GB	1.00 TB	226.75 GB	$39,843.75	$30,986.18
<TOTAL>	<TOTAL>	<TOTAL>	<TOTAL>	1.99 TB	453.51 GB	1.00 TB	226.75 GB	$39,843.75	$30,986.18

This charge back report, which includes VMs from ESX servers, shows total usable storage, total raw storage, and usage. Raw storage includes storage used for data protection and provides the true overall storage committed to this application. Usage information at this granular level help managers understand how much of that raw storage has data written to it or is sitting idle.

Automated Capacity Plans

The Storage Horizon Storage Planner provides an automated summary of what the organization needs to provision and/or purchase for budgeting purposes and workforce planning for VMware environments, enabling storage teams to become much more efficient with storage resources.



	Current Allocation	Current Usage	Utilization Threshold	Jun-Jun 2008	Jul-Sep 2008	Oct-Dec 2008	Jan-Mar 2009	Apr-May 2009
LA ESX Servers								
tempranillo.usacclab.monosphe								
/	4.80 GB	1.98 GB	75%	0.00 MB	1.31 GB	4.55 GB	6.83 GB	6.59 GB
/boot	98.00 MB	1.00 MB	75%	0.00 MB	0.00 MB	0.00 MB	0.00 MB	0.00 MB
/var/log	1.92 GB	539.00 MB	75%	0.00 MB	0.00 MB	0.00 MB	205.00 MB	300.00 MB
/vmfs/volumes/clariion	5.75 GB	1.92 GB	75%	0.00 MB	0.00 MB	0.00 MB	140.00 MB	706.00 MB
/vmfs/volumes/clariion1	4.75 GB	2.03 GB	75%	0.00 MB	0.00 MB	975.00 MB	1.33 GB	921.00 MB
/vmfs/volumes/tempranillo	60.25 GB	2.00 GB	75%	0.00 MB	0.00 MB	0.00 MB	0.00 MB	0.00 MB
/vmfs/volumes/clariion2	4.75 GB	211.00 MB	75%	0.00 MB	0.00 MB	0.00 MB	0.00 MB	0.00 MB
/vmfs/volumes/clariion-qa	19.75 GB	6.47 GB	75%	0.00 MB	0.00 MB	0.00 MB	0.00 MB	0.00 MB
/vmfs/volumes/netapp-qa	14.75 GB	4.17 GB	75%	0.00 MB	0.00 MB	0.00 MB	532.00 MB	2.00 GB
rondinella.usacclab.monospher								
/	4.80 GB	2.10 GB	75%	0.00 MB	0.00 MB	0.00 MB	0.00 MB	0.00 MB
/boot	98.00 MB	48.00 MB	75%	16.00 MB	230.00 MB	231.00 MB	225.00 MB	154.00 MB
/var/log	1.92 GB	60.00 MB	75%	0.00 MB	0.00 MB	0.00 MB	0.00 MB	0.00 MB
/vmfs/volumes/storage1	128.00 GB	33.64 GB	75%	0.00 MB	0.00 MB	0.00 MB	0.00 MB	13.19 GB
/vmfs/volumes/clariion	5.75 GB	2.84 GB	75%	0.00 MB	0.00 MB	1.49 GB	1.50 GB	1.02 GB
/vmfs/volumes/clariion1	4.75 GB	1.68 GB	75%	0.00 MB	0.00 MB	0.00 MB	0.00 MB	0.00 MB
/vmfs/volumes/clariion2	4.75 GB	320.00 MB	75%	0.00 MB	0.00 MB	0.00 MB	0.00 MB	0.00 MB
/vmfs/volumes/clariion-qa	19.75 GB	9.76 GB	75%	0.00 MB	1.00 GB	6.30 GB	6.17 GB	4.18 GB
/vmfs/volumes/netapp-qa	14.75 GB	4.70 GB	75%	0.00 MB	0.00 MB	0.00 MB	3.28 GB	2.43 GB
/vmfs/volumes/hds-qa	20.50 GB	9.23 GB	75%	0.00 MB	0.00 MB	2.33 GB	4.69 GB	3.18 GB
/vmfs/volumes/esxdevtest	4.50 GB	1.76 GB	75%	0.00 MB	0.00 MB	0.00 MB	0.00 MB	206.00 MB

This Storage Horizon Storage Planner example shows when and how much additional storage needs to be provisioned for each VMFS.

INCREASE SERVER UTILIZATION AND STORAGE UTILIZATION

Host virtualization is a powerful technology that helps reduce capital spending on servers. Smart IT shops are using Storage Horizon to manage the storage capacity of VMware environments to ensure that they do not compromise the return on their investment by increased and inefficient storage spending. In addition to storage capital spending reductions, Storage Horizon enables storage teams to:

- Automate data collection and analysis for storage environment reporting.
- Understand adherence to corporate usage goals through high level and detailed views of the physical and logical storage infrastructure.
- Calculate the storage costs of applications, business units, departments, etc.
- Determine when additional provisions or purchases are required by analyzing how storage is configured and used by hosts, VMware servers, databases, and storage systems.
- Quickly locate the best available storage resources to provide to applications.
- Proactively identify when new provisions are necessary and locate disks from which new storage can be provisioned.
- Avoid emergency out-of-hours provisions or purchases by receiving early warning of potential out-of-storage problems.
- Develop clear, accurate, and objective cost justification for future storage purchases.

ABOUT QUEST SOFTWARE, INC.

Quest Software, Inc., a leading enterprise systems management vendor, delivers innovative products that help organizations get more performance and productivity from their applications, databases, Windows infrastructure and virtual environments. Quest also provides customers with client management through its ScriptLogic subsidiary and server virtualization management through its Vizioncore subsidiary. Through a deep expertise in IT operations and a continued focus on what works best, Quest helps more than 100,000 customers worldwide meet higher expectations for enterprise IT. Visit www.quest.com for more information.

Contacting Quest Software

Phone:	949.754.8000 (United States and Canada)
Email:	info@quest.com
Mail:	Quest Software, Inc. World Headquarters 5 Polaris Way Aliso Viejo, CA 92656 USA
Web site:	www.quest.com

Please refer to our Web site for regional and international office information.