Data Infrastructure Insights™ (DII)

Report Catalog for Business Intelligence

November 2024 Release

NetApp

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Introduction

The Data Infrastructure Insights Report Catalog for Business Intelligence provides a repository of storage and compute reporting artifacts available for delivery by NetApp Customer Success professionals at no cost.

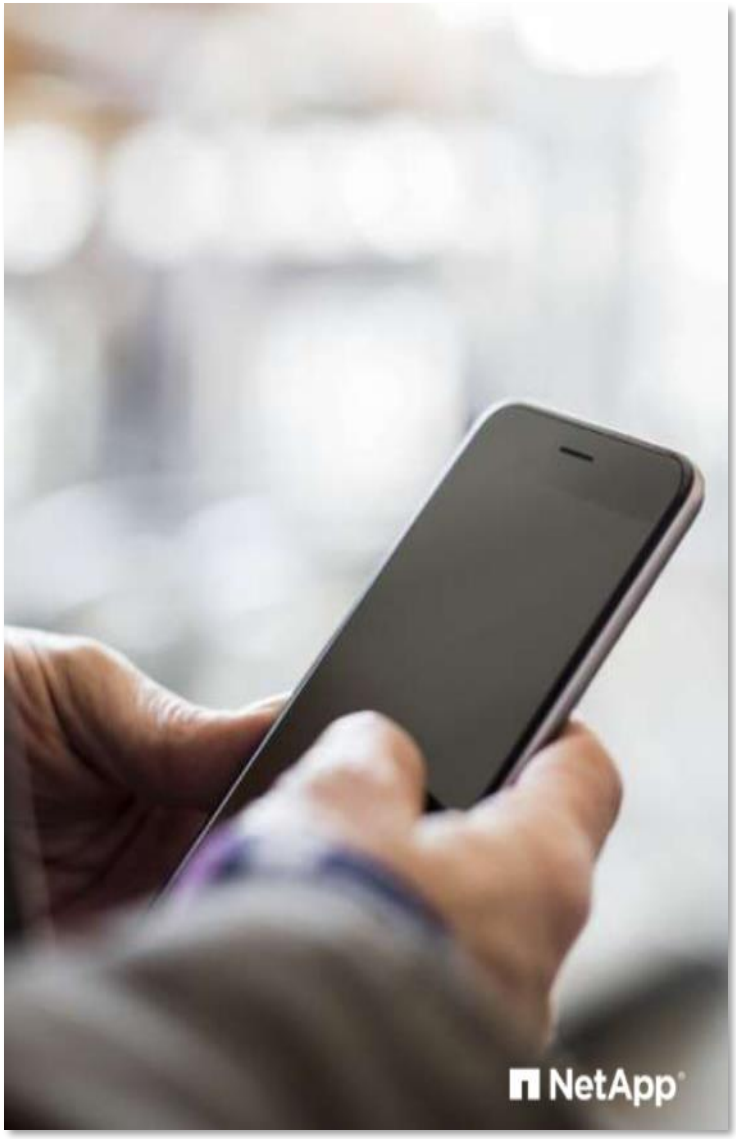
How to Access the Catalog Content

1. Click on the navigation links at the top of this page to view the available reports by category
2. Select the link to the report (only for authorized users) to download
3. Upload the report to your tenant using the following instructions: Data Infrastructure Insights - Report Import and Export Procedures
4. Contact your NetApp sales representative for more information or to schedule a discussion for each report selection

NOTE:

The guidance provided in this catalog is based on the combined experiences of NetApp Professional Services, NetApp Customer Success, and Global Support Center personnel who work with Data Infrastructure Insights on a daily basis.

ALL REPORTS IN THIS CATALOG ARE HIGHLY CUSTOMIZABLE. REACH OUT TO YOUR SALES TEAM FOR ADDITIONAL DETAILS.



Common Report Definitions – Capacity

Field	Description
Storage Pool	
Raw Capacity (TiB)	Pre-RAID Raw Capacity in TiB of all disks as reported by the storage device monitored by DII and contained in the Storage and Storage Pool Capacity Fact table. Represented as: capacity * rawToUsableRatio
Capacity (TiB)	Usable capacity allocated for a storage-pool as reported by the storage-array in Tebibytes (Base 2 units)
Used Capacity (TiB)	Used capacity in Tebibytes as reported by the storage pool or aggregate. If Thin Provisioned, then Used = Written. If Thick Provisioned then Used = 100% of Allocated
Unconfigured Raw Capacity (TiB)	Unconfigured raw capacity of the storage (includes failed, spare and unused disks) in TiB
Snapshot Used Capacity (TiB)	Capacity used for storage-pool level snapshots in TiB
Volume Capacity (TiB)	Provisioned capacity of all block/SAN volumes on this storage pool in TiB
Volume Consumed Capacity (TiB)	Physical capacity consumed by volumes on this storage pool in TiB
Internal Volume Allocated Capacity (TiB)	Total allocated capacity of internal volumes (NAS/Flexvol) on this storage pool in TiB
Internal Volume Used Capacity (TiB)	Total used capacity of internal volumes (NAS/Flexvol) on this storage pool in TiB
dedupeRatio	The deduplication ratio on this storage pool
compressionRatio	The compression ratio on this storage pool
compactionRatio	The compaction ratio on this storage pool
Internal Volume	
Allocated Capacity (GiB)	Total allocated capacity on internal volume in Gibibytes (Base 2 units)
Consumed Capacity (GiB)	Capacity consumed by this internal volume from storage pool
Used Capacity (GiB)	Total used capacity on this internal volume
Data Used Capacity (GiB)	Used capacity on this internal volume without snapshot
Snapshot Allocated Capacity (GiB)	Capacity allocated for snapshots on this internal volume
Snapshot Used Capacity (GiB)	Capacity used by snapshots on this internal volume
Total Clone Saved Capacity (GiB)	Capacity which the clone internal volume shares with its source internal volume
Volume	
Provisioned Capacity (GiB)	Provisioned capacity of volumes in Gibibytes (Base 2 units)
Accessed Capacity (GiB)	Provisioned capacity of volumes that are accessed by hosts
Orphaned Capacity (GiB)	Provisioned capacity of volumes that are masked but do not have active path to them
Consumed Capacity (GiB)	The amount of volume capacity consumed in the storage pool

NOTE: The term "terabyte" (TB) refers to 1,000,000,000,000 bytes (Base 10 units). Tebibytes (TiB) refers to 1,099,511,627,776 bytes (Base 2 units).
Typically, most storage arrays discovered by DII will be represented in Tebibytes (DEFAULT).

StorageGRID and IBM XIV will be represented in Terabytes. For these two families, you must convert to terabytes using the following example:
storage_node_capacity_fact.totalNodeCapacityUtilizationMB/1024 * 1.0737

Common Report Definitions – Performance

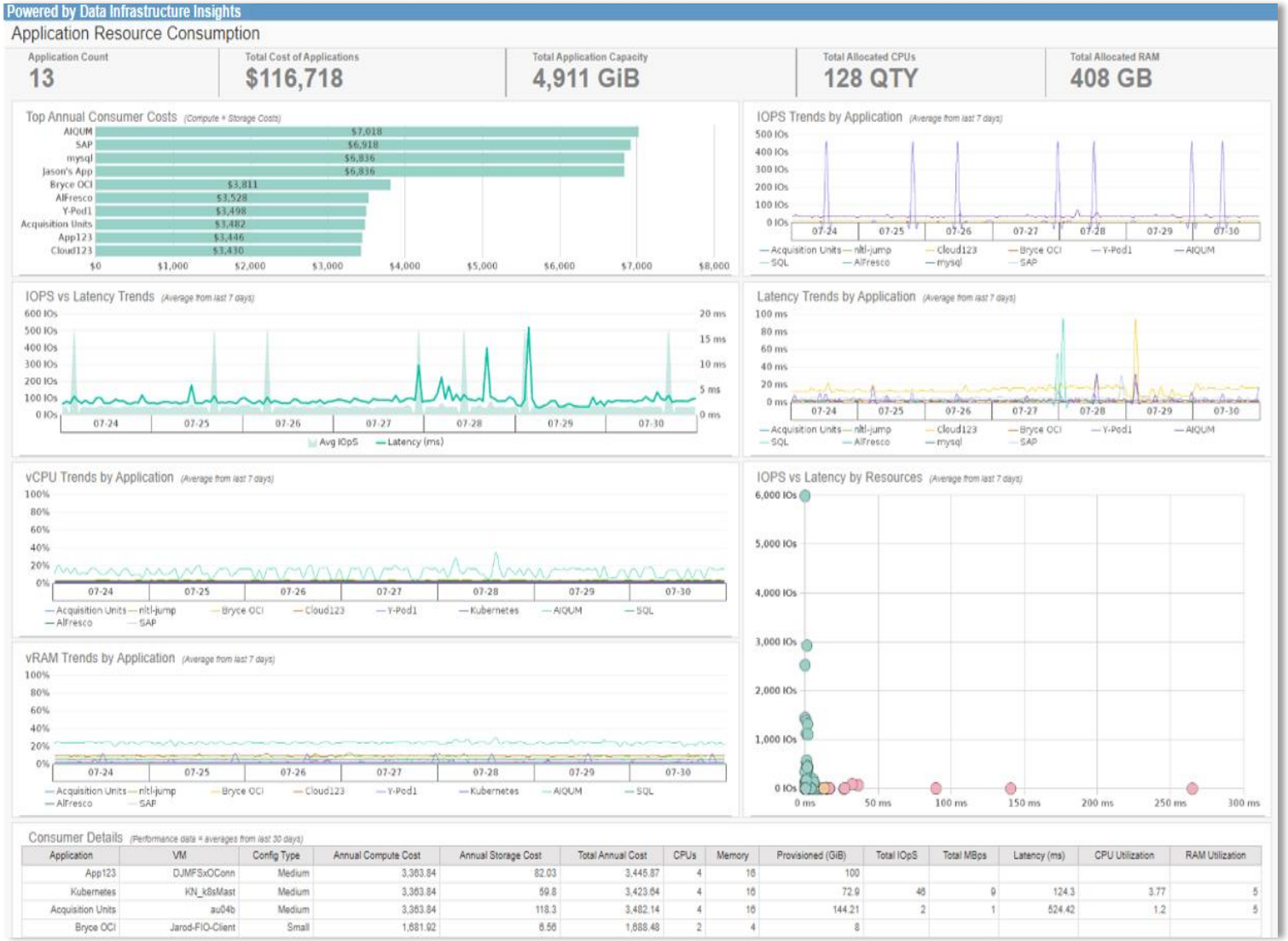
Field	Description
Internal Volume / Volume (backend metrics)	
Total IOPS	Measures the total number of I/O service requests (read+write) on the volume during the selected time period (measured in I/O per sec). Consists of front-end protocol IOpS (NFS, CIFS, FC, iSCSI) for NetApp nodes
Total IOPS Max	Measures the maximum I/O service requests on the volume during the selected time period (measured in I/O per sec)
Total Response Time	The time it takes from the moment a request for information arrives at the storage device to the time when the storage device begin to send the information back in response. This is the actual latency of the device in milliseconds
Total Response Time Max	The maximum time it takes from the moment a request for information arrives at the storage device to the time when the storage device begins to send the information back in response. This is the actual latency of the device in milliseconds
Total Throughput	The Rate at which data is being transmitted in a fixed amount of time in response to I/O service requests (measured in MB per sec)
Total IO Density	Measured in IOPS /TiB of capacity
Storage Node (frontend, protocol metrics include all of the volume type metrics e.g. IOPS, Response Time etc)	
Utilization	Node CPU Utilization shows the percentage of time that one or more CPUs were busy. In DII, this is based on the higher of CPU, WAFL_EX and Kahuna Processor Domain metrics. Details are as follows: • System – avg_processor_busy, cpu_elapsed_time1 • WAFL – total_cp_msecs, cp_phase_times.P2_FLUSH • Processor – domain_busy, processor_elapsed_time Overall node utilization then is displayed as the higher of the 3 (system, WAFL or processor domains) which all indicate a controller's ability (utilization) to process read/write requests. For EMC Symmetrix Arrays, this metric is FA Port Utilization.
Other Performance Metrics	
Disk Utilization	The percentage % of post-cache service time used for requests out of the available sample time. This metric indicates what portion of the time the disk is busy servicing requests
Disk IOPS	Measures the total number of I/O service requests on the disk for the virtual volume during the time presented period (measured in I/Os per second)
95th Percentile	The 95th percentile states that 95% of the time, the usage is at or below this amount. Conversely, 5% of the samples may be bursting above this rate but are ignored

Application Overview

In this section, here are some of the reports that can be leveraged to address application specific monitoring:

- ❑ Application Resource Consumption
- ❑ Asset Utilization by Application and Business Unit
- ❑ Qtree Capacity with Applications and Business Units
- ❑ Open Systems Storage – Top 10 Applications
- ❑ Application Allocation and Cost Consumption
- ❑ Epic Health Application Summary
- ❑ Epic Capacity and Costs
- ❑ Application Capacity and Performance
- ❑ Kubernetes Capacity Forecast by Cluster or Namespace
- ❑ Kubernetes Chargeback – AWS Rate Card

1.1 Application Resource Consumption



Application	VM	Config Type	Annual Compute Cost	Annual Storage Cost	Total Annual Cost	CPUs	Memory	Provisioned (GiB)	Total IOPS	Total MBps	Latency (ms)	CPU Utilization	RAM Utilization
App123	DJMFSxOConn	Medium	3,363.84	82.03	3,445.87	4	16	100					
Kubernetes	KN_k8sMast	Medium	3,363.84	59.8	3,423.64	4	16	72.9	46	9	124.3	3.77	5
Acquisition Units	au04b	Medium	3,363.84	118.3	3,482.14	4	16	144.21	2	1	524.42	1.2	5
Bryce OCI	Jarod-FIO-Client	Small	1,681.92	6.56	1,888.48	2	4	8					

Description: This report shows top annual application costs (derived from DII tier annotations), performance trends for IOPS, latency, vCPU and vRAM consumption as well as consumer details at bottom.

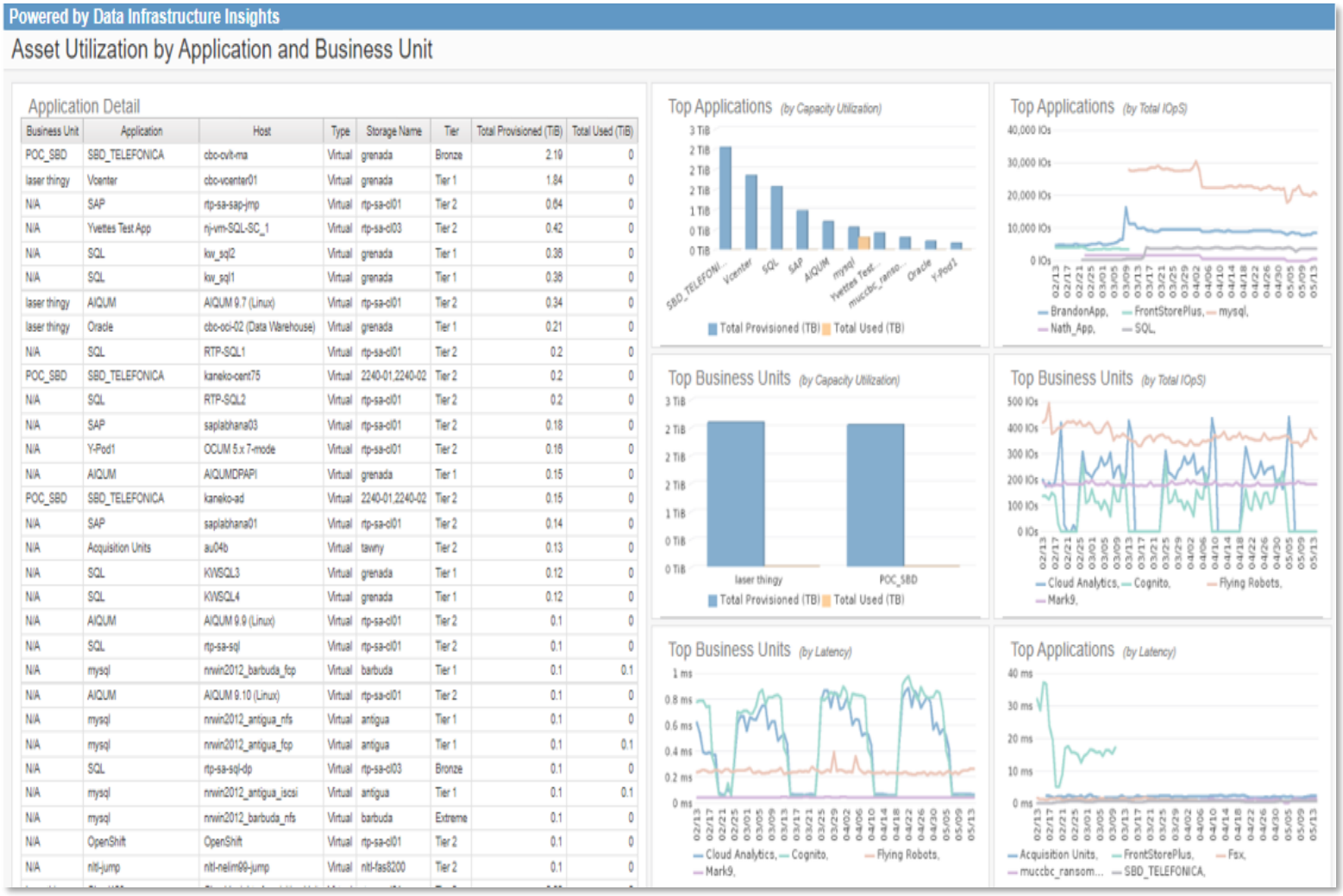
Prerequisites: Data Infrastructure Insights (DII) reporting enabled. Application, tier and tier cost annotations deployed.

Report XML: 1.1 Application Resource Consumption

1.1 Application Resource Consumption Definitions

Metric/Attribute	Description
Application	DII configured annotation. Defines the application associated with the virtual machine or backend storage capacity
Tier	DII configured annotation. Defines tiers of storage based on disk type, disk speed, etc.
VM	Name of the virtual machine discovered and monitored by DII via the vSphere Client API
Config Type	WHEN vCPU <=2 AND vRAM <=8 THEN 'Small' WHEN vCPU <=4 AND vRAM <=16 THEN 'Medium' WHEN vCPU <=8 AND vRAM <=32 THEN 'Large' WHEN vCPU >8 OR vRAM >=32 THEN 'xLarge'
Annual Compute Cost	Embedded cost metric associated with the Config Type: WHEN ConfigType ='Small' THEN 1681.92 WHEN ConfigType ='Medium' THEN 3363.84 WHEN ConfigType ='Large' THEN 6727.68 WHEN ConfigType ='xLarge' THEN 13455.36
Annual Storage Cost	Provisioned Capacity in Gibibytes * $840 per year (the cost of storage is an estimate and will vary greatly)
Total Annual Cost	Annual Storage Cost + Annual Compute Cost
CPUs	Number of virtual CPUs associated with the virtual machine inventory
Memory	Amount of memory in Gibibytes associated with the virtual machine inventory
Provisioned (GiB)	Capacity that has been provisioned to virtual machines via a VMDK and Datastore
Total IOpS	Measures the total number of I/O service requests (read+write) on the volume during the selected time period (measured in I/O per sec). Consists of front-end protocol IOpS (NFS, CIFS, FC, iSCSI) for NetApp nodes
Total MBps	The Rate at which data is being transmitted in a fixed amount of time in response to I/O service requests (measured in MB per sec)
Latency (ms)	The time it takes from the moment a request for information arrives at the storage device to the time when the storage device begin to send the information back in response. This is the actual latency of the device in milliseconds
CPU Utilization	Average vCPU Utilization as reported by virtual machine instances for the user selected time period
RAM utilization	Average vRAM Utilization as reported by virtual machine instances for the user selected time period
Application Count	Number of applications being monitored by DII
Total Cost of Applications	A sum of Total Annual Cost for the report
Total Application Capacity	A sum of Provisioned Capacity (GiB) for the report
Total Allocated CPUs	A sum of allocated vCPUs for the report
Total Allocated RAM	A sum of allocated vRAM for the report
Date	Full Date field derived from the Date Dimension table in the DWH
Time	Hourdatetime field derived from the Time Dimension table in the DWH

1.2 Asset Utilization by Application and Business Unit



Business Unit	Application	Host	Type	Storage Name	Tier	Total Provisioned (TiB)	Total Used (TiB)
POC_SBD	SBD_TELEFONICA	cbo-cvit-ma	Virtual	grenada	Bronze	2.19	0
laser thingy	Vcenter	cbo-vcenter01	Virtual	grenada	Tier 1	1.84	0
N/A	SAP	rtp-sa-sap-jmp	Virtual	rtp-sa-ol01	Tier 2	0.64	0
N/A	Yvettes Test App	nj-vm-SQL-SC_1	Virtual	rtp-sa-ol03	Tier 2	0.42	0
N/A	SQL	kw_sql2	Virtual	grenada	Tier 1	0.38	0
N/A	SQL	kw_sql1	Virtual	grenada	Tier 1	0.36	0
laser thingy	AIQUM	AIQUM 9.7 (Linux)	Virtual	rtp-sa-ol01	Tier 2	0.34	0
laser thingy	Oracle	cbo-oci-02 (Data Warehouse)	Virtual	grenada	Tier 1	0.21	0
N/A	SQL	RTP-SQL1	Virtual	rtp-sa-ol01	Tier 2	0.2	0
POC_SBD	SBD_TELEFONICA	kaneko-cent75	Virtual	2240-01,2240-02	Tier 2	0.2	0
N/A	SQL	RTP-SQL2	Virtual	rtp-sa-ol01	Tier 2	0.2	0
N/A	SAP	saplabhana03	Virtual	rtp-sa-ol01	Tier 2	0.18	0
N/A	Y-Pod1	OCUM 5.x 7-mode	Virtual	rtp-sa-ol01	Tier 2	0.18	0
N/A	AIQUM	AIQUMDPAPI	Virtual	grenada	Tier 1	0.15	0
POC_SBD	SBD_TELEFONICA	kaneko-ad	Virtual	2240-01,2240-02	Tier 2	0.15	0
N/A	SAP	saplabhana01	Virtual	rtp-sa-ol01	Tier 2	0.14	0
N/A	Acquisition Units	au04b	Virtual	tawny	Tier 2	0.13	0
N/A	SQL	KWSQL3	Virtual	grenada	Tier 1	0.12	0
N/A	SQL	KWSQL4	Virtual	grenada	Tier 1	0.12	0
N/A	AIQUM	AIQUM 9.9 (Linux)	Virtual	rtp-sa-ol01	Tier 2	0.1	0
N/A	SQL	rtp-sa-sql	Virtual	rtp-sa-ol01	Tier 2	0.1	0
N/A	mysql	nrwin2012_barbuda_fcp	Virtual	barbuda	Tier 1	0.1	0.1
N/A	AIQUM	AIQUM 9.10 (Linux)	Virtual	rtp-sa-ol01	Tier 2	0.1	0
N/A	mysql	nrwin2012_antigua_nfs	Virtual	antigua	Tier 1	0.1	0
N/A	mysql	nrwin2012_antigua_fcp	Virtual	antigua	Tier 1	0.1	0.1
N/A	SQL	rtp-sa-sql-dp	Virtual	rtp-sa-ol03	Bronze	0.1	0
N/A	mysql	nrwin2012_antigua_iscsi	Virtual	antigua	Tier 1	0.1	0.1
N/A	mysql	nrwin2012_barbuda_nfs	Virtual	barbuda	Extreme	0.1	0
N/A	OpenShift	OpenShift	Virtual	rtp-sa-ol01	Tier 2	0.1	0
N/A	nti-jump	nti-nelim99-jump	Virtual	nti-fas8200	Tier 2	0.1	0

Description: This report shows asset utilization by application and business unit. Top application performance and capacity utilization is emphasized.

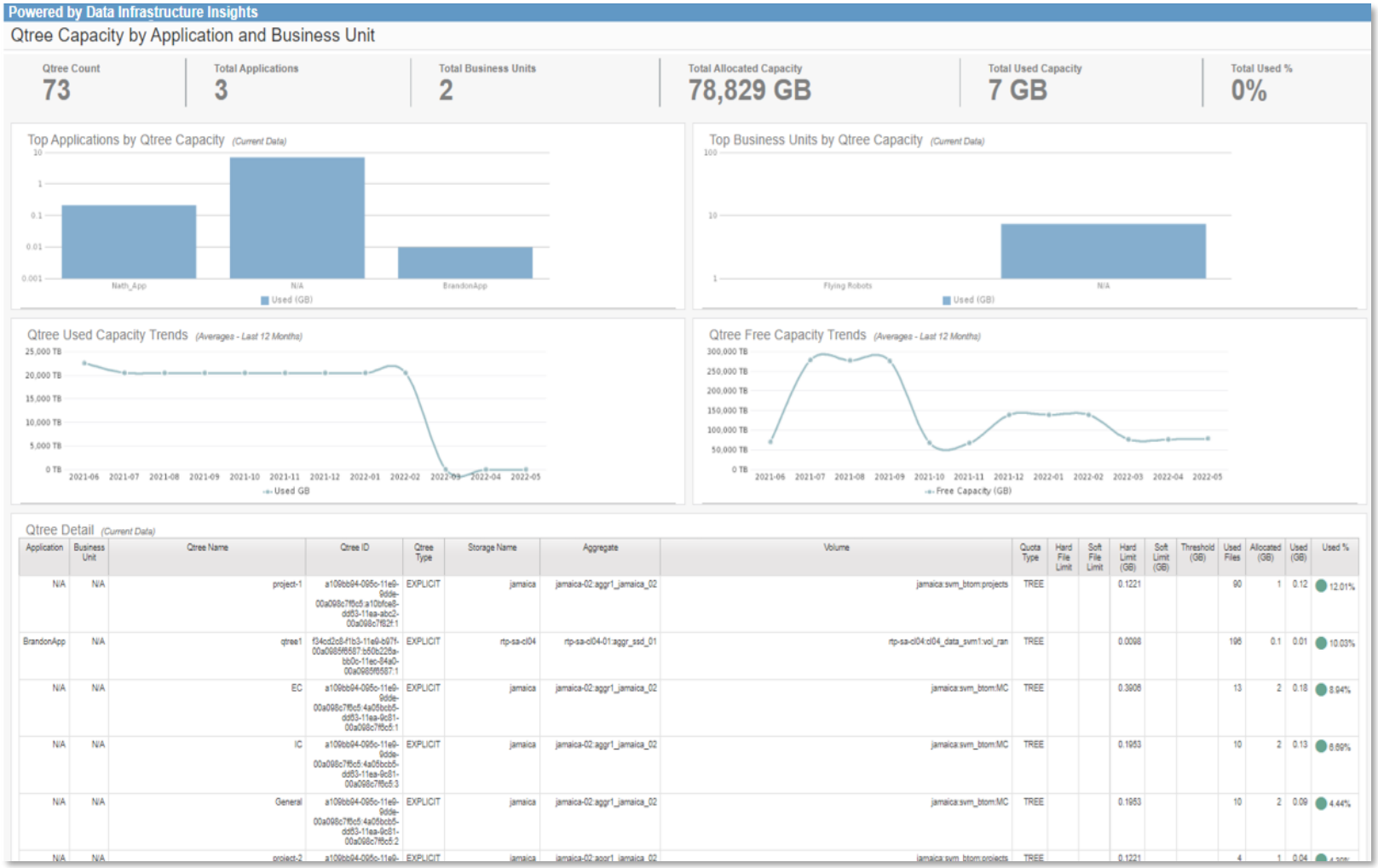
Prerequisites: Data Infrastructure Insights (DII) reporting enabled. Application, tier and tier cost annotations deployed.

Report XML: 1.2 Asset Utilization by Application and Business Unit

1.2 Asset Utilization by Application and Business Unit Definitions

Metric/Attribute	Description
Business Unit	DII configured annotation. Defines the Business Unit with host, volume, or internal volume capacity
Application	DII configured annotation. Defines the application associated with the virtual machine or backend storage capacity
Host	Name of the physical or virtual host monitored by DII
Type	The type of host/server either ‘physical’ or ‘virtual’
Storage Name	Name of the storage device discovered and monitored by DII
Tier	DII configured annotation. Defines tiers of storage based on disk type, disk speed, etc.
Total Provisioned (TiB)	Internal Volume or Volume/LUN capacity allocated to host initiators that are annotated with Business Unit or Application.
Total Used (TiB)	For Internal Volumes that are not LUNS and with Space Guarantee disabled, this is written capacity grouped by Application or Business Unit. For Internal Volumes with Space Guarantee enabled and for LUNs, used capacity will be equal to allocated
Total IOpS	Max of Average IOpS (both read and write) averaged daily for past 90 days
Response Time (ms)	Average Latency in milliseconds for past 90 days
Full Date	Hourdatetime and/or fulldate fields derived from the Time Dimension and Date Dimension tables in the DWH

1.3 Qtree Capacity by Application and Business Unit



Description: This report shows NetApp Qtree capacity by Application and Business Unit.

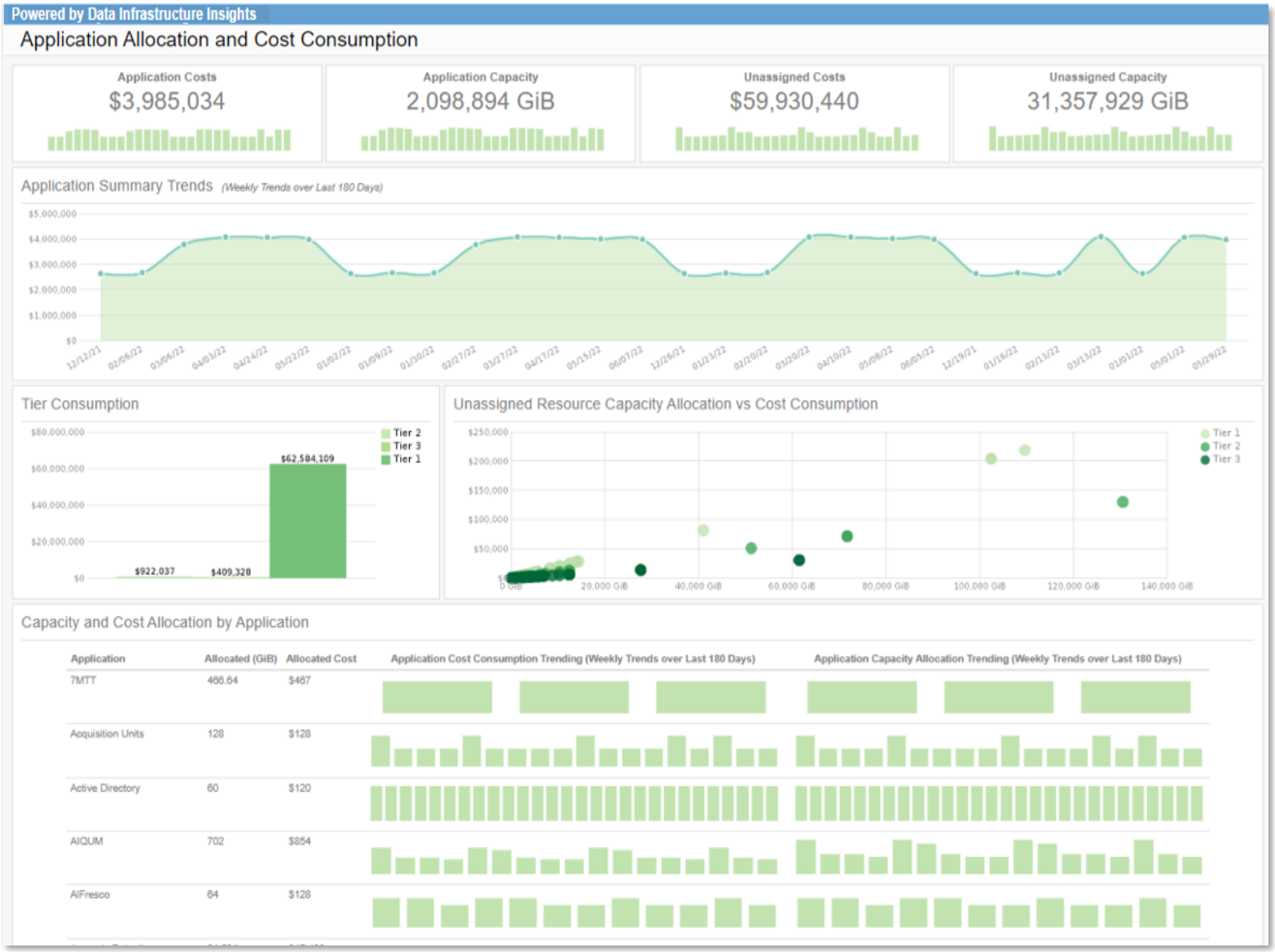
Prerequisites: Data Infrastructure Insights (DII) reporting enabled. Application, Business Unit, tier and tier cost annotations deployed.

Report XML: [1.3 Qtree Capacity by Application and Business Unit]

1.3 Qtree Capacity by Application and Business Unit Definitions

Metric/Attribute	Description
Application	DII configured annotation. Defines the application associated with the virtual machine or backend storage capacity
Business Unit	DII configured annotation. Defines the Business Unit with host, volume, or internal volume capacity
Qtree Name	Name of the Qtree associated with the internal volume. A NetApp Qtree is a logically defined file system that acts as a subdirectory within a volume, allowing you to partition a volume into smaller, more manageable segments
Qtree ID	ID associated with the Qtree used for SQL joins in reporting
Qtree Type	The type of Qtree (Default, Explicit)
Storage Name	Name of the storage device discovered and monitored by DII
Aggregate	Name of the aggregate/pool associated with the storage device discovered and monitored by DII
Volume	Name of the volume associated with the storage device
Quota Type	Specifies the target type (tree, group or user) to which this quota applies
Hard File Limit	Hard limit on the number of files that this quota imposes on the tree, group or user
Soft File Limit	Soft quota file limit that, if exceeded, issues warnings, rather than rejecting file creation requests
Hard Limit (GiB)	Hard disk space limit, in Gibibytes, that this quota imposes on the tree, group, user or type
Soft Limit (GiB)	Soft quota space limit, in Gibibytes, that if exceeded, issues warnings rather than rejecting space requests
Threshold (GiB)	Disk space usage point, in Gibibytes, at which warnings of approaching quota limits are issued
Used Files	Number of files currently used by the target of this quota
Allocated (GiB)	Total allocated capacity on internal volume in Gibibytes (Base 2 units)
Used (GiB)	Used capacity in Gibibytes as reported by the Internal Volume
Used %	Used (GiB) / Allocated (GiB)
Qtree Count	Total number of Qtrees for this report
Total Applications	Total number of Applications for this report
Total Business Units	Total number of Business Units for this report
Total Allocated Capacity (GiB)	Sum of Allocated (GiB) for this report
Total Used Capacity (GiB)	Sum of Used (GiB) for this report
Total Used %	Total Used Capacity (GiB) / Total Allocated Capacity (GiB)

1.5 Application Allocation and Cost Consumption



Description: This report shows application resource consumption and costs over time. Assigned and unassigned resource costs and consumption metrics are highlighted.

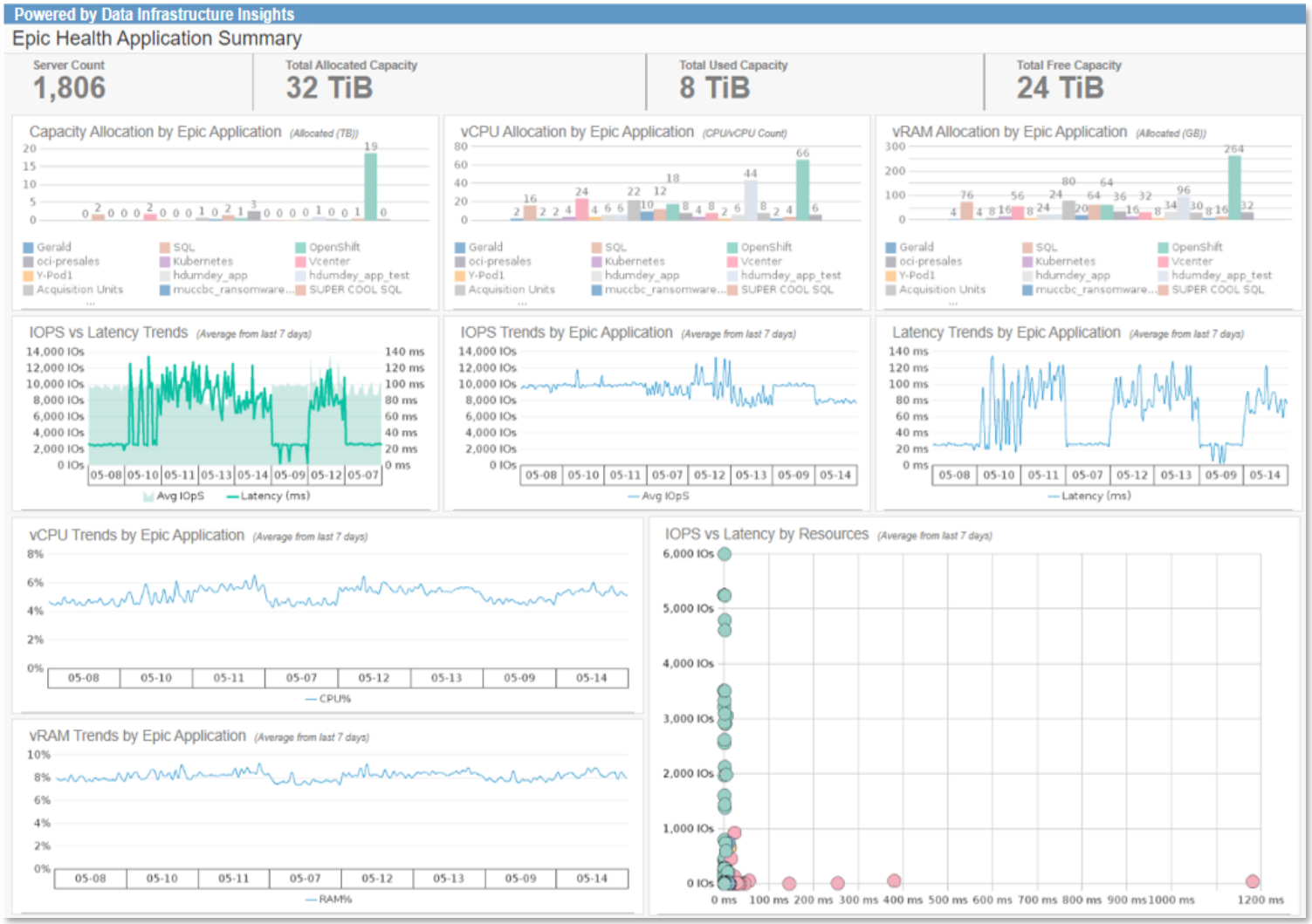
Prerequisites: Data Infrastructure Insights (DII) reporting enabled. Application, tier and tier cost annotations deployed.

Report XML: 1.5 Application Allocation and Cost Consumption

1.5 Application Allocation and Cost Consumption Definitions

Metric/Attribute	Description
Application	DII configured annotation. Defines the application associated with the virtual machine or backend storage capacity
Allocated (GiB)	Capacity in Gibibytes provisioned to host initiators or virtual machines
Allocated Cost	DII configured annotation. Cost of capacity allocated via tier/cost annotations to host initiators or virtual machines
Application Cost	DII configured annotation. Cost of applications via tier/cost annotations
Application Capacity GiB	Capacity in Gibibytes assigned to applications associated with host initiators or virtual machines
Unassigned Costs	Cost of capacity that is not assigned to applications
Unassigned Capacity GiB	Total capacity that is not assigned to applications
Full Date	Hourdatetime and/or fulldate fields derived from the Time Dimension and Date Dimension tables in the DWH
Tier	DII configured annotation. Defines tiers of storage based on disk type, disk speed, etc.
Tier Cost	DII configured annotation. Defines costs associated with tiers

1.10 Epic Health Application Summary



Report XML: 1.10 Epic Health Application Summary

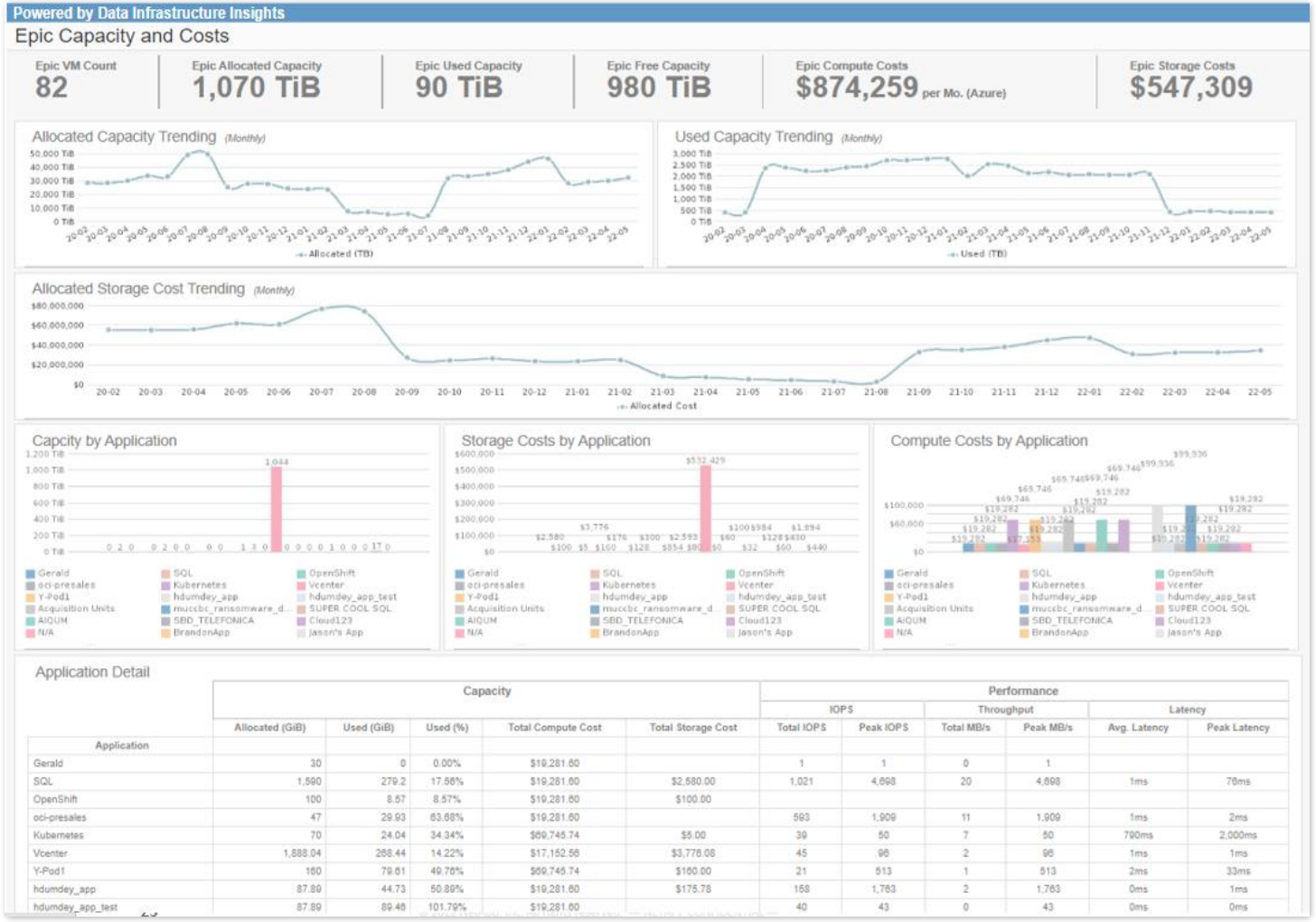
Description: This report is a summary of EPIC application performance and capacity trends. Top applications are shown for vCPU and vRAM utilization, IOPS and Latency comparisons with allocated capacity.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled. Application, tier and tier cost annotations deployed.

1.10 Epic Health Application Summary Definitions

Metric/Attribute	Description
Application	DII configured annotation. Defines the EPIC applications associated with the virtual machine or backend storage capacity
Server Count	Total number of virtual machines associated with the EPIC applications
Provisioned (TiB)	Capacity in Tebibytes that has been provisioned to virtual machines hosting EPIC applications
Used Capacity (TiB)	Used capacity in Tebibytes associated with the virtual machines that are hosting EPIC applications
Free (TiB)	Provisioned (TiB) - Used Capacity (TiB)
Allocated vCPUs	Number of virtual CPUs allocated to EPIC applications running on virtual machines
Allocated vRAM	Amount of virtual Memory allocated to EPIC applications
Avg IOpS	Max of average total IOPS (read+write) as reported by the virtual machines running EPIC applications
Latency (ms)	Average total response time (read+write) as reported by the virtual machines running EPIC applications
CPU %	Average CPU utilization % of virtual machines
RAM %	Average Memory utilization % of virtual machines
Date	Full Date field derived from the Date Dimension table in the DWH
Time	Hourdatetime field derived from the Time Dimension table in the DWH

1.11 Epic Capacity and Costs



Application	Capacity					Performance					
						IOPS		Throughput		Latency	
	Allocated (GiB)	Used (GiB)	Used (%)	Total Compute Cost	Total Storage Cost	Total IOPS	Peak IOPS	Total MB/s	Peak MB/s	Avg. Latency	Peak Latency
Gerald	30	0	0.00%	$19,281.60		1	1	0	1		
SQL	1,590	279.2	17.56%	$19,281.60	$2,580.00	1,021	4,698	20	4,698	1ms	76ms
OpenShift	100	8.57	8.57%	$19,281.60	$100.00						
oci-presales	47	29.93	63.68%	$19,281.60		593	1,909	11	1,909	1ms	2ms
Kubernetes	70	24.04	34.34%	$69,745.74	$5.00	39	50	7	50	790ms	2,000ms
Vcenter	1,888.04	268.44	14.22%	$17,152.56	$3,776.08	45	96	2	96	1ms	1ms
Y-Pod1	160	79.61	49.76%	$69,745.74	$160.00	21	513	1	513	2ms	33ms
hdumdey_app	87.89	44.73	50.89%	$19,281.60	$175.78	158	1,763	2	1,763	0ms	1ms
hdumdey_app_test	87.89	89.46	101.79%	$19,281.60		40	43	0	43	0ms	0ms

Description: This report shows the costs assoicated with EPIC based applications and the underlying supporting infrastructure.

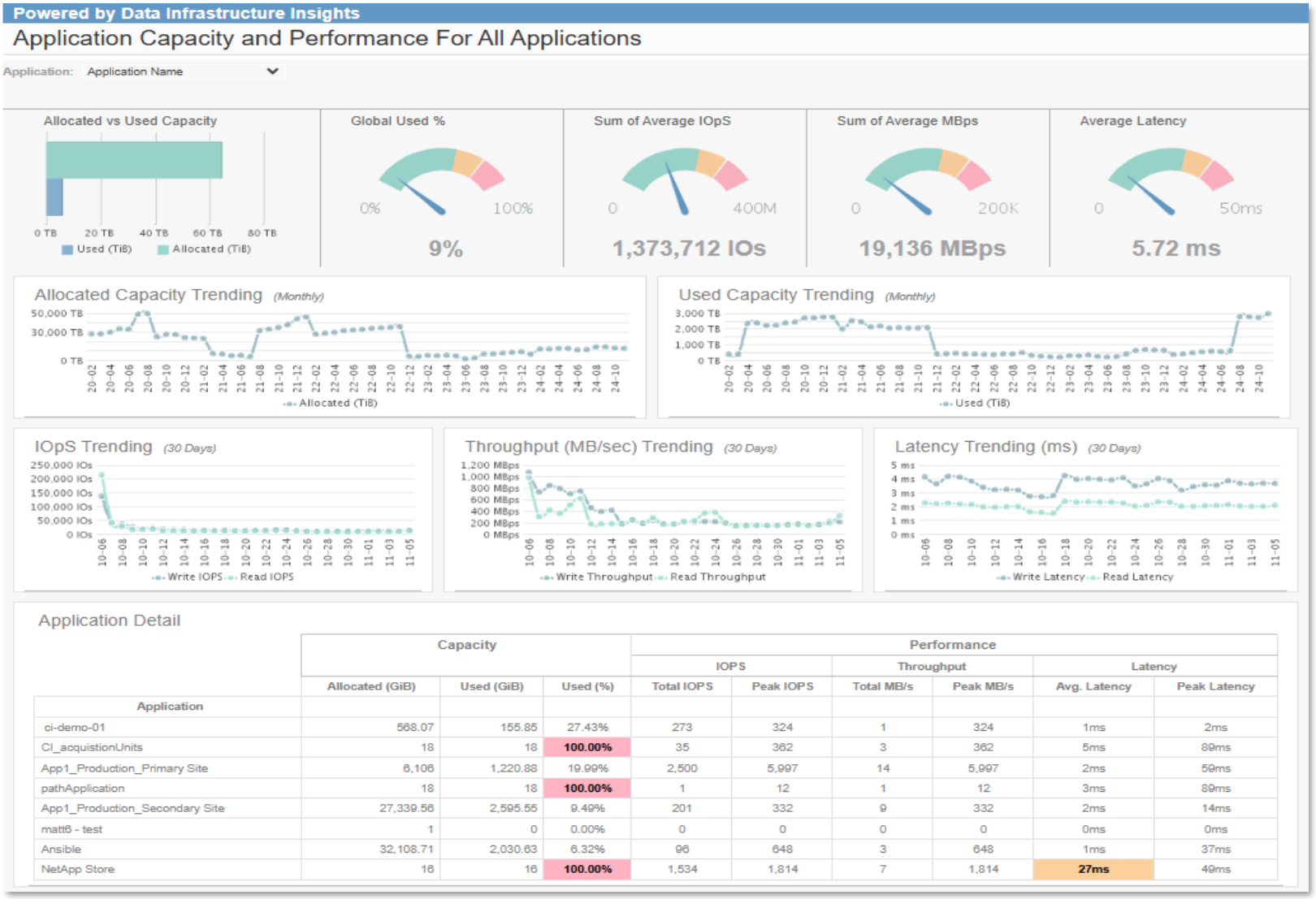
Prerequisites: Data Infrastructure Insights (DII) reporting enabled. Application, tier and tier cost annotations deployed.

Report XML: 1.11 Epic Capacity and Costs

1.11 Epic Capacity and Costs Definitions

Metric/Attribute	Description
Application	DII configured annotation. Defines the EPIC applications associated with the virtual machine or backend storage capacity
Allocated (GiB)	Capacity in Gibibytes that has been provisioned to virtual machines hosting EPIC applications
Used (GiB)	Used capacity in Tebibytes associated with the virtual machines that are hosting EPIC applications
Used %	Used (GiB) / Allocated (GiB)
Tier Cost	DII configured annotation. Defines the cost per Gibibyte associated with the storage tier
Allocated Cost	Tier Cost * Virtual Machine Provisioned (GiB)
Total Compute Cost	Sum of Allocated Cost for compute devices
Total Storage Cost	Sum of Allocated Cost for storage devices
IOPS	Max of average total IOPS (read+write) as reported by the virtual machines running EPIC applications
Throughput	Max of average total throughput in Megabytes per second (read+write) as reported by the virtual machines running EPIC applications
Latency	Average total response time in milliseconds (read+write) as reported by the virtual machines running EPIC applications
Epic VM Count	Number of VMs used for EPIC applications
Epic Allocated Capacity	Amount of provisioned capacity in Tebibytes allocated for EPIC applications
Epic Used Capacity	Amount of used capacity in Tebibytes allocated for EPIC applications
Epic Free Capacity	Epic Allocated Capacity - Epic Used Capacity
Epic Compute Costs	Sum of Allocated Cost for EPIC applications
Epic Storage Costs	Sum of Allocated Cost for Storage associated with EPIC applications
Allocated (TiB)	Sum of Capacity in Tebibytes that has been provisioned to virtual machines hosting EPIC applications
Used (TiB)	Sum of Used Capacity in Tebibytes that has been provisioned to virtual machines hosting EPIC applications
Date	Full Date field derived from the Date Dimension table in the DWH

1.12 Application Capacity and Performance



Application	Capacity			Performance					
				IOPS		Throughput		Latency	
	Allocated (GiB)	Used (GiB)	Used (%)	Total IOPS	Peak IOPS	Total MB/s	Peak MB/s	Avg. Latency	Peak Latency
ci-demo-01	568.07	155.85	27.43%	273	324	1	324	1ms	2ms
CI_acquistionUnits	18	18	100.00%	35	362	3	362	5ms	89ms
App1_Production_Primary Site	6,106	1,220.88	19.99%	2,500	5,997	14	5,997	2ms	59ms
pathApplication	18	18	100.00%	1	12	1	12	3ms	89ms
App1_Production_Secondary Site	27,339.56	2,595.55	9.49%	201	332	9	332	2ms	14ms
matt6 - test	1	0	0.00%	0	0	0	0	0ms	0ms
Ansible	32,108.71	2,030.63	6.32%	96	648	3	648	1ms	37ms
NetApp Store	16	16	100.00%	1,534	1,814	7	1,814	27ms	49ms

Description: This report shows application specific capacity and performance metrics captured by DII.

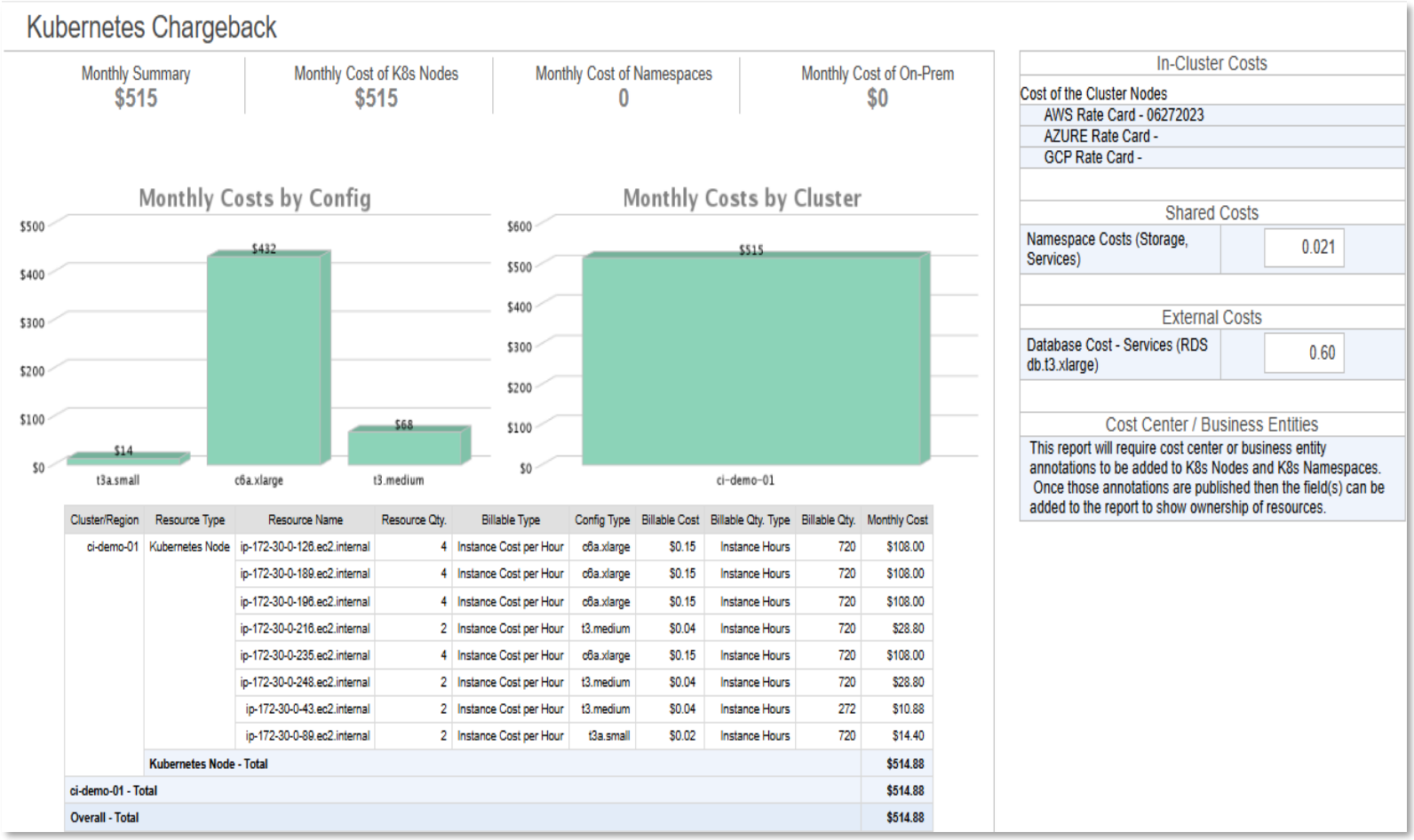
Prerequisites: Data Infrastructure Insights (DII) reporting enabled. Application, tier and tier cost annotations deployed.

Report XML: 1.12 Application Capacity and Performance

1.12 Application Capacity and Performance Definitions

Metric/Attribute	Description
Application	DII configured annotation. Defines the application associated with the virtual machine or backend storage capacity
Allocated (GiB)	Capacity in Gibibytes that has been provisioned to virtual machines running applications
Used (GiB)	Used capacity in Gibibytes reported by the virtual machines running applications
Used (%)	Used (GiB) / Allocated (GiB)
Total IOPS	Max of average total IOPS (read+write) as reported by the virtual machines running applications
Peak IOPS	Max of Max total IOPS (read+write) as reported by the virtual machines running applications
Total MB/s	Max of average total throughput in Megabytes per second (read+write) as reported by the virtual machines
Peak MB/s	Max of Max total throughput in Megabytes per second as reported by the virtual machines
Avg. Latency	Average total response time in milliseconds (read+write)
Peak Latency	Max total response time in milliseconds (read+write)
Used (TiB)	Used capacity in Tebibytes associated with virtual machines
Allocated (TiB)	Provisioned capacity in Tebibytes associated with virtual machines
Global Used (%)	Sum of Used (TiB) / Allocated (TiB)

1.25 Kubernetes Chargeback



Kubernetes Chargeback

Monthly Summary	Monthly Cost of K8s Nodes	Monthly Cost of Namespaces	Monthly Cost of On-Prem
$515	$515	0	$0

Monthly Costs by Config

Monthly Costs by Cluster

Cluster/Region	Resource Type	Resource Name	Resource Qty.	Billable Type	Config Type	Billable Cost	Billable Qty. Type	Billable Qty.	Monthly Cost
ci-demo-01	Kubernetes Node	ip-172-30-0-126.ec2.internal	4	Instance Cost per Hour	c6a.xlarge	$0.15	Instance Hours	720	$108.00
		ip-172-30-0-189.ec2.internal	4	Instance Cost per Hour	c6a.xlarge	$0.15	Instance Hours	720	$108.00
		ip-172-30-0-196.ec2.internal	4	Instance Cost per Hour	c6a.xlarge	$0.15	Instance Hours	720	$108.00
		ip-172-30-0-216.ec2.internal	2	Instance Cost per Hour	t3.medium	$0.04	Instance Hours	720	$28.80
		ip-172-30-0-235.ec2.internal	4	Instance Cost per Hour	c6a.xlarge	$0.15	Instance Hours	720	$108.00
		ip-172-30-0-248.ec2.internal	2	Instance Cost per Hour	t3.medium	$0.04	Instance Hours	720	$28.80
		ip-172-30-0-43.ec2.internal	2	Instance Cost per Hour	t3.medium	$0.04	Instance Hours	272	$10.88
		ip-172-30-0-89.ec2.internal	2	Instance Cost per Hour	t3a.small	$0.02	Instance Hours	720	$14.40
	Kubernetes Node - Total								**$514.88**
ci-demo-01 - Total									**$514.88**
Overall - Total									**$514.88**

In-Cluster Costs	
Cost of the Cluster Nodes	
AWS Rate Card - 06272023	
AZURE Rate Card -	
GCP Rate Card -	

Shared Costs	
Namespace Costs (Storage, Services)	0.021

External Costs	
Database Cost - Services (RDS db.t3.xlarge)	0.60

Cost Center / Business Entities

This report will require cost center or business entity annotations to be added to K8s Nodes and K8s Namespaces. Once those annotations are published then the field(s) can be added to the report to show ownership of resources.

Description: This report shows Kubernetes infrastructure costs configured by the rate card on the right. Montly summaries and details are included.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled. Application, tier and tier cost annotations deployed.

Report XML: 1.25 Kubernetes Chargeback

1.25 Kubernetes Chargeback Definitions

Metric/Attribute	Description
Cluster/Region	Name of the on Prem host cluster or region for cloud providers
Resource Type	Name of the Kubernetes Node
Resource Name	Kubernetes Node
Resource Qty	Number of the vCPUs associated with Kubernetes instance
Billable Type	Instance cost per hour
Config Type	Cloud instance type or VMware resource
Billable Cost	.02541 per hour
Billable Qty Type	Total Instance Hours
Billable Qty	LEAST(COUNT(DISTINCT hourDateTime), 720)
Monthly Cost	LEAST(COUNT(DISTINCT hourDateTime), 720) * vm.processors * 0.02641
Monthly Summary	total([Monthly Cost] for report)
Monthly Cost of K8s Nodes	total(IF([Resource Type] contains 'Node') THEN ([Monthly Cost]) ELSE (0) for report)
Monthly Cost of Namespaces	When resource type = ‘namespace’ then *tier_dimension.cost/10 * vm_capacity.provisionedMB/1024*
Monthly Cost of On-Prem	total(IF([Config Type] ='VMware') THEN ([Monthly Cost]) ELSE (0) for report)
Real Cost	AWS or VMware rate card associated with the Config Type
Monthly Cost by Config	WHEN [Resource Type] contains 'Node' THEN [Real Cost]*[Billable Qty.] ELSE [Billable Qty.]*[Billable Cost]
Monthly Cost by Cluster	WHEN [Resource Type] contains 'Node' THEN [Real Cost]*[Billable Qty.] ELSE [Billable Qty.]*[Billable Cost]

Assets Overview

These are some of the day-to-day and monthly asset management tasks that can be addressed by leveraging the reports in this catalog. Here are some of the objectives met by this section:

- ❑ Physical Assets
- ❑ Assessment Metrics
- ❑ SAN Switch Inventory
- ❑ End to End Path – SAN and NAS – with Performance
- ❑ VM End to End Path – SAN and NAS / with Application
- ❑ AIQUM – NetApp Storage Summary Report
- ❑ Host with Single Point of Failure

2.2 Physical Assets

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Physical Assets - Host Info

Host Name	Model	Vendor	IPs	OS	CPU Count	CPU Speed	Memory GB	HBA Ports	HBA Speed	HBA F/W	Application
ronald4220511005041-rg-avset		Microsoft Azure Compute OS		Microsoft Azure Compute OS				0			
ronald4220516151545-rg-avset		Microsoft Azure Compute OS		Microsoft Azure Compute OS				0			
cbc-esxi213			10.65.58.213					0			
esxi67a	PowerEdge R610	Dell Inc.	10.197.143.71	VMware ESXi 6.5.0 build-6765664	8	2260	192	2			

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Physical Assets - Virtual Machines

Name	IP	Host Names	V-Cluster	OS	Processors	VM Memory (MB)	Storage	N
cbc-oci-03	192.168.223.138	cbc-esxi201	MUCCBC/CBC-MGMT	CentOS 4/5/6/7 (64-bit)	2	8,192	grenada	grena
01rancherserver	10.0.0.17,20.98.214.129		984e6d5f-7ea1-4394-8330-52e1f31b4097/AzureComputeDefaultAvailabilitySet	Linux	2	4,096		
AIQUM 9.7 (Linux)	10.62.216.122	10	RTP SA Datacenter/RTP SA Cluster	CentOS 7 (64-bit)	4	20,480	rtp-sa-cl01	rtp-sa-08
OpenShift		10	RTP SA Datacenter/RTP SA Cluster	CentOS 4/5 (64-bit)	2	4,096	rtp-sa-cl01	rtp-sa-08

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Physical Assets - Storage Arrays

Vendor	Family	Microcode Version	Storage Name	IP	Node Name	Model	Serial Number	State	Raw (TB)	Capacity (TB)	Protocols
NetApp	FAS8000	9.8.0P7 clustered Data ONTAP	ai-testdrive-fas	192.168.1.80	ai-testdrive-fas-01	FAS8020	451552000064	Healthy	124.17	61.56	NFS
NetApp	AFF	9.10.1P2 clustered Data ONTAP	mn1-ontap1	10.0.4.50	mn1-ontap1-01	AFF-A200	621816000285	Healthy	74.50	25.82	iSCSI, FC, NFS,
NetApp	FAS8000	9.8.0P11 clustered Data ONTAP	rtp-sa-cl01	10.62.218.150	rtp-sa-cl01-05	FAS8020	701415000951	Healthy	335.86	13.94	iSCSI, FC, NFS,
NetApp	FAS	9.7.0 clustered Data ONTAP	markcvo07a	172.30.8.143	markcvo07a-01	CDvM100	90920130000000024728	Healthy	0.70	0.62	NFS

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Physical Assets - FC Switches

Switch Name	IP	Vendor	Model	Firmware	Serial Number	Total Ports	Used Ports	Free Ports	Status	Type	Data Center
cbc-fab01-sw01	10.65.59.231	Brocade	Brocade G620	v9.0.1a	EWY1927N001	91	66	25	OK	CHASSIS	MUCCBC
cbc-fab01-sw02	10.65.59.232	Brocade	Brocade G620	v9.0.1a	EWY1927N004	51	11	40	OK	CHASSIS	MUCCBC
rtp-sa-br6510-02	10.62.216.52	Brocade	Brocade 6510	v8.2.0	BRW2548L00B	24	6	18	OK	CHASSIS	N/A
rtp-sa-br6510-01	10.62.216.51	Brocade	Brocade 6510	v8.2.0	BRW2548L00S	24	6	18	OK	CHASSIS	N/A

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Physical Assets - Switch Connectivity

Physical Switch	Physical Port Name	Physical Port WWN	Virtual Switch	Virtual Port Name	Virtual Port WWN	Port Type	Port Speed	Blade	Status	Status Detail	Connected WWN	Device Type	Physical Device	Virtu
cbc-fab01-sw01			cbc-fab01-sw01	fc1	20:01:C4:F5:7C:BF:C4:95	F-Port	16G		OK	Online	50:0A:09:82:80:03:5C:DD	GENERIC_DEVICE_PORT		50:0A:09:82:80:
cbc-fab01-sw01			cbc-fab01-sw01	fc1-650101-128	20:01:C4:F5:7C:BF:C4:95-650101-128	F-Port	16G		OK	Online	20:0C:00:A0:98:B3:AB:B4	GENERIC_DEVICE_PORT		20:0C:00:A0:98:
cbc-fab01-sw01			cbc-fab01-sw01	fc1-650102-128	20:01:C4:F5:7C:BF:C4:95-650102-128	F-Port	16G		OK	Online	20:00:00:A0:98:B3:AB:B4	GENERIC_DEVICE_PORT		20:00:00:A0:98:
cbc-fab01-sw01			cbc-fab01-sw01	fc1-650103-128	20:01:C4:F5:7C:BF:C4:95-650103-128	F-Port	16G		OK	Online	20:05:00:A0:98:B3:AB:B4	GENERIC_DEVICE_PORT		20:05:00:A0:98:
cbc-fab01-sw01			cbc-fab01-sw01	fc11	20:0B:C4:F5:7C:BF:C4:95	F-Port	32G		OK	Online	10:00:00:10:9B:57:01:54	Physical Server		cbc-demo-03.m
cbc-fab01-sw01			cbc-fab01-sw01	fc15	20:0F:C4:F5:7C:BF:C4:95	F-Port	32G		OK	Online	10:00:00:10:9B:57:01:72	Physical Server		cbc-demo-04.m

Description: This report is a collection of 5 separate asset categories. Host/Servers, Virtual Machines, Storage Arrays, FC Switches and Switch Connectivity.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.
No annotations required.

Report XML: 2.2 Physical Assets

2.3 Assessment Metrics

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Assessment Metrics

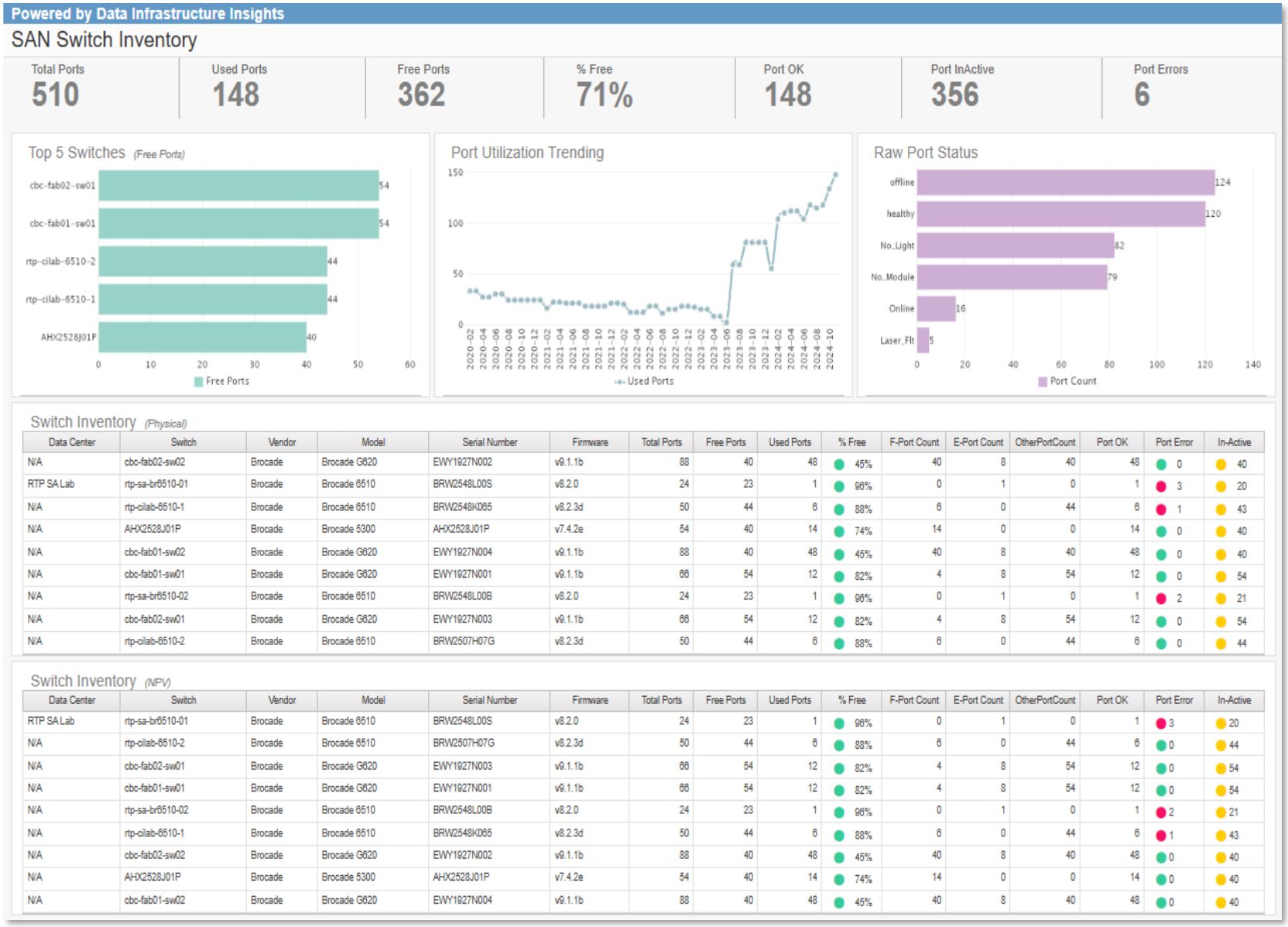
	Metric	Value	Description
Host	Server Count	704	# of VMs + non-Hypervisor hosts
	VM Count	539	# of VMs
	Bare Metal Count	165	# of non-HV physical hosts
	Percent Virtualised	76.6%	VMs / (VMs + bare metal)
	Hypervisor Count	35	# of hypervisors
	Hypervisor CPU Count	604	Total CPU cores in hypervisors
	Hypervisor Memory GB	15,726	Total memory GB in hypervisors
	V2P Ratio	15.4	VMs per hypervisor
	Powered Off VM Count	144	# of powered off VMs
	Powered Off VM Capacity TB	9.1	Capacity TB in powered off VMs
	Hypervisor CPU %	13.4%	Avg hypervisor CPU utilisation
	Hypervisor Memory %	32.2%	Avg hypervisor memory utilisation
	Avg of Max HV CPU %	22.1%	Avg of the peak CPU across Hypervisors
	Avg of Max HV Memory %	36.4%	Avg of the peak memory across Hypervisors
	Max of Max HV CPU %	122.7%	Max of the peak CPU across Hypervisors
	Max of Max HV Memory %	99.3%	Max of the peak memory across Hypervisors
	vCPU : CPU Ratio	3.9	Total VM CPU count / hypervisor CPU core count
	vMemory : Memory Ratio	0.5	Total VM memory GB / hypervisor memory GB
	Number of Datastores	201	
	Number of Datastores on Block	32	
	Number of Datastores on NAS	59	
	Number of other Datastores	110	
	Datastore capacity - allocated (TB)	570.1	Allocated Datastore capacity in TB
	Datastore capacity - free (TB)	394.5	free Datastore capacity in TB
	Datastore capacity - used (TB)	175.6	used DataStore capacity in TB
	Datastore capacity - consumed on Disk (TB)	160.0	consumed Datastore Capacity on Disk in TB
	Count VMs > 65% CPU / mem	0	# of VMs with avg CPU and avg MEM utilisation >65%
	Count VMs < 15% CPU / mem	280	# of VMs with avg CPU and avg MEM utilisation <15%
	avg number of CPU per VM	4.3	# of CPU per VM (AVG)
	avg GB of MEM per VM	15.596475	avg MB of MEM per VM
	avg provisioned Capacity per VM (GB)	596.9	avg provisioned Capacity per VM (GB)
	avg used Capacity per VM (GB)	159.1	avg used Capacity per VM (GB)
Network	Switch Count	9	# of switches
	Physical Port Count	528	# of physical switch ports
	Used Physical Port Count	86	# of physical switch ports in use
	Virtual Port Count	62	# of virtual (NPIV or other generated) switch ports
	Used Physical Port %	16.3%	Used physical ports / total physical ports
	Average Port Perf Util %	0.0%	Avg performance % utilisation of physical switch ports
Storage	Storage Count	52	# of arrays
	Total Raw Capacity TB	6,829.8	Total TB raw capacity
	Usable Capacity TB	5,919.0	Usable capacity in storage pools
	Provisioned Capacity TB	11,702.1	Allocated capacity - masked volume TB + allocated internal volume TB (can 'sort of' double count for NetApp SAN)
	Used Capacity TB	2,369.4	Used capacity in storage pools
	Usable Capacity Utilisation %	40.0%	Used capacity / usable capacity
	Flash Capacity TB	4,271.4	Capacity of Flash disks
	Performance Spindle Capacity TB	613.1	Capacity of 10k / 15k spindles
	Nearline Spindle Capacity TB	1,945.3	Capacity of 7.2k spindles
	Flash Spindle Count	1,387	Count of Flash Disks
	Performance Spindle Count	596	Count of 10k / 15k spindles
	Nealine Spindle Count	399	Count of 7.2k spindles
	Flash Capacity %	62.5%	Flash capacity / total disk capacity
	Performance Spindle Capacity %	9.0%	10k | 15k spindle capacity / total disk capacity
	Nearline Spindle Capacity %	28.5%	7.2k spindle capacity / total disk capacity
	IO Density Flash %	54.4%	% of used capacity requiring flash (2048+ IOPS/TB @ 95th percentile)
	IO Density Performance %	1.8%	% of used capacity requiring performance (256 - 2048 IOPS/TB @ 95th percentile)
	IO Density Nearline %	43.9%	% of used capacity requiring nearline (<256 IOPS/TB @ 95th percentile)
	Orphaned TB by Config	13.8	Volumes orphaned by Config (consumed TB - ROI will convert to raw)
	Orphaned TB by Performance	42.5	Orphaned by performance (consumed TB - ROI will convert to raw)
	Capacity Allocated for Volumes (TB)	8,654.1	
	Capacity Allocated for int. Volumes (TB)	5,641.0	Capacity Allocated for int. Volumes (TB) without snapshots
	Capacity used on Volumes (TB)	2,573.2	
	Capacity used on int. Volumes (TB)	676.9	Capacity used on int. Volumes (TB) without snapshots
Risk	Hosts with Redundancy Violations	0	# of hosts with redundancy violations
	VMs on Non-Redundant Hosts	0	# VMs on hypervisors with redundancy violations
	VMs with Latency Risk	1	# of VMs with avg latency > 30ms and avg IOPS > 5
	Hosts with Volume Latency Risk	2	# of hosts with avg latency > 20ms and volume avg IOPS > 10 (figures averaged across all volumes visible to a given host)
	Internal Volume Latency Risk	0	# of internal volumes with avg latency > 20ms and avg IOPS > 10

Description: This report

Prerequisites: Data Infrastructure Insights (DII) reporting enabled. Application, tier and tier cost annotations deployed.

Report XML: 2.3 Assessment Metrics

2.4 SAN Switch Inventory



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SAN Switch Inventory

Total Ports	Used Ports	Free Ports	% Free	Port OK	Port InActive	Port Errors
510	148	362	71%	148	356	6

Top 5 Switches (Free Ports)

Port Utilization Trending

Raw Port Status

Switch Inventory (Physical)

Data Center	Switch	Vendor	Model	Serial Number	Firmware	Total Ports	Free Ports	Used Ports	% Free	F-Port Count	E-Port Count	OtherPortCount	Port OK	Port Error	In-Active
N/A	cbc-fab02-sw02	Brocade	Brocade G620	EWY1927N002	v9.1.1b	88	40	48	45%	40	8	40	48	0	40
RTP SA Lab	rtp-sa-br6510-01	Brocade	Brocade 6510	BRW2548L00S	v8.2.0	24	23	1	96%	0	1	0	1	3	20
N/A	rtp-cilab-6510-1	Brocade	Brocade 6510	BRW2548K065	v8.2.3d	50	44	6	88%	6	0	44	6	1	43
N/A	AHX2528J01P	Brocade	Brocade 5300	AHX2528J01P	v7.4.2e	54	40	14	74%	14	0	0	14	0	40
N/A	cbc-fab01-sw02	Brocade	Brocade G620	EWY1927N004	v9.1.1b	88	40	48	45%	40	8	40	48	0	40
N/A	cbc-fab01-sw01	Brocade	Brocade G620	EWY1927N001	v9.1.1b	66	54	12	82%	4	8	54	12	0	54
N/A	rtp-sa-br6510-02	Brocade	Brocade 6510	BRW2548L00B	v8.2.0	24	23	1	96%	0	1	0	1	2	21
N/A	cbc-fab02-sw01	Brocade	Brocade G620	EWY1927N003	v9.1.1b	66	54	12	82%	4	8	54	12	0	54
N/A	rtp-cilab-6510-2	Brocade	Brocade 6510	BRW2507H07G	v8.2.3d	50	44	6	88%	6	0	44	6	0	44

Switch Inventory (NPV)

Data Center	Switch	Vendor	Model	Serial Number	Firmware	Total Ports	Free Ports	Used Ports	% Free	F-Port Count	E-Port Count	OtherPortCount	Port OK	Port Error	In-Active
RTP SA Lab	rtp-sa-br6510-01	Brocade	Brocade 6510	BRW2548L00S	v8.2.0	24	23	1	96%	0	1	0	1	3	20
N/A	rtp-cilab-6510-2	Brocade	Brocade 6510	BRW2507H07G	v8.2.3d	50	44	6	88%	6	0	44	6	0	44
N/A	cbc-fab02-sw01	Brocade	Brocade G620	EWY1927N003	v9.1.1b	66	54	12	82%	4	8	54	12	0	54
N/A	cbc-fab01-sw01	Brocade	Brocade G620	EWY1927N001	v9.1.1b	66	54	12	82%	4	8	54	12	0	54
N/A	rtp-sa-br6510-02	Brocade	Brocade 6510	BRW2548L00B	v8.2.0	24	23	1	96%	0	1	0	1	2	21
N/A	rtp-cilab-6510-1	Brocade	Brocade 6510	BRW2548K065	v8.2.3d	50	44	6	88%	6	0	44	6	1	43
N/A	cbc-fab02-sw02	Brocade	Brocade G620	EWY1927N002	v9.1.1b	88	40	48	45%	40	8	40	48	0	40
N/A	AHX2528J01P	Brocade	Brocade 5300	AHX2528J01P	v7.4.2e	54	40	14	74%	14	0	0	14	0	40
N/A	cbc-fab01-sw02	Brocade	Brocade G620	EWY1927N004	v9.1.1b	88	40	48	45%	40	8	40	48	0	40

Description: This report

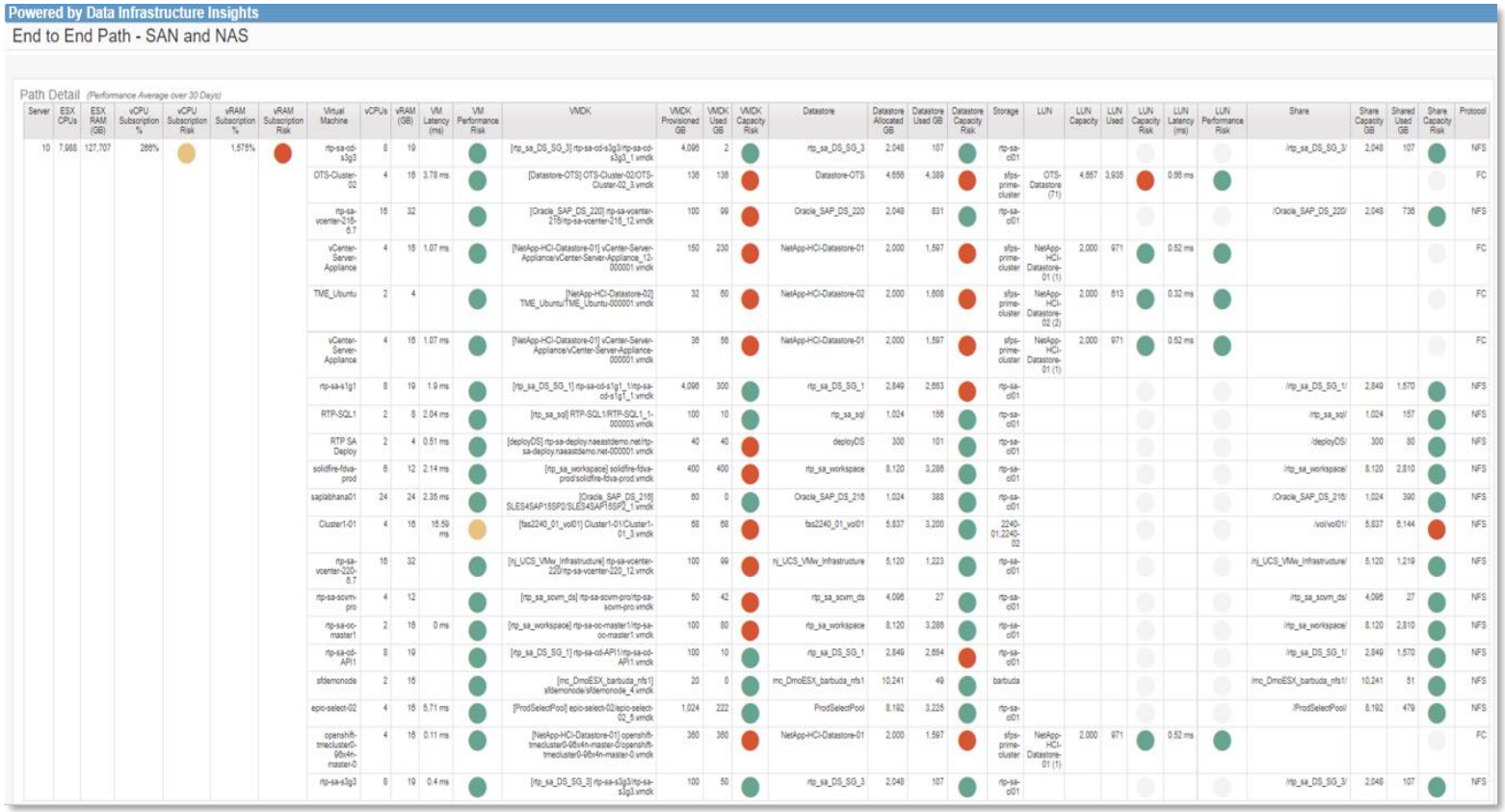
Prerequisites: Data Infrastructure Insights (DII) reporting enabled. Application, tier and tier cost annotations deployed.

Report XML: 2.4 SAN Switch Inventory

2.4 SAN Switch Inventory Definitions

Metric/Attribute	Description
Data Center	DII configured annotation. Defines the location of the device
Switch	Name of the SAN switch discovered and monitored by DII
Vendor	Manufacturer of the SAN switch
Model	Model name of the SAN switch
Serial Number	Serial Number of the SAN switch
Firmware	Firmware version of the SAN switch
Total Ports	Total number of ports associated with each switch
Free Ports	Total number of free ports associated with each switch
Used Ports	Total number of used ports associated with each switch
% Free	Free Ports / Total Ports
F-Port Count	Total number of F-Ports
E-Port Count	Total number of E-Ports
OtherPortCount	Total number of 'Other' report types
Port OK	Total number of active ports on the switch
Port Error	Total number of port errors
In-Active	Total number of inactive ports on the switch
Raw Port Status	Status of the raw port e.g. offline, healthy, no light, no module, online, laser fault etc.
Full Date	Fulldate field derived from the Date Dimension tables in the DWH

2.5 End to End Path – SAN and NAS with Performance


Powered by Data Infrastructure Insights

End to End Path - SAN and NAS

Path Detail (Performance Average over 30 Days)

Server	ESX CPUs	ESX RAM (GB)	vCPU Subscription %	vCPU Subscription Risk	vRAM Subscription %	vRAM Subscription Risk	Virtual Machine	vCPUs	vRAM (GB)	VM Latency (ms)	VM Performance Risk	VMDK	VMDK Provisioned GB	VMDK Used GB	VMDK Capacity Risk	Datastore	Datastore Allocated GB	Datastore Used GB	Datastore Capacity Risk	Storage	LUN	LUN Capacity	LUN Used	LUN Capacity Risk	LUN Latency (ms)	LUN Performance Risk	Share	Share Capacity GB	Shared Used GB	Share Capacity Risk	Protocol
10	7,988	127,707	266%		1,575%		rtp-sa-cd-s3g3	8	19			[rtp_sa_DS_SG_3] rtp-sa-cd-s3g3/rtp-sa-cd-s3g3_1.vmdk	4,096	2		rtp_sa_DS_SG_3	2,048	107		rtp-sa-c01							/rtp_sa_DS_SG_3/	2,048	107		NFS
							OTS-Cluster-02	4	16	3.78 ms		[Datastore-OTS] OTS-Cluster-02/OTS-Cluster-02_3.vmdk	136	136		Datastore-OTS	4,656	4,389		sfps-prime-cluster	OTS-Datastore (71)	4,657	3,935		0.66 ms						FC
							rtp-sa-vcenter-215-6.7	16	32			[Oracle_SAP_DS_220] rtp-sa-vcenter-278/rtp-sa-vcenter-216_12.vmdk	100	99		Oracle_SAP_DS_220	2,048	831		rtp-sa-c01							/Oracle_SAP_DS_220/	2,048	736		NFS
							vCenter-Server-Appliance	4	16	1.07 ms		[NetApp-HCI-Datastore-01] vCenter-Server-Appliance/vCenter-Server-Appliance_12-000001.vmdk	150	230		NetApp-HCI-Datastore-01	2,000	1,597		sfps-prime-cluster	NetApp-HCI-Datastore-01 (1)	2,000	971		0.52 ms						FC
							TME_Ubuntu	2	4			[NetApp-HCI-Datastore-02] TME_Ubuntu/TME_Ubuntu-000001.vmdk	32	60		NetApp-HCI-Datastore-02	2,000	1,608		sfps-prime-cluster	NetApp-HCI-Datastore-02 (2)	2,000	613		0.32 ms						FC
							vCenter-Server-Appliance	4	16	1.07 ms		[NetApp-HCI-Datastore-01] vCenter-Server-Appliance/vCenter-Server-Appliance-000001.vmdk	36	56		NetApp-HCI-Datastore-01	2,000	1,597		sfps-prime-cluster	NetApp-HCI-Datastore-01 (1)	2,000	971		0.52 ms						FC
							rtp-sa-s1g1	8	19	1.9 ms		[rtp_sa_DS_SG_1] rtp-sa-cd-s1g1_1/rtp-sa-cd-s1g1_1.vmdk	4,096	300		rtp_sa_DS_SG_1	2,849	2,653		rtp-sa-c01							/rtp_sa_DS_SG_1/	2,849	1,570		NFS
							RTP-SQL1	2	8	2.04 ms		[rtp_sa_sql] RTP-SQL1/RTP-SQL1_1-000003.vmdk	100	10		rtp_sa_sql	1,024	156		rtp-sa-c01							/rtp_sa_sql/	1,024	157		NFS
							RTP SA Deploy	2	4	0.51 ms		[deployOS] rtp-sa-deploy.naeastdemo.net/rtp-sa-deploy.naeastdemo.net-000001.vmdk	40	40		deployOS	300	101		rtp-sa-c01							/deployOS/	300	80		NFS
							solidfire-fova-prod	8	12	2.14 ms		[rtp_sa_workspace] solidfire-fova-prod/solidfire-fova-prod.vmdk	400	400		rtp_sa_workspace	8,120	3,286		rtp-sa-c01							/rtp_sa_workspace/	8,120	2,810		NFS
							saplabhana01	24	24	2.35 ms		[Oracle_SAP_DS_216] SLES4SAP15SP2/SLES4SAP15SP2_1.vmdk	60	0		Oracle_SAP_DS_216	1,024	388		rtp-sa-c01							/Oracle_SAP_DS_216/	1,024	390		NFS
							Cluster1-01	4	16	16.59 ms		[fas2240_01_vol01] Cluster1-01/Cluster1-01_3.vmdk	68	68		fas2240_01_vol01	5,837	3,200		2240-01,2240-02							/vol/vol01/	5,837	6,144		NFS
							rtp-sa-vcenter-220-6.7	16	32			[nj_UCS_VMw_Infrastructure] rtp-sa-vcenter-220/rtp-sa-vcenter-220_12.vmdk	100	99		nj_UCS_VMw_Infrastructure	5,120	1,223		rtp-sa-c01							/nj_UCS_VMw_Infrastructure/	5,120	1,219		NFS
							rtp-sa-scvm-pro	4	12			[rtp_sa_scvm_ds] rtp-sa-scvm-pro/rtp-sa-scvm-pro.vmdk	50	42		rtp_sa_scvm_ds	4,096	27		rtp-sa-c01							/rtp_sa_scvm_ds/	4,096	27		NFS
							rtp-sa-oc-master1	2	16	0 ms		[rtp_sa_workspace] rtp-sa-oc-master1/rtp-sa-oc-master1.vmdk	100	80		rtp_sa_workspace	8,120	3,286		rtp-sa-c01							/rtp_sa_workspace/	8,120	2,810		NFS
							rtp-sa-cd-API1	8	19			[rtp_sa_DS_SG_1] rtp-sa-cd-API1/rtp-sa-cd-API1.vmdk	100	10		rtp_sa_DS_SG_1	2,849	2,654		rtp-sa-c01							/rtp_sa_DS_SG_1/	2,849	1,570		NFS
							sfdemonode	2	16			[mc_DmoESX_barbuda_nfs1] sfdemonode/sfdemonode_4.vmdk	20	0		mc_DmoESX_barbuda_nfs1	10,241	49		barbuda							/mc_DmoESX_barbuda_nfs1/	10,241	51		NFS
							epic-select-02	4	16	5.71 ms		[ProdSelectPool] epic-select-02/epic-select-02_5.vmdk	1,024	222		ProdSelectPool	8,192	3,225		rtp-sa-c01							/ProdSelectPool/	8,192	479		NFS
							openshift-tmecluster0-96x4n-master-0	4	16	0.11 ms		[NetApp-HCI-Datastore-01] openshift-tmecluster0-96x4n-master-0/openshift-tmecluster0-96x4n-master-0.vmdk	360	360		NetApp-HCI-Datastore-01	2,000	1,597		sfps-prime-cluster	NetApp-HCI-Datastore-01 (1)	2,000	971		0.52 ms						FC
							rtp-sa-s3g3	8	19	0.4 ms		[rtp_sa_DS_SG_3] rtp-sa-s3g3/rtp-sa-s3g3.vmdk	100	50		rtp_sa_DS_SG_3	2,048	107		rtp-sa-c01							/rtp_sa_DS_SG_3/	2,048	107		NFS

Description: This report contains a comprehensive estate level view of SAN and NAS resource paths with alerts. Please see the data dictionary for definitions.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.
No annotations required.

Report XML: 2.5 End to End Path - SAN and NAS with Performance

2.5 End to End Path Definitions

Metric/Attribute	Description
Server	Name of the hypervisor discovered and monitored by DII
ESX CPUs	The CPU count associated with the hypervisor
ESX RAM (GiB)	The amount of RAM in Gibibytes associated with the hypervisor
vCPU Subscription %	[ESX CPUs] / total([vCPUs] for [Server])
vCPU Subscription Risk	● vCPU Subscription % > 4 ● vCPU Subscription % BETWEEN 2.4 and 4
vRAM Subscription %	[ESX RAM (GiB)] / total([vRAM (GiB)] for [Server])
vRAM Subscription Risk	● vRAM Subscription % > 4 ● vRAM Subscription % BETWEEN 2.5 and 4
Virtual Machine	Name of the virtual machine associated with the hypervisor
vCPUs	Number of vCPUs allocated to the virtual machine
vRAM (GiB)	Amount of vRAM in Gibibytes allocated to the virtual machine
VM Latency (ms)	Average total response time in milliseconds (read+write) as reported by the virtual machine
VM Performance Risk	● VM Latency (ms) > 25 ● VM Latency (ms) BETWEEN 10 and 25
VMDK	Name of the virtual disk provisioned to the virtual machine
VMDK Provisioned (GiB)	Amount of capacity in Gibibytes of the VMDK
VMDK Used (GiB)	Amount of used capacity in Gibibytes of the VMDK
VMDK Capacity Risk	● VMDK Used % > .75 ● VMDK Used % Between .65 and .75
Datastore	Name of the datastore associated with the hypervisor
Datastore Allocated (GiB)	Amount of capacity in Gibibytes allocated to the datastore
Datastore Capacity Risk	● Datastore Used % > .75 ● Datastore Used % Between .65 and .75
Storage	Name of the storage device discovered and monitored by DII that feeds the datastore
LUN	Name of the LUN associated with the storage device
LUN Capacity	Amount of capacity in Gibibytes allocated to the LUN
LUN Used	Amount of used capacity in Gibibytes reported by the LUN
LUN Capacity Risk	● Lun Used % > .75 ● Lun Used % Between .65 and >.75
LUN Latency (ms)	Average total response time in milliseconds (read+write) as reported by the Volume/LUN
LUN Performance Risk	● LUN Latency (ms) > 10 ● LUN Latency (ms) Between 5 and 10 ● LUN Latency (ms) <= 5
Share	Name of the NFS share associated with the storage device

Share Capacity (GiB)	Amount of Capacity in Gibibytes allocated from the Flexvol to the share
Share Used (GiB)	Amount of Used Capacity in Gibibytes as reported from the Flexvol
Share Used %	Share Used (GiB) / Share Capacity (GiB)
Share Capacity Risk	● Share Used % > .75 ● Share Used % Between .65 and .75
Protocol	The protocol associated with the share e.g. NFS, CIFS

2.6 VM End to End Path – SAN and NAS

Powered by Data Infrastructure Insights

VM End to End Path - SAN and NAS

Path Detail *(Current Data)*

Server	Virtual Machine	Datastore	Storage	Vendor	Model	Firmware	LUN	LUN Capacity (GiB)	Share	Protocol	Share Capacity GiB	VMDK	VMDK Provisioned GiB	VMDK Used GiB	VMDK % Used	Datastore Allocated GiB	Datastore Used GiB	DS % Used
	rtp-sa-select01-1	ProdSelectDS1	rtp-sa-fas8200-infra	NetApp	FAS8200	NetApp Release 9.15.1P2: Wed Sep 25 22:33:44 UTC 2024			/ProdSelectDS1/	NFS	24,576	[ProdSelectDS1] rtp-sa-select01-1/rtp-sa-select01-1_1.vmdk	120.00	11.75	10%	24,576.00	11,360.03	46%
	linux03-js	Datastore02	DEMOF2750	NetApp	FAS2750	9.14.1P7 clustered Data ONTAP	SVM-POC:Datastore02_vol/:/vol/Datastore02_vol/Datastore02	5,120.00		FC		[Datastore02] linux03-js/linux03-js-000001.vmdk	200.00	206.94	103%	5,119.75	4,006.21	78%
cbc-esxi56	kw_vmdk1	cbc_esxi_snapcenter	grenada	NetApp	AFF-A800	9.14.1P6 clustered Data ONTAP			/cbc_esxi_snapcenter/	NFS	10,500	[cbc_esxi_snapcenter] kw_vmdk1/kw_vmdk1_8.vmdk	64.00	41.43	66%	10,500.00	7,932.04	76%
	rtp-sa-ansible	nfs_mgmt_ds	rtp-sa-fas8200-infra	NetApp	FAS8200	NetApp Release 9.15.1P2: Wed Sep 25 22:33:44 UTC 2024			/nfs_mgmt_ds/	NFS	2,048	[nfs_mgmt_ds] rtp-sa-ansible/rtp-sa-ansible_1.vmdk	500.00	0.00	0%	2,048.00	905.07	44%
cbc-esxi55	cbc-vmware01	cbc_esxi_prod_linux_ds_02	grenada	NetApp	AFF-A800	9.14.1P6 clustered Data ONTAP			/cbc_esxi_prod_linux_ds_02/	NFS	39,900	[cbc_esxi_prod_linux_ds_02] cbc-vmware01/cbc-vmware01_9.vmdk	10.00	0.22	2%	39,900.00	14,502.84	36%
cbc-esxi56	cbc-ocum-02	cbc_esxi_prod_linux_ds_03	grenada	NetApp	AFF-A800	9.14.1P6 clustered Data ONTAP			/cbc_esxi_prod_linux_ds_03/	NFS	39,900	[cbc_esxi_prod_linux_ds_03] cbc-ocum-02_1/cbc-ocum-02_3-000001.vmdk	30.00	0.15	0%	39,900.00	18,871.95	47%
rtp-cilab-cisco-c240m4-03	VMware vCenter Server	vmdsfc02	rtp-cilab-fas2750	NetApp	FAS2750	9.14.1 clustered Data ONTAP	vmwareDSfc01:vmdsfc02:/vol/vmdsfc02/vmdsfc02	512.00		FC		[vmdsfc02] VMware vCenter Server/VMware vCenter Server_1.vmdk	7.25	7.25	100%	511.75	145.66	28%
cbc-esxi56	jmike-sles11sp3	cbc_esxi_prod_win_ds_01	grenada	NetApp	AFF-A800	9.14.1P6 clustered Data ONTAP			/cbc_esxi_prod_win_ds_01/	NFS	39,900	[cbc_esxi_prod_win_ds_01] jmike-sles11sp3/jmike-sles11sp3_1.vmdk	74.00	6.13	8%	39,900.00	11,842.34	30%
cbc-esxi56	gwaching-grid1-sn3	cbc_esxi_prod_linux_ds_01	grenada	NetApp	AFF-A800	9.14.1P6 clustered Data ONTAP			/cbc_esxi_prod_linux_ds_01/	NFS	39,900	[cbc_esxi_prod_linux_ds_01] gwaching-grid1-sn3/gwaching-grid1-sn3.vmdk	100.00	4.67	5%	39,900.00	13,729.33	34%
	scv-amer-sa	esx_nfs_1	fas8060-2n-rtp-13	NetApp	FAS8060	9.8.0P21 clustered Data ONTAP			/esx_nfs_1/	NFS	3,072	[esx_nfs_1] scv-amer-sa/scv-amer-sa_2-000001.vmdk	20.00	1.29	6%	3,072.00	2,251.79	73%
	rtp-sa-select01-1	ProdSelectDS1	rtp-sa-fas8200-infra	NetApp	FAS8200	NetApp Release 9.15.1P2: Wed Sep 25 22:33:44 UTC 2024			/ProdSelectDS1/	NFS	24,576	[ProdSelectDS1] rtp-sa-select01-1/rtp-sa-select01-1_5.vmdk	3,450.00	3,410.95	99%	24,576.00	11,360.03	46%
	nane-oi-vcenter.rtp.openenglab.netapp.com	flexVol_markcTawny01	tawny	NetApp	FAS8060	9.8.0 clustered Data ONTAP			/flexVol_markcTawny01/	NFS	2,048	[flexVol_markcTawny01] nane-oi-vcenter.rtp.openenglab.netapp.com/nane-oi-vcenter.rtp.openenglab.netapp.com_1.vmdk	5.61	5.63	100%	2,048.00	1,150.54	56%
	rtp-sa-select03-02	ProdSelectDS2	rtp-sa-fas8200-infra	NetApp	FAS8200	NetApp Release 9.15.1P3: Wed Sep 25 22:33:44 UTC 2024			/ProdSelectDS2/	NFS	24,576	[ProdSelectDS2] rtp-sa-select03-02/rtp-sa-select03-02_3.vmdk	2,048.00	49.66	2%	24,576.00	2,773.51	11%
cbc-esxi55	cbc-vmware01	cbc_esxi_prod_linux_ds_02	grenada	NetApp	AFF-A800	9.14.1P6 clustered Data ONTAP			/cbc_esxi_prod_linux_ds_02/	NFS	39,900	[cbc_esxi_prod_linux_ds_02] cbc-vmware01/cbc-vmware01.vmdk	48.66	20.72	43%	39,900.00	14,502.84	36%
	scv-amer-sa	esx_nfs_1	fas8060-2n-rtp-13	NetApp	FAS8060	9.8.0P21 clustered Data ONTAP			/esx_nfs_1/	NFS	3,072	[esx_nfs_1] scv-amer-sa/scv-amer-sa_3-000001.vmdk	10.00	0.04	0%	3,072.00	2,251.79	73%
	xenadev	amer_sa	fas8060-2n-rtp-13	NetApp	FAS8060	9.8.0P21 clustered Data ONTAP			/amer_sa/	NFS	3,048	[amer_sa] xenadev/xenadev.vmdk	200.00	2.23	1%	3,048.00	1,012.94	33%
cbc-esxi56	ohaensel-win80	cbc_esxi_prod_win_ds_02	grenada	NetApp	AFF-A800	9.14.1P6 clustered Data ONTAP			/cbc_esxi_prod_win_ds_02/	NFS	39,900	[cbc_esxi_prod_win_ds_02] ohaensel-win80/ohaensel-win80_1-000001.vmdk	90.00	33.42	37%	39,900.00	15,820.46	40%
	rtp-sa-eavc	NFSa	rtp-sa-fas8200-infra	NetApp	FAS8200	NetApp Release 9.15.1P2: Wed Sep 25 22:33:44 UTC 2024			/NFSa/	NFS	1,024	[NFSa] rtp-sa-eavc/rtp-sa-eavc_5.vmdk	25.00	1.16	5%	1,024.00	487.22	48%
	rtp-sa-select02-02	ProdSelectDS2	rtp-sa-fas8200-infra	NetApp	FAS8200	NetApp Release 9.15.1P3: Wed Sep 25 22:33:44 UTC 2024			/ProdSelectDS2/	NFS	24,576	[ProdSelectDS2] rtp-sa-select02-02/rtp-sa-select02-02_5.vmdk	1,024.00	833.31	81%	24,576.00	2,773.51	11%
	nane-oi-vcenter.rtp.openenglab.netapp.com	flexVol_markcTawny01	tawny	NetApp	FAS8060	9.8.0 clustered Data ONTAP			/flexVol_markcTawny01/	NFS	2,048	[flexVol_markcTawny01] nane-oi-vcenter.rtp.openenglab.netapp.com/nane-oi-vcenter.rtp.openenglab.netapp.com_3.vmdk	50.00	1.04	2%	2,048.00	1,150.54	56%

Description: This report contains a view of VM SAN and NAS resource paths with alerts. Please see the data dictionary for definitions.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.
No annotations required.

Report XML: 2.6 VM End to End Path - SAN and NAS

2.6 VM End to End Path Definitions

Metric/Attribute	Description
Server	Name of the hypervisor discovered and monitored by DII
Virtual Machine	Name of the virtual machine associated with the hypervisor
Datastore	Name of the datastore associated with the hypervisor
Storage	Name of the storage device discovered and monitored by DII that feeds the datastore
Vendor	Manufacturer of the storage device
Model	Model name of the storage device
Firmware	Firmware or Microcode Version of the storage device
LUN	Name of the LUN associated with the storage device
LUN Capacity GiB	Amount of capacity in Gibibytes allocated to the LUN
Share	Name of the NFS share associated with the storage device
Protocol	The protocol associated with the share e.g. NFS, CIFS
Share Capacity GiB	Amount of Capacity in Gibibytes allocated from the Flexvol to the share
VMDK	Name of the virtual disk provisioned to the virtual machine
VMDK Provisioned GiB	Amount of capacity in Gibibytes of the VMDK
VMDK Used GiB	Amount of used capacity in Gibibytes of the VMDK
VMDK % Used	VMDK Used GiB / VMDK Provisioned GiB
Datastore Allocated GiB	Amount of capacity in Gibibytes allocated to the datastore
Datastore Used GiB	The amount of data-store capacity being used (vm_capacity_fact.ActualMB/1024)
DS % Used	Datastore Used GiB / Datastore Allocated GiB

2.9 AIQUM - NetApp Storage Summary Report

Powered by Data Infrastructure Insights

NetApp Storage Summary Report

Cluster	Model	OS Version	HA Pair	Total Raw Capacity (TiB)	Unconfigured Raw Capacity (TiB)	Aggregate Total Capacity (TiB)	Aggregate Used Capacity (TiB)	Aggregate Unused Capacity (TiB)	Allocated LUN Capacity (TiB)	Unallocated LUN Capacity (TiB)	Volume Total Capacity (TiB)	Volume Used Capacity (TiB)	Volume Unused Capacity (TiB)	Volume Protection Capacity (TiB)
A250-41-42-43	AFF-A250	9.13.1P1 clustered Data ONTAP	A250-43/A250-42	35.79	0	25.7	3.34	22.36	2.31	0.07	138.11	3.74	134.37	0
aff300-sa-rtp-1	AFF-A300	NetApp Release 9.15.1P3: Wed Sep 25 22:33:44 UTC 2024	aff300-sa-rtp-1-01/aff300-sa-rtp-1-02	72.36	0	55.96	0.04	55.92	0	0	0	0	0	0
antigua	AFF-A300	9.15.1P1 clustered Data ONTAP	antigua-01/antigua-02	79.91	0	27.95	1.34	26.61	4	0	6.38	0.75	5.63	0
bahamas	AFF-A400	9.15.1P1 clustered Data ONTAP	bahamas-01/bahamas-02	38.62	0	28.42	2.32	26.1	633.34	201.02	533.09	1.62	531.47	0
barbuda	AFF-A300	9.15.1P1 clustered Data ONTAP	barbuda-01/barbuda-02	89.74	0	37.08	1.59	35.49	0	0	30.87	5.64	25.23	0
cluster1	SIMBOX	9.14.1 clustered Data ONTAP	cluster1-01/cluster1-02	0	0	1.16	0.86	0.3	10.7	9.98	1.9	1.02	0.88	0
cluster1	SIMBOX	9.12.1P11 clustered Data ONTAP	cluster1-01/cluster1-02	0	0	1.16	0.08	1.08	0	0	0.08	0.04	0.04	0
cluster2	SIMBOX	9.14.1 clustered Data ONTAP	cluster2-01/cluster2-02	0	0	0.69	0.4	0.29	10.53	0.1	8.67	1.46	7.21	0
DEMOF2750	FAS2750	9.14.1P7 clustered Data ONTAP	DEMOF2750-01/DEMOF2750-02	17.94	0	13.18	6.98	6.2	14	0	14.62	2.7	11.92	0
epic-select	FASDvM300	NetApp Release 9.15.1P3: Wed Sep 25 22:33:44 UTC 2024	epic-select-01/epic-select-02	0	0	1.68	0.01	1.67	0	0	0.01	0	0.01	0
gemini	AFF8040	9.8.0P21 clustered Data ONTAP	gemini-03/gemini-04	12.3	0	9.72	1.75	7.97	1.01	1	56.81	1.13	55.68	0
grenada	AFF-A800	9.14.1P6 clustered Data ONTAP	grenada-03/grenada-04	307.38	0	265.44	111.03	154.41	34.41	4.9	2,148.53	137.98	2,010.55	0
Infra-OTS	FASDvM300	NetApp Release 9.15.1P3: Wed Sep 25 22:33:44 UTC 2024	Infra-OTS-01/Infra-OTS-02	4	0	1.68	0.36	1.32	0.03	0	2.6	0.11	2.49	0
jamaica	AFF-A700	NetApp Release 9.15.1P1: Tue Jul 30 05:15:49 UTC 2024	jamaica-01/jamaica-02	38.3	0	31.52	0.62	30.9	4.93	0	10	0.49	9.51	0

Description: This report shows NetApp Clusters with node pairs and the capacity metrics for each cluster.

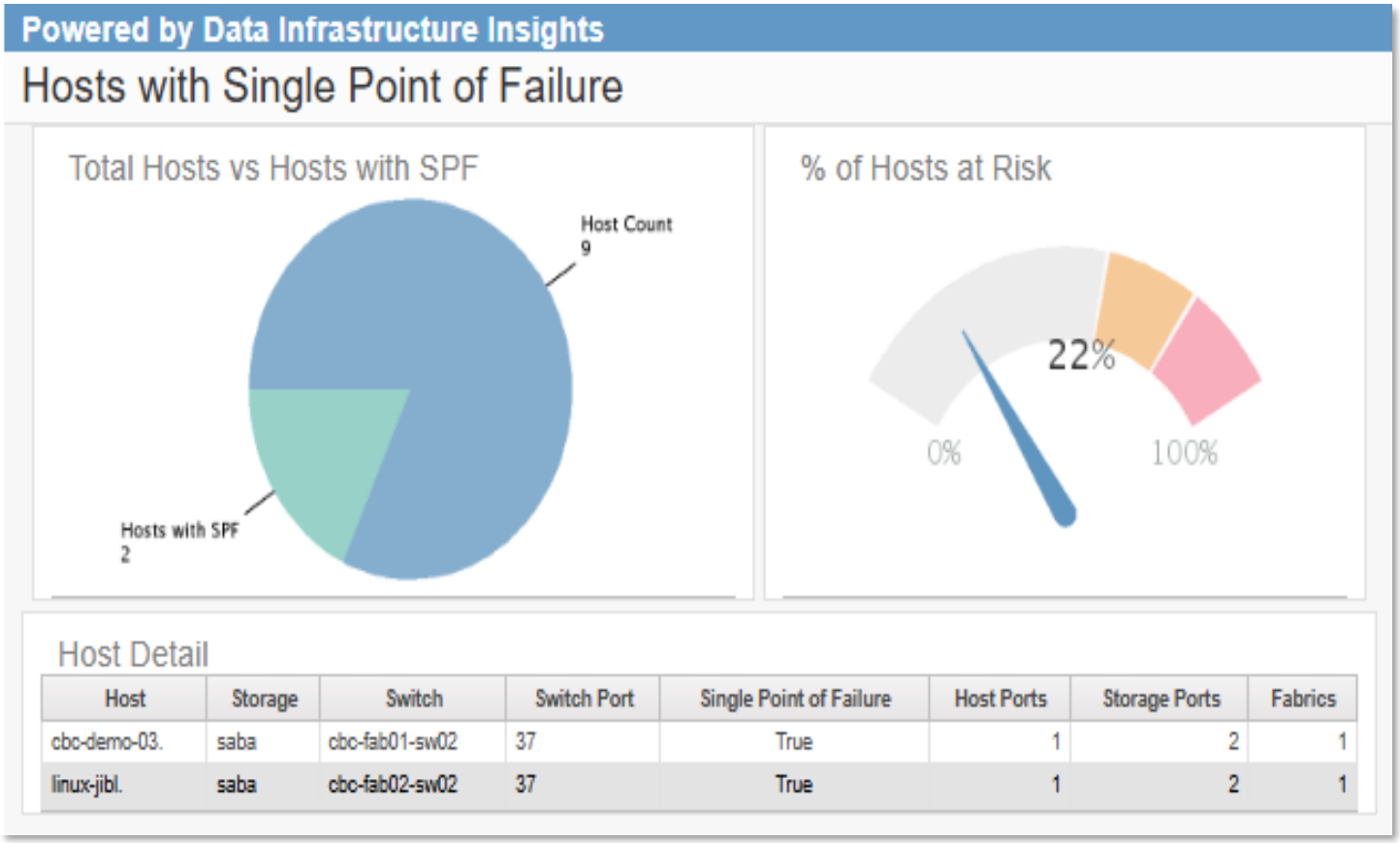
Prerequisites: Data Infrastructure Insights (DII) reporting enabled. No annotations required.

Report XML: 2.9 AIQUM - NetApp Storage Summary Report

2.9 NetApp Storage Summary Report Definitions

Metric/Attribute	Description
Cluster	Name of the NetApp CDOT cluster discovered and monitored by DII
Model	Model name of the CDOT cluster
OS Version	ONTAP version associated with the CDOT cluster
HA Pair	Node pair associated with the CDOT cluster
Total Raw Capacity (TiB)	Pre-RAID Raw Capacity in Tebibytes of all disks as reported by the storage device monitored by DII and contained in the Storage and Storage Pool Capacity Fact table
Unconfigured Raw Capacity (TIB)	Unused disks (including failed and spare) that are not allocated to a storage pool or aggregate
Aggregate Total Capacity (TiB)	Capacity in Tebibytes that is allocated for a storage-pool or aggregate as reported by the storage-array
Aggregate Used Capacity (TiB)	Capacity in Tebibytes that is used in a storage-pool or aggregate
Aggregate Unused Capacity (TiB)	Aggregate Total Capacity (TiB) - Aggregate Used Capacity (TiB)
Allocated LUN Capacity (TiB)	Volume/LUN capacity in Tebibytes allocated to host initiators
Unallocated LUN Capacity (TiB)	Volume UnAllocated capacity in Tebibytes as reported by the storage pool or aggregate
Volume Total Capacity (TiB)	Provisioned capacity in Tebibytes of all volumes on this storage pool
Volume Used Capacity (TiB)	Volume or Internal Volume Used Capacity in Tebibytes. If capacity is Thick Provisioned, then used will equal Allocated or Total
Volume Unused Capacity (TiB)	Provisioned capacity in Tebibytes of unused volumes on this storage pool
Volume Protection Capacity (TiB)	Capacity in Tebibytes reserved for backup or mirroring

2.10 Hosts with Single Point of Failure



Host	Storage	Switch	Switch Port	Single Point of Failure	Host Ports	Storage Ports	Fabrics
cbc-demo-03.	saba	cbc-fab01-sw02	37	True	1	2	1
linux-jibl.	saba	cbc-fab02-sw02	37	True	1	2	1

Description: This report

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.
No annotations required.

Report XML: Hosts with Single Point of Failure

2.11 SAN Overview

Switch	Vendor	Model	SerialNumber	Firmware	Total Ports	Used Ports	Used Ports %	Used Ports %	Free Ports	Port OK	In-Active	Rx Traffic (MB)	Tx Traffic (MB)	Utilization %	Peak Utilization %	bbCredit Zero	bbCredit Zero Ms Tx	Class 3 Discards	Port CRC Errors	Signal Losses	Link Failures
y01p65t0bdc6	Cisco	DS-C9148T-K9	JPG261300EW	8.4(1)	305	273	90%	90%	32	281	24	169,552	423,711	0.05%	0.14%	599,443	0	0	0	0	0
y01c72fcdc	Cisco	DS-C9148T-K9	JPG272500D2	8.4(1)	49	18	37%	37%	31	19	0	1,466,869	4,544,845	0.4%	0.99%	2,650,396	0	0	0	0	0
y02s74cbdv	Cisco	DS-C9396T-K9	JPG243900GY	8.4(1)	97	24	25%	25%	73	25	72	1,254,642	1,351,117	0.12%	0.24%	24,848,981	0	0	0	0	6
y02p45e0bbdc	Cisco	DS-C9148T-K9	JPG25310018	8.4(1)	305	273	90%	90%	32	281	24	905,690	309,354	0.08%	0.41%	246,803	0	0	0	0	0
y01p60f0bdc6.	Cisco	DS-C9148T-K9	JPG2537001Z	8.4(1)	239	203	85%	85%	36	211	24	50,743	133,508	0.02%	0.05%	205,300	0	0	0	0	0
y02s81tdc6	Cisco	DS-C9396T-K9	JPG25250094	8.4(1)	97	16	16%	16%	81	17	80	570,487	155,493	0.05%	0.08%	1,842	0	0	0	0	0
y01p65t0adc6	Cisco	DS-C9148T-K9	JPG261600AZ	8.4(1)	305	273	90%	90%	32	281	24	188,634	519,574	0.06%	0.16%	597,724	0	0	0	0	0

Description: This report shows critical SAN switch port performance and capacity statistics for all vendors.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 2.11 SAN Overview

2.11 SAN Overview Definitions

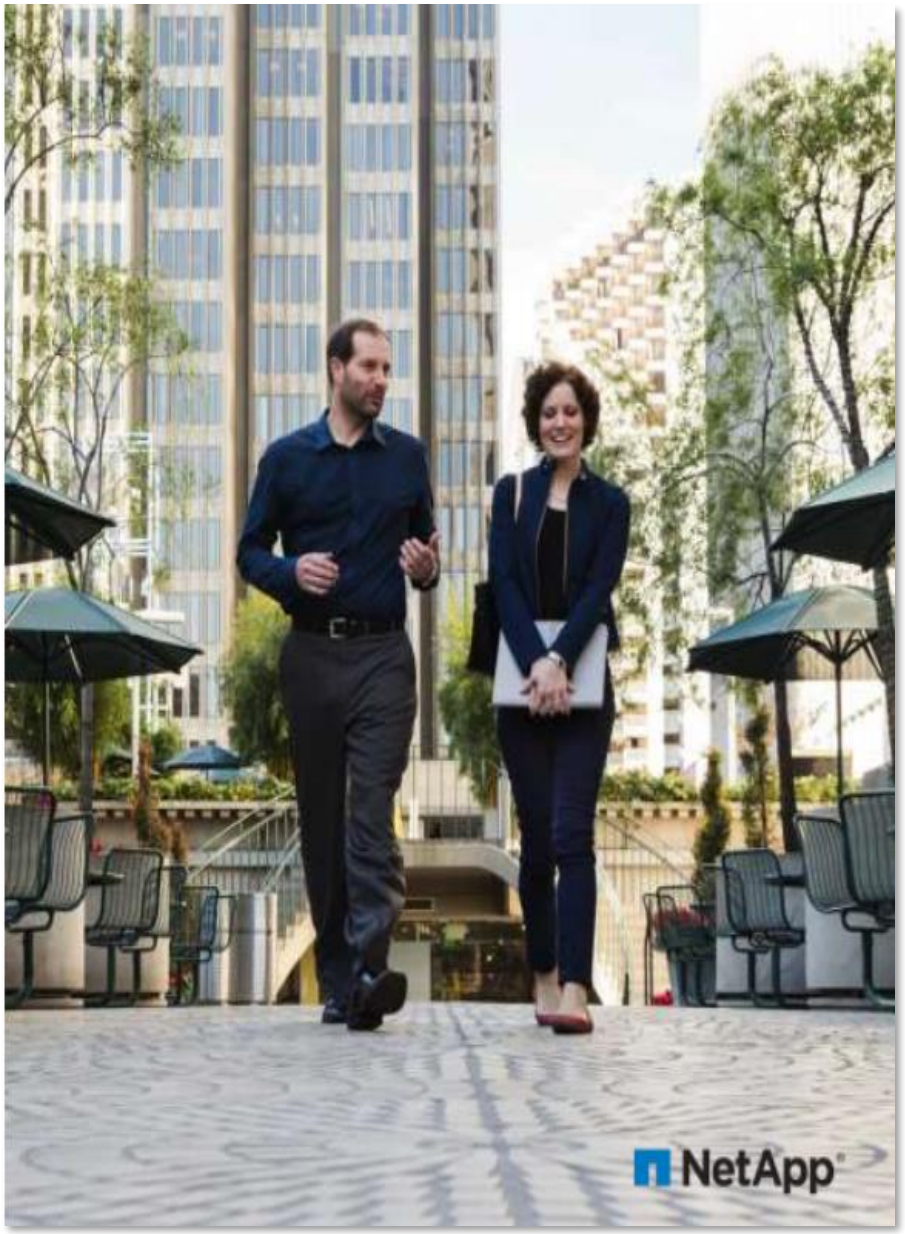
Metric/Attribute	Description
Switch	Name of the fibre channel switch discovered and monitored by DII
Vendor	The manufacturer of the switch
Model	The model name of the switch
Serial Number	The serial number associated with the switch
Firmware	The firmware version deployed on the switch
Total Ports	Total number of ports for the switch
Used Ports	Total number of connected ports
Used Ports %	Used Ports / Total Ports
Free Ports	Total Ports – Used Ports
Port OK	Total number of ports functioning normally on the switch
In-Active	Total number of ports that are in-active on the switch
Rx Traffic (MB)	Rx (or read) Traffic in Megabytes on the switch
Tx Traffic (MB)	Tx (or write) Traffic in Megabytes on the switch
Utilization %	Port utilization percent on the switch
Peak Utilization %	Peak port utilization percent on the switch
bbCredit Zero	This is a counter that indicates the number of times a port was unable to transmit frames because the transmit buffer-to-buffer (BB) credit was zero. Buffer-to-buffer (BB) credits are a flow control mechanism used in Fibre Channel (SAN) to manage the number of frames that can be sent to a recipient switch device without causing saturation
bbCredit Zero Ms Tx	This is the measure of bbCredit Zero latency in milliseconds during transmit operations on a port
Max Port Utilization	The maximum port utilization % for all switches discovered by DII over a 14 day period collected hourly
Avg Port Utilization	The average port utilization % for all switches discovered by DII over a 14 day period collected hourly
Port Traffic Read	Rx Traffic in Megabytes trending over a 14 day period collected hourly
Port Traffic Write	Tx Traffic Megabytes trending over a 14 day period collected hourly
Port Utilization % Trends	This is the port utilization % over a 14 day period collected hourly
Port Error Trends	This the total error count trend over a 14 day period collected hourly
Blocked Hosts	This is the number of hosts where there is no SAN physical_path, no logical path, no iscsi_path or no nas_logical path
Hosts with SPF	This is the total number of hosts with a single point of failure on a fibre channel network (SAN)
Orphaned Volumes	Total number of volumes that are not mapped or masked
Class 3 Discards	This metric contains the number of frames that were discarded by the switch due to a timeout condition while attempting to transmit or receive data, essentially meaning the switch waited too long for a response from the connected device and dropped the frame; this is often considered a sign of potential network congestion or a faulty connection

Port CRC Errors	This is the number of times where a Brocade switch receives a Fibre Channel frame with a corrupted Cyclic Redundancy Check (CRC) value, indicating that the data within the frame may be unreliable due to transmission errors, usually caused by a faulty cable or connection issue on the network port
Link Failures	This is the number of times where a Fibre Channel port on a Brocade switch loses communication with a connected device, indicated by a loss of signal or synchronization, causing the link to become inactive and preventing data transfer, often due to issues like faulty cables, incompatible SFP transceivers, or physical connection problems
Signal Losses	This is the number of times where the Fibre Channel signal being transmitted on a port is not properly received by the connected device, often due to issues with the cable, connector, or the physical link itself, resulting in data loss and potential disruption to network traffic
Total Port Errors %	The percent of used ports that have been flagged with an error

Capacity Overview

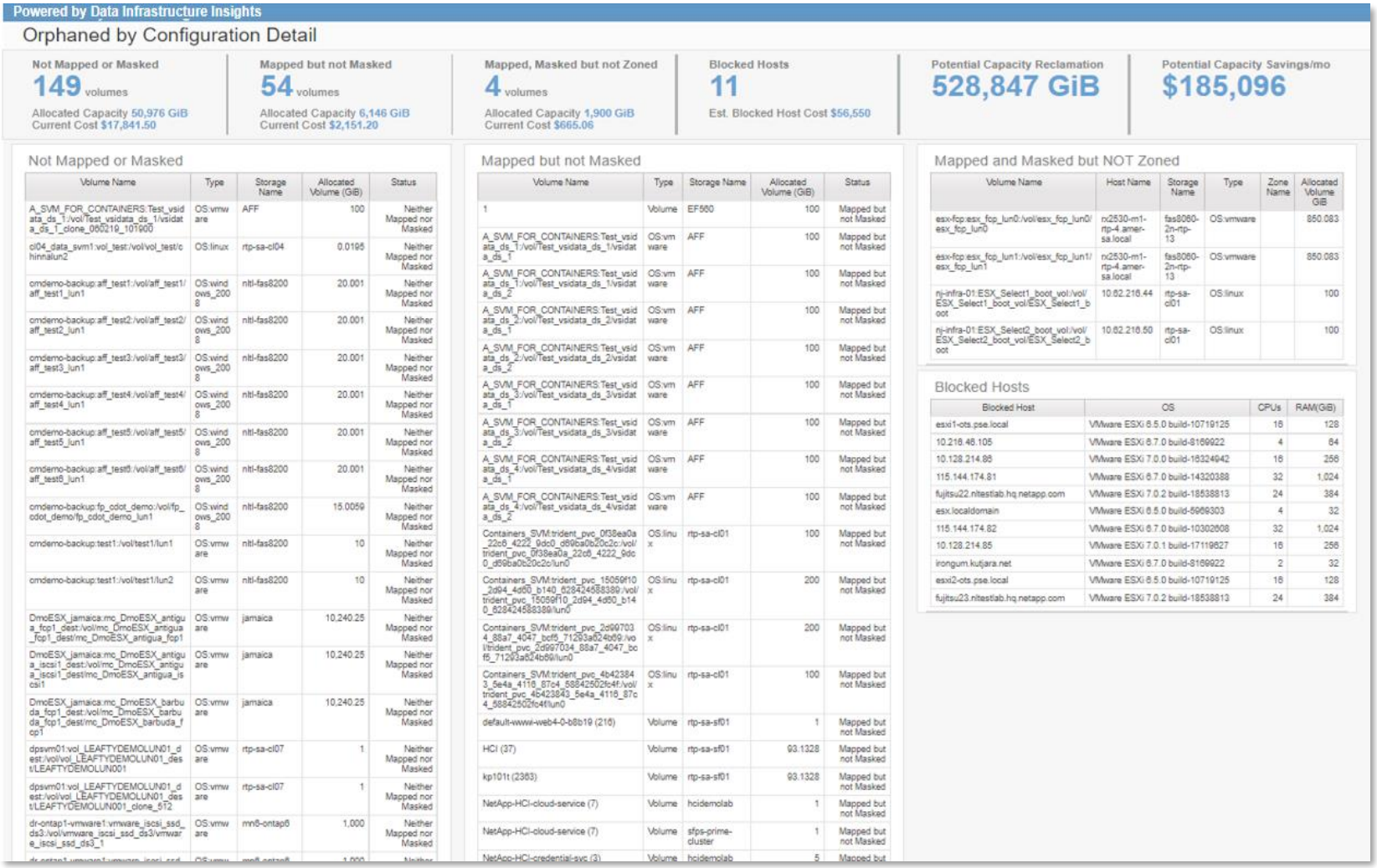
Here are some of the day-to-day capacity management tasks that are augmented by using the wide variety of capacity reports in this catalog.

- ❑ Orphaned Capacity by Configuration Detail
- ❑ Capacity Efficiency Savings
- ❑ Capacity Efficiency Savings – Pool and Volume Reduction Ratios
- ❑ Capacity Efficiency Savings for CVO
- ❑ Capacity Efficiency Savings for FSx
- ❑ Volume Efficiency Savings with Costs
- ❑ Capacity Forecast and Trends
- ❑ Capacity Consumption by Data Center
- ❑ ICP Storage Consumption
- ❑ Volume Capacity Growth
- ❑ NetApp Aggregate Capacity Utilization
- ❑ QoS Policies for SAN and NAS
- ❑ Global Usable Capacity
- ❑ Global Environment Changes
- ❑ Storage Capacity – Executive Overview
- ❑ Weekly Storage Consumption
- ❑ Reclamation Efficiency Allocation Life Cycle Report
- ❑ Storage Capacity Forecast with Projection Exceptions
- ❑ Volumes with Highest Capacity Growth
- ❑ StorageGrid Capacity with Forecast
- ❑ FSx Volume Capacity Trends and Forecast



NetApp

3.1 Orphaned by Configuration Detail



Powered by Data Infrastructure Insights

Orphaned by Configuration Detail

Not Mapped or Masked	Mapped but not Masked	Mapped, Masked but not Zoned	Blocked Hosts	Potential Capacity Reclamation	Potential Capacity Savings/mo
149 volumes	54 volumes	4 volumes	11	528,847 GiB	$185,096
Allocated Capacity 50,976 GiB Current Cost $17,841.50	Allocated Capacity 6,146 GiB Current Cost $2,151.20	Allocated Capacity 1,900 GiB Current Cost $665.06	Est. Blocked Host Cost $56,550		

Not Mapped or Masked

Volume Name	Type	Storage Name	Allocated Volume (GiB)	Status
A_SVM_FOR_CONTAINERS:Test_vsidata_ds_1:/vol/Test_vsidata_ds_1/vsidata_ds_1_clone_060219_107900	OS:vmware	AFF	100	Neither Mapped nor Masked
cl04_data_svm1:vol_test:/vol/vol_test/chinnalun2	OS:linux	rtp-sa-cl04	0.0195	Neither Mapped nor Masked
cmdemo-backup:aff_test1:/vol/aff_test1/aff_test1_lun1	OS:windows_2008	ntl-fas8200	20.001	Neither Mapped nor Masked
cmdemo-backup:aff_test2:/vol/aff_test2/aff_test2_lun1	OS:windows_2008	ntl-fas8200	20.001	Neither Mapped nor Masked
cmdemo-backup:aff_test3:/vol/aff_test3/aff_test3_lun1	OS:windows_2008	ntl-fas8200	20.001	Neither Mapped nor Masked
cmdemo-backup:aff_test4:/vol/aff_test4/aff_test4_lun1	OS:windows_2008	ntl-fas8200	20.001	Neither Mapped nor Masked
cmdemo-backup:aff_test5:/vol/aff_test5/aff_test5_lun1	OS:windows_2008	ntl-fas8200	20.001	Neither Mapped nor Masked
cmdemo-backup:aff_test6:/vol/aff_test6/aff_test6_lun1	OS:windows_2008	ntl-fas8200	20.001	Neither Mapped nor Masked
cmdemo-backup:fp_cdot_demo:/vol/fp_cdot_demo/fp_cdot_demo_lun1	OS:windows_2008	ntl-fas8200	15.0059	Neither Mapped nor Masked
cmdemo-backup:test1:/vol/test1/lun1	OS:vmware	ntl-fas8200	10	Neither Mapped nor Masked
cmdemo-backup:test1:/vol/test1/lun2	OS:vmware	ntl-fas8200	10	Neither Mapped nor Masked
DmoESX_jamaica:mc_DmoESX_antigua_fcp1_dest:/vol/mc_DmoESX_antigua_fcp1_dest/mc_DmoESX_antigua_fcp1	OS:vmware	jamaica	10,240.25	Neither Mapped nor Masked
DmoESX_jamaica:mc_DmoESX_antigua_iscsi1_dest:/vol/mc_DmoESX_antigua_iscsi1_dest/mc_DmoESX_antigua_iscsi1	OS:vmware	jamaica	10,240.25	Neither Mapped nor Masked
DmoESX_jamaica:mc_DmoESX_barbuda_fcp1_dest:/vol/mc_DmoESX_barbuda_fcp1_dest/mc_DmoESX_barbuda_fcp1	OS:vmware	jamaica	10,240.25	Neither Mapped nor Masked
dpsvm01:vol_LEAFTYDEMOLUN01_dest:/vol/vol_LEAFTYDEMOLUN01_dest/LEAFTYDEMOLUN001	OS:vmware	rtp-sa-cl07	1	Neither Mapped nor Masked
dpsvm01:vol_LEAFTYDEMOLUN01_dest:/vol/vol_LEAFTYDEMOLUN01_dest/LEAFTYDEMOLUN001_clone_5T2	OS:vmware	rtp-sa-cl07	1	Neither Mapped nor Masked
dr-ontap1-vmware1:vmware_iscsi_ssd_ds3:/vol/vmware_iscsi_ssd_ds3/vmware_iscsi_ssd_ds3_1	OS:vmware	rtp8-ontap6	1,000	Neither Mapped nor Masked

Mapped but not Masked

Volume Name	Type	Storage Name	Allocated Volume (GiB)	Status
1	Volume	EF560	100	Mapped but not Masked
A_SVM_FOR_CONTAINERS:Test_vsidata_ds_1:/vol/Test_vsidata_ds_1/vsidata_ds_1	OS:vmware	AFF	100	Mapped but not Masked
A_SVM_FOR_CONTAINERS:Test_vsidata_ds_1:/vol/Test_vsidata_ds_1/vsidata_ds_2	OS:vmware	AFF	100	Mapped but not Masked
A_SVM_FOR_CONTAINERS:Test_vsidata_ds_2:/vol/Test_vsidata_ds_2/vsidata_ds_1	OS:vmware	AFF	100	Mapped but not Masked
A_SVM_FOR_CONTAINERS:Test_vsidata_ds_2:/vol/Test_vsidata_ds_2/vsidata_ds_2	OS:vmware	AFF	100	Mapped but not Masked
A_SVM_FOR_CONTAINERS:Test_vsidata_ds_3:/vol/Test_vsidata_ds_3/vsidata_ds_1	OS:vmware	AFF	100	Mapped but not Masked
A_SVM_FOR_CONTAINERS:Test_vsidata_ds_3:/vol/Test_vsidata_ds_3/vsidata_ds_2	OS:vmware	AFF	100	Mapped but not Masked
A_SVM_FOR_CONTAINERS:Test_vsidata_ds_4:/vol/Test_vsidata_ds_4/vsidata_ds_1	OS:vmware	AFF	100	Mapped but not Masked
A_SVM_FOR_CONTAINERS:Test_vsidata_ds_4:/vol/Test_vsidata_ds_4/vsidata_ds_2	OS:vmware	AFF	100	Mapped but not Masked
Containers_SVM:trident_pvc_0f38ea0a_22c6_4222_9dc0_d89ba0b20c2c:/vol/trident_pvc_0f38ea0a_22c6_4222_9dc0_d89ba0b20c2c/lun0	OS:linux	rtp-sa-cl01	100	Mapped but not Masked
Containers_SVM:trident_pvc_15059f10_2d94_4d60_b140_628424588380:/vol/trident_pvc_15059f10_2d94_4d60_b140_628424588380/lun0	OS:linux	rtp-sa-cl01	200	Mapped but not Masked
Containers_SVM:trident_pvc_2d997034_88a7_4047_bcf5_71293a624b99:/vol/trident_pvc_2d997034_88a7_4047_bcf5_71293a624b99/lun0	OS:linux	rtp-sa-cl01	200	Mapped but not Masked
Containers_SVM:trident_pvc_4b423843_5e4a_4116_87c4_58842502fc4f:/vol/trident_pvc_4b423843_5e4a_4116_87c4_58842502fc4f/lun0	OS:linux	rtp-sa-cl01	100	Mapped but not Masked
default-www-web4-0-b8b19 (216)	Volume	rtp-sa-sf01	1	Mapped but not Masked
HCI (37)	Volume	rtp-sa-sf01	93.1328	Mapped but not Masked
kp101t (2383)	Volume	rtp-sa-sf01	93.1328	Mapped but not Masked
NetApp-HCI-cloud-service (7)	Volume	hcidemolab	1	Mapped but not Masked
NetApp-HCI-cloud-service (7)	Volume	sfps-prime-cluster	1	Mapped but not Masked
NetApp-HCI-credential-svc (3)	Volume	hcidemolab	5	Mapped but

Mapped and Masked but NOT Zoned

Volume Name	Host Name	Storage Name	Type	Zone Name	Allocated Volume GiB
esx-fcp:esx_fcp_lun0:/vol/esx_fcp_lun0/esx_fcp_lun0	rx2530-m1-rtp-4.amer-sa.local	fas8060-2n-rtp-13	OS:vmware		850.083
esx-fcp:esx_fcp_lun1:/vol/esx_fcp_lun1/esx_fcp_lun1	rx2530-m1-rtp-4.amer-sa.local	fas8060-2n-rtp-13	OS:vmware		850.083
nj-infra-01:ESX_Select1_boot_vol:/vol/ESX_Select1_boot_vol/ESX_Select1_boot	10.62.216.44	rtp-sa-cl01	OS:linux		100
nj-infra-01:ESX_Select2_boot_vol:/vol/ESX_Select2_boot_vol/ESX_Select2_boot	10.62.216.50	rtp-sa-cl01	OS:linux		100

Blocked Hosts

Blocked Host	OS	CPUs	RAM(GiB)
esxi1-ots.pse.local	VMware ESXi 6.5.0 build-10719125	16	128
10.218.46.105	VMware ESXi 6.7.0 build-8169922	4	64
10.128.214.96	VMware ESXi 7.0.0 build-16324942	16	256
115.144.174.81	VMware ESXi 6.7.0 build-14320388	32	1,024
fujitsu22.nltestlab.hq.netapp.com	VMware ESXi 7.0.2 build-18538813	24	384
esx.localdomain	VMware ESXi 6.5.0 build-5969303	4	32
115.144.174.82	VMware ESXi 6.7.0 build-10302608	32	1,024
10.128.214.85	VMware ESXi 7.0.1 build-17119627	16	256
irongum.kutjara.net	VMware ESXi 6.7.0 build-8169922	2	32
esxi2-ots.pse.local	VMware ESXi 6.5.0 build-10719125	16	128
fujitsu23.nltestlab.hq.netapp.com	VMware ESXi 7.0.2 build-18538813	24	384

Description: This report shows savings from reclaiming potential Orphaned by Configuration capacity. Focus is on block, multi-vendor storage.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled. Application, tier and tier cost annotations deployed.

Report XML: 3.1 Orphaned by Configuration Detail

3.1 Orphaned by Configuration Detail Definitions

Metric/Attribute	Description
Volume Name	Name of the SAN volume associated with the storage pool / storage device discovered by DII
Type	The vendor specific type of volume e.g. SFS, BCV, Linux, Windows etc.
Storage Name	Name of the storage device discovered and monitored by DII
Allocated Volume (GiB)	Provisioned capacity of all block/SAN volumes on this storage pool in Gibibytes
Total Capacity (GiB)	Total Allocated Volume (GiB) for the report
Status	Custom field WHEN [Mapped] is null AND [Masked] is null THEN 'Neither Mapped nor Masked' WHEN [Mapped] is null AND [Masked] is not null THEN 'Masked but not Mapped' WHEN [Mapped] is not null AND [Masked] is null THEN 'Mapped but not Masked'
Host Name	Name of the physical host
Blocked Host	A host that has been blocked from accessing the network due to connection-rate filtering. This happens when a port is configured to block high connection rates, and a host triggers that filter
OS	Operating system of the physical host
CPUs	Number of CPUs for the host
RAM(GiB)	Amount of RAM in Gibibytes installed in the host
Mapped	Defines which hosts can access specific logical units (LUs) within the disk controllers. LUN mapping is usually done at the storage system level
Masked	An authorization mechanism used in storage area networks (SANs) to make LUNs available to some hosts but unavailable to other hosts
Potential Cost Savings	Total Capacity (GiB) * .35

3.2a Capacity Efficiency Savings (Array and Node)

Powered by Data Infrastructure Insights Average Cost per GiB: .35

Capacity Efficiency Savings

Thin Logical Allocated	Deduplicated	Compressed	Compacted	Pool Subscribed %	Total Monthly Cost Savings
5,313 TiB	**249 TiB**	**54 TiB**	**48 TiB**	**112%**	**$1,800,680**
Thin Volume Count 3,206 Cost Savings $470,435.84	Deduped Volumes 816 Cost Savings $609.28	Compressed Volumes 3,206 Cost Savings $211.46	Compacted Pools 14 Cost Savings $455.17	Usable Capacity 5,819 TB Used Capacity 2,362 TB Block Allocated 8,604 TB File Allocated 6,509 TB	Total Efficiency Capacity 5,664 TiB

Capacity Detail *(Current Data)*

Array	Vendor	Usable Capacity (TiB)	Logical Used Capacity (TiB)	Physical Used Capacity (TiB)	Physical Used %	Thin Logical (TiB)	Subscribed %	Pool Deduplicated (TiB)	Pool Compressed (TiB)	Pool Compacted (TiB)	Pool Efficiency Ratio
tawny	NetApp	35.2	21.52	18.34	52%	44.73	127%	3.18	0	0.69	1.03
rtp-cilab-fas2750	NetApp	32.17	0.76	0.74	2%	4.92	15%	0.02	0	0.14	1.23
cluster2	NetApp	0.69	0.4	0.13	19%			0.14	0.13	0.25	2.67
gemini	NetApp	9.72	1.75	0	0%	56.1	577%	2.83	0.11	0.16	1.1
saba	NetApp	71.28	18.48	0	0%	881.58	1,237%	89.26	0.16	0.09	1
rtp-sa-cl07	NetApp	8.76	1.7	1.67	19%	30.82	352%	0.03	0	0	1
cluster1	NetApp	1.16	0.47	0.22	19%			0.12	0.13	0.09	1.24
antigua	NetApp	27.95	1.34	1.19	4%	5.67	20%	0.14	0.01	0.04	1.03
cvoProd06	NetApp	1.01	0.14	0.14	14%			0	0	0.02	1.17
grenada	NetApp	265.44	111.03	0	0%	2,148.1	809%	94.39	50.4	41.12	1.59
osa4	NetApp	13.97	8.94	6.65	48%	1,326.57	9,496%	1.7	0.59	1.27	1.17
bahamas	NetApp	28.42	2.32	0	0%	532.75	1,875%	50.71	0.02	0.05	1.02
barbuda	NetApp	37.08	1.59	1.15	3%	30.17	81%	0.37	0.07	0.08	1.05
A250-41-42-43	NetApp	25.7	3.34	0	0%	137.8	536%	4.35	2.02	0.81	1.32
rtp-sa-cl01	NetApp	83.96	27.69	25.46	30%	113.72	135%	1.99	0.24	3.02	1.12

Efficiency Savings Detail *(Current Data)*

Node	Model	Volume Name	Logical Allocated (GB)	Physical Used (GB)	Used (GB)	Deduplicated (GB)	Dedupe %	Compressed (GB)	Compression %	Total Savings %	Dedupe Ratio	Compression Ratio	Dedupe Enabled	Compression Enabled	isEncrypted
A250-42	AFF-A250	A250-41-42-43:nfs_vserver:trident_pvc_volume74	100.00	0.03	0.01	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	AFF-A250	A250-41-42-43:nfs_vserver:trident_pvc_volume15	100.00	0.04	0.01	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	AFF-A250	A250-41-42-43:nfs_vserver:trident_pvc_volume20	100.00	0.03	0.01	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	AFF-A250	A250-41-42-43:test1:darksite_testing	1.00	0.00	0.00	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	AFF-A250	A250-41-42-43:nfs_vserver:trident_pvc_cd00093e_8143_4de1_b865_877e631c41c2	10.00	0.00	0.00	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	AFF-A250	A250-41-42-43:nfs_vserver:trident_pvc_volume78	100.00	0.03	0.01	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	AFF-A250	A250-41-42-43:nfs_vserver:trident_pvc_volume14	100.00	0.04	0.01	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	AFF-A250	A250-41-42-43:nfs_vserver:trident_pvc_volume89	100.00	0.03	0.01	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	AFF-A250	A250-41-42-43:nfs_vserver:trident_pvc_volume98	100.00	0.03	0.01	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	AFF-A250	A250-41-42-43:nfs_vserver:trident_pvc_volume58	100.00	0.03	0.01	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	AFF-A250	A250-41-42-43:nfs_vserver:trident_pvc_volume94	100.00	0.02	0.01	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	AFF-A250	A250-41-42-43:nfs_vserver:trident_pvc_volume11	100.00	0.03	0.01	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false

Description: This report shows savings from leveraging storage efficiency technologies in your storage environment.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 3.2 Capacity Efficiency Savings

3.2a Capacity Efficiency Savings Definitions

Metric/Attribute	Description
Array	Name of the storage device discovered and monitored by DII
Vendor	Manufacturer of the storage device
Node	Name of the node associated with the storage device
Model	Model name of the storage device
Usable Capacity (TiB)	Usable capacity allocated for a storage-pool as reported by the storage-array in Tebibytes (Base 2 units)
Logical Used Capacity (TiB)	Used capacity in Tebibytes as reported by the internal volume (internal_volume_capacity_fact)
Used Capacity (TiB)	Used capacity in Tebibytes as reported by the storage pool or aggregate and contained in the Storage and Storage Pool Capacity Fact table. If Thin Provisioned, then Used = Written. If Thick Provisioned, then Used = Allocated. If Space Guarantee is Enabled, then Used = Allocated.
Physical Used (TiB)	Consumed Capacity in Tebibytes reported by the internal volume
Thin Logical (TiB)	IF thinprovisioned =1 THEN allocatedCapacityMB/1024 ELSE 0
Pool Subscribed %	Thin Logical (TiB) / Usable Capacity (TiB)
Pool Deduplicated (TiB)	Derived from the storage_and_storage_pool_capacity_ fact (1 – (dedupeRatio / dedupeRatio) * (Used Capacity TiB))
Pool Compressed (TiB)	(1 – (compressionRatio / compressionRatio) * (Used Capacity TiB))
Pool Compacted (TiB)	(1 – (compactionRatio / compactionRatio) * (Used Capacity TiB))
Pool Efficiency Ratio	Used Capacity TiB / (Used Capacity TiB - Pool Compacted TiB)
Volume Name	Name of the volume associated with the storage pool/aggregate
Logical Allocated (GiB)	Allocated capacity in Gibibytes associated with the internal volume
Deduplicated (GiB)	Derived from the internal_volume_capacity_fact (1 – (dedupeRatio / dedupeRatio) * (Used Capacity GiB))
Dedupe %	(1 – (internal_volume_capacity_fact.dedupeRatio))
Compressed (GiB)	(1 – (compressionRatio / compressionRatio) * (Used Capacity GiB))
Compression %	(1 – (compressionRatio / compressionRatio))
Total Savings %	(1 – (internal_volume_capacity_fact.dedupeRatio)) + (1 – (compressionRatio / compressionRatio))
Dedupe Ratio	The amount of data stored after deduplication compared to the amount of data that would be stored without deduplication
Compression Ratio	The amount of data stored after compression compared to the amount of data that would be stored without compression
Dedupe Enabled	True if enabled for this volume
Compression Enabled	True if enabled for this volume
isEncrypted	True if the volume is encrypted

3.2b Storage Efficiency Report (Aggregate and Volume Metrics Sum by Array)

Powered by Data Infrastructure Insights

Storage Efficiency Report

Capacity Detail *(Current Data)*

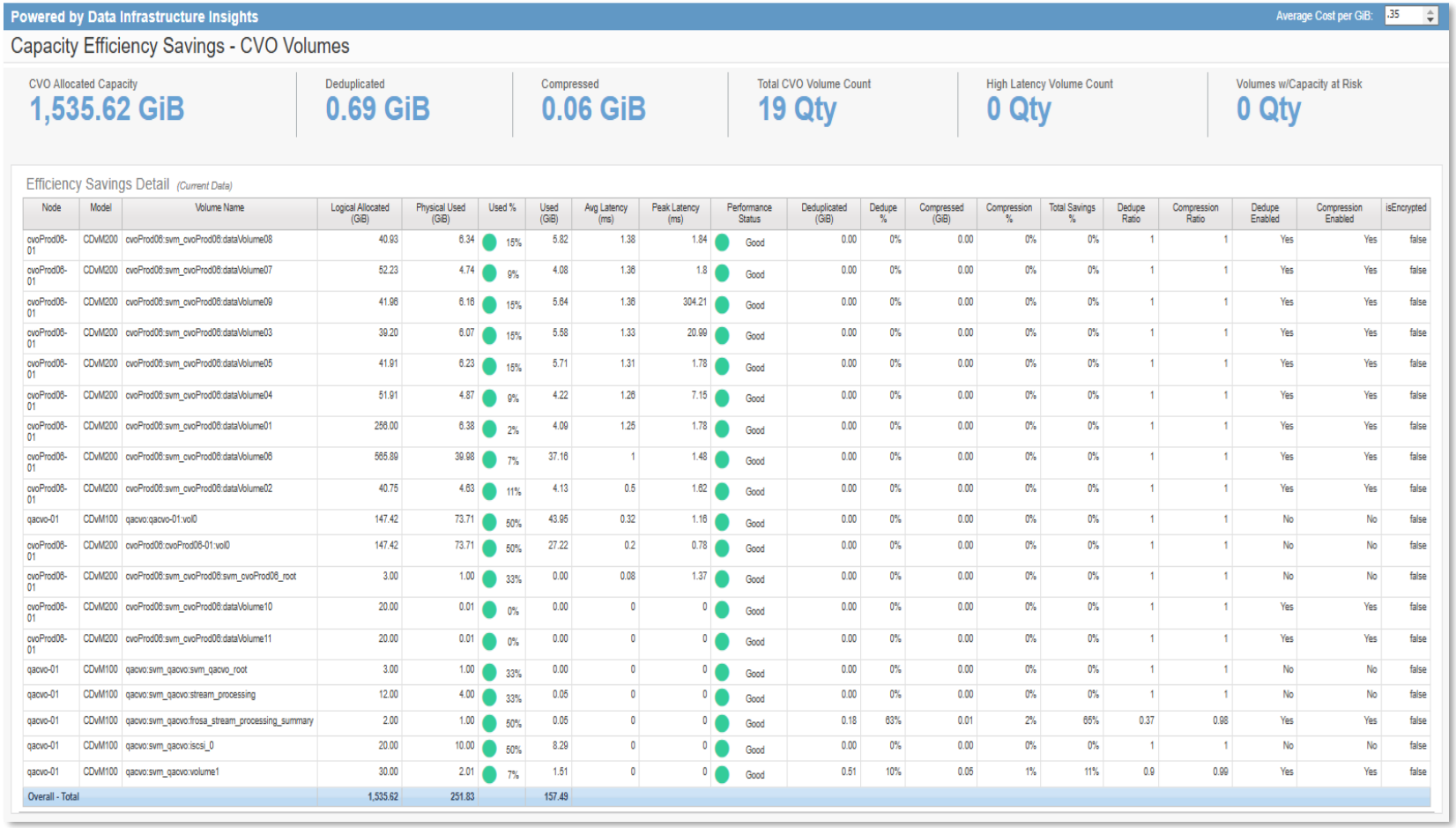
		Aggregate Capacity							Volume Capacity						
Array	Vendor	Usable Capacity (TiB)	Logical Used Capacity (TiB)	Physical Used Capacity (TiB)	Pool Deduplicated (TiB)	Pool Compressed (TiB)	Pool Compacted (TB)	Pool Efficiency Ratio	Logical Allocated (TiB)	Thin Logical (TiB)	Logical Used (TiB)	Physical Used (TiB)	Deduplicated (TiB)	Compressed (TiB)	Volume Efficiency Ratio
rtpsh-openlab-01-02	NetApp	11.34	10.52	10.52	0	0			10.46	4.93	4.93	4.93	0.00	0.00	1:1
qacvo	NetApp	0.62	0.09	0.09	0	0									
fas8060-2n-rtp-13	NetApp	51.12	16.91	14.18	1.32	1.41			173.79	12.56	12.56	10.98	0.75	0.83	1.14:1
umeng-aff300-01-02	NetApp	14.02	8.86	7.1	1.04	0.72			50.48	9.05	9.05	7.22	1.09	0.74	1.25:1
saba	NetApp	71.28	18.48	0	89.26	0.16	0.09	1:1	881.88	7,600.03	7,600.03	15.75	7,584.18	0.10	482.54:1
C1_sti70-vsim-ucs163a_1730820932	NetApp	0.04	0.00	0	0	0									
rtp-sa-select01	NetApp	5.68	2.32	2.21	0.06	0.05									
A250-41-42-43	NetApp	25.70	3.34	0	4.35	2.02	0.81	1.32:1	138.12	10.88	10.88	3.73	4.75	2.40	2.91:1
bahamas	NetApp	28.42	2.32	0	50.71	0.02	0.05	1.02:1	533.08	1.92	1.92	1.63	0.27	0.02	1.18:1
cvoProd06	NetApp	1.01	0.14	0.14	0	0	0.02	1.17:1							
ntapit-osg-prd01	NetApp	1,089.63	341.33	341.33	0	0			341.33	341.33	341.33	341.33	0.00	0.00	1:1
epic-select	NetApp	1.68	0.01	0.01	0	0									
rtp-sa-fas8200-infra	NetApp	160.38	30.56	24.58	5.54	0.44			294.22	67.34	67.34	57.69	9.63	0.02	1.17:1
rtp-sa-cl07	NetApp	8.76	1.70	1.67	0.03	0	0	1:1	32.33	0.22	0.22	0.22	0.00	0.00	1:1
stiA900-311_cluster	NetApp	104.22	2.61	2.61	0	0									
cluster1	NetApp	1.16	0.47	0.22	0.12	0.13	0.09	1.24:1							
gemini	NetApp	9.72	1.75	0	2.83	0.11	0.16	1.1:1	56.81	2.25	2.25	1.13	1.01	0.11	1.99:1
SG-default_three_site	NetApp	4.55	0.00	0	0	0			0.41	0.41	0.41	0.41	0.00	0.00	1:1
Marks Grid	NetApp	0.17	0.04	0.04	0	0			0.04	0.04	0.04	0.04	0.00	0.00	1:1
rtp-sa-select-sgl1	NetApp	3.54	0.00	0	0	0									
rtp-sa-cl01	NetApp	83.96	27.69	25.46	1.99	0.24	3.02	1.12:1	121.28	24.45	24.45	22.54	1.76	0.15	1.08:1
rtp-sa-select03	NetApp	3.36	0.00	0	0	0									
SWELAB	NetApp	2.74	0.01	0.01	0	0			0.01	0.01	0.01	0.01	0.00	0.00	1:1
EF600SASExpansion	NetApp	1,180.29	42.53	42.53	0	0									
aff300-sa-rtp-1	NetApp	55.96	0.04	0.04	0	0			0.00	0.00	0.00	0.00	0.00	0.00	1:1
rtp-sa-select02	NetApp	1.68	0.13	0.12	0	0.01									
DEMOF2750	NetApp	13.18	6.98	6.98	0	0			14.62	2.70	2.70	2.70	0.00	0.00	1:1
rtp-sa-cl06	NetApp	13.10	0.91	0.87	0.03	0.01			13.33	0.12	0.12	0.12	0.00	0.00	1:1
osa4	NetApp	13.97	8.94	6.65	1.7	0.59	1.27	1.17:1	1,326.90	17.40	17.40	14.06	2.51	0.83	1.24:1
barbuda	NetApp	37.08	1.59	1.15	0.37	0.07	0.08	1.05:1	30.87	5.97	5.97	5.63	0.29	0.05	1.06:1
cluster2	NetApp	0.69	0.40	0.13	0.14	0.13	0.25	2.67:1							
trinidad	NetApp	29.00	24.10	23.78	0.32	0			216.65	0.52	0.52	0.52	0.00	0.00	1:1
grenada	NetApp	265.44	111.03	0	94.39	50.4	41.12	1.59:1	2,148.45	301.30	301.30	137.92	108.02	55.36	2.18:1
tawny	NetApp	35.20	21.52	18.34	3.18	0	0.69	1.03:1	53.59	14.87	14.87	12.79	2.08	0.00	1.16:1

Description: This report shows efficiency ratios for storage pools and volumes backed by storage efficiency technology metrics.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: Storage Efficiency Report

3.2c Capacity Efficiency Savings – CVO Volumes



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Average Cost per GiB: .35

Capacity Efficiency Savings - CVO Volumes

CVO Allocated Capacity	Deduplicated	Compressed	Total CVO Volume Count	High Latency Volume Count	Volumes w/Capacity at Risk
1,535.62 GiB	0.69 GiB	0.06 GiB	19 Qty	0 Qty	0 Qty

Efficiency Savings Detail *(Current Data)*

Node	Model	Volume Name	Logical Allocated (GiB)	Physical Used (GiB)	Used %	Used (GiB)	Avg Latency (ms)	Peak Latency (ms)	Performance Status	Deduplicated (GiB)	Dedupe %	Compressed (GiB)	Compression %	Total Savings %	Dedupe Ratio	Compression Ratio	Dedupe Enabled	Compression Enabled	isEncrypted
cvoProd06-01	CDvM200	cvoProd06:svm_cvoProd06:dataVolume08	40.93	6.34	15%	5.82	1.38	1.84	Good	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
cvoProd06-01	CDvM200	cvoProd06:svm_cvoProd06:dataVolume07	52.23	4.74	9%	4.08	1.36	1.8	Good	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
cvoProd06-01	CDvM200	cvoProd06:svm_cvoProd06:dataVolume09	41.96	6.16	15%	5.64	1.36	304.21	Good	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
cvoProd06-01	CDvM200	cvoProd06:svm_cvoProd06:dataVolume03	39.20	6.07	15%	5.58	1.33	20.99	Good	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
cvoProd06-01	CDvM200	cvoProd06:svm_cvoProd06:dataVolume05	41.91	6.23	15%	5.71	1.31	1.78	Good	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
cvoProd06-01	CDvM200	cvoProd06:svm_cvoProd06:dataVolume04	51.91	4.87	9%	4.22	1.26	7.16	Good	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
cvoProd06-01	CDvM200	cvoProd06:svm_cvoProd06:dataVolume01	256.00	6.38	2%	4.09	1.25	1.78	Good	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
cvoProd06-01	CDvM200	cvoProd06:svm_cvoProd06:dataVolume06	565.89	39.98	7%	37.16	1	1.48	Good	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
cvoProd06-01	CDvM200	cvoProd06:svm_cvoProd06:dataVolume02	40.75	4.63	11%	4.13	0.5	1.62	Good	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
qacvo-01	CDvM100	qacvo:qacvo-01:vol0	147.42	73.71	50%	43.95	0.32	1.16	Good	0.00	0%	0.00	0%	0%	1	1	No	No	false
cvoProd06-01	CDvM200	cvoProd06:cvoProd06-01:vol0	147.42	73.71	50%	27.22	0.2	0.78	Good	0.00	0%	0.00	0%	0%	1	1	No	No	false
cvoProd06-01	CDvM200	cvoProd06:svm_cvoProd06:svm_cvoProd06_root	3.00	1.00	33%	0.00	0.08	1.37	Good	0.00	0%	0.00	0%	0%	1	1	No	No	false
cvoProd06-01	CDvM200	cvoProd06:svm_cvoProd06:dataVolume10	20.00	0.01	0%	0.00	0	0	Good	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
cvoProd06-01	CDvM200	cvoProd06:svm_cvoProd06:dataVolume11	20.00	0.01	0%	0.00	0	0	Good	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
qacvo-01	CDvM100	qacvo:svm_qacvo:svm_qacvo_root	3.00	1.00	33%	0.00	0	0	Good	0.00	0%	0.00	0%	0%	1	1	No	No	false
qacvo-01	CDvM100	qacvo:svm_qacvo:stream_processing	12.00	4.00	33%	0.05	0	0	Good	0.00	0%	0.00	0%	0%	1	1	No	No	false
qacvo-01	CDvM100	qacvo:svm_qacvo:frosa_stream_processing_summary	2.00	1.00	50%	0.05	0	0	Good	0.18	63%	0.01	2%	66%	0.37	0.98	Yes	Yes	false
qacvo-01	CDvM100	qacvo:svm_qacvo:iscsi_0	20.00	10.00	50%	8.29	0	0	Good	0.00	0%	0.00	0%	0%	1	1	No	No	false
qacvo-01	CDvM100	qacvo:svm_qacvo:volume1	30.00	2.01	7%	1.51	0	0	Good	0.51	10%	0.05	1%	11%	0.9	0.99	Yes	Yes	false
Overall - Total			1,535.62	251.83		157.49													

Description: This report shows storage efficiency metrics for Cloud Volumes Ontap workloads.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 3.2 Capacity Efficiency Savings - CVO Volumes

3.2c Capacity Efficiency Savings – CVO Volumes Definitions

Metric/Attribute	Description
Node	Name of the CVO node associated with the cluster discovered by DII
Model	Model name of the CVO storage node
Volume Name	Name of the volume associated with the CVO storage node
Logical Allocated (GiB)	Allocated capacity in Gibibytes associated with the CVO volume
Physical Used (GiB)	Consumed Capacity in Gibibytes reported by the CVO volume
Used %	Physical Used (GiB) / Logical Allocated (GiB) ● Used % > .90 ● Used % Between .75 and .90
Used (GiB)	Used capacity in Tebibytes as reported by the CVO volume
Avg Latency (ms)	Average total response time in milliseconds (read+write) from the moment a request for information arrives at the storage device to the time when the storage device begin to send the information back in response
Peak Latency (ms)	Maximum response time for the collection period
Performance Status	● WHEN [Avg Latency (ms)] <10 THEN 'Good' ● WHEN [Avg Latency (ms)] BETWEEN 10 and 15 THEN 'Nearing Threshold' ● WHEN [Avg Latency (ms)] BETWEEN 15 and 20 THEN 'At Threshold' ● WHEN [Avg Latency (ms)] > 20 THEN 'Exceeds Threshold'
Deduplicated (GiB)	Derived from the internal_volume_capacity_fact (1 – (dedupeRatio / dedupeRatio) * (Used GiB))
Dedupe %	(1 – (internal_volume_capacity_fact.dedupeRatio))
Compressed (GiB)	(1 – (compressionRatio / compressionRatio) * (Used Capacity GiB))
Compression %	(1 – (compressionRatio / compressionRatio))
Total Savings %	(1 – (internal_volume_capacity_fact.dedupeRatio)) + (1 – (compressionRatio / compressionRatio))
Dedupe Ratio	The amount of data stored after deduplication compared to the amount of data that would be stored without deduplication
Compression Ratio	The amount of data stored after compression compared to the amount of data that would be stored without compression
Dedupe Enabled	True if enabled for this volume
Compression Enabled	True if enabled for this volume
isEncrypted	True if the volume is encrypted

3.2d Capacity Efficiency Savings – FSx Volumes

Powered by Data Infrastructure Insights

Capacity Efficiency Savings for FSx Volumes

Total FSx Volumes	Deduplicated	Compressed	Compacted
34	3.41 GiB	0 GiB	48 TiB
Allocated Capacity 61,084 GiB Used Capacity 3,449 GiB	Deduped Volumes 2	Compressed Volumes 0	Compacted Pools 14

Efficiency Savings Detail *(Current Data)*

Node	Model	Volume Name	Logical Allocated (GB)	Physical Used (GB)	Used (GB)	Deduplicated (GB)	Dedupe %	Compressed (GB)	Compression %	Total Savings %	Dedupe Ratio	Compression Ratio	Dedupe Enabled	Compression Enabled	isEncrypted
Fsxid025b9d58c14bdafbb-01	FSx for ONTAP	Fsxid025b9d58c14bdafbb:fsx:nfs_default_cache__0001	850.97	0.51	0.51	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	FSx for ONTAP	Fsxid025b9d58c14bdafbb:fsx:funtimes_at_ridgemont	100.00	0.01	0.01	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	FSx for ONTAP	Fsxid025b9d58c14bdafbb:fsx:vol4	3,840.00	412.41	412.41	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	FSx for ONTAP	Fsxid025b9d58c14bdafbb:fsx:vol2	3,840.00	411.76	411.75	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	FSx for ONTAP	Fsxid025b9d58c14bdafbb:fsx:hana_shared	20,480.00	9.35	9.35	0.81	8%	0.00	0%	8%	0.92	1	Yes	Yes	false
	FSx for ONTAP	Fsxid025b9d58c14bdafbb:fsx:epic_nfs_test	1,024.00	127.30	127.30	2.60	2%	0.00	0%	2%	0.98	1	Yes	Yes	false
	FSx for ONTAP	Fsxid025b9d58c14bdafbb:fsx:epic_nfs	4,000.00	0.57	0.53	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	FSx for ONTAP	Fsxid025b9d58c14bdafbb:fsx:nfs_default_cache__0004	850.97	0.50	0.50	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	FSx for ONTAP	Fsxid025b9d58c14bdafbb:fsx:single_vol_test	1,024.00	0.06	0.01	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	FSx for ONTAP	Fsxid025b9d58c14bdafbb:fsx:vol3	3,840.00	411.76	411.76	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	FSx for ONTAP	Fsxid025b9d58c14bdafbb:fsx:vol5	3,840.00	412.12	412.12	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	FSx for ONTAP	Fsxid025b9d58c14bdafbb:fsx:fsx_root	1.00	1.00	0.00	0.00	0%	0.00	0%	0%	1	1	No	No	false
	FSx for ONTAP	Fsxid025b9d58c14bdafbb:fsx:nfs_default_cache__0003	850.97	0.50	0.50	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	FSx for ONTAP	Fsxid025b9d58c14bdafbb:fsx:vol7	3,840.00	411.77	411.77	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	FSx for ONTAP	Fsxid025b9d58c14bdafbb:fsx:vol8	3,840.00	411.76	411.76	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	FSx for ONTAP	Fsxid025b9d58c14bdafbb:fsx:nfs_default_cache__0002	850.97	0.50	0.50	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	FSx for ONTAP	Fsxid025b9d58c14bdafbb:fsx:vol6	3,840.00	412.39	412.39	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	FSx for ONTAP	Fsxid025b9d58c14bdafbb:fsx:vol1	3,840.00	411.76	411.76	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
Fsxid0e2fc280c041f12c9-01	FSx for ONTAP	Fsxid0e2fc280c041f12c9:cilabfsxsvm03:filesMO	16.00	0.10	0.09	0.00	0%	0.00	0%	0%	1	1	Yes	No	false
	FSx for ONTAP	Fsxid0e2fc280c041f12c9:cilabfsxsvm01:vol002	64.00	0.03	0.01	0.00	0%	0.00	0%	0%	1	1	Yes	No	false
	FSx for ONTAP	Fsxid0e2fc280c041f12c9:cilabfsxsvm01:vol001	64.00	14.22	14.22	0.00	0%	0.00	0%	0%	1	1	Yes	No	false

Description: This report shows storage efficiency metrics for FSx workloads.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 3.2 Capacity Efficiency Savings - FSx Volumes

3.2e Internal Volume Efficiency Savings

Powered by Data Infrastructure Insights

Internal Volume Efficiency Savings

Total Logical Allocated
19,112 TiB
Volume Count 10,991
Thin Logical 18,810 TB
Used 974 TB
Physical Used 1,287 TB

Deduplicated
15,656 TiB
Deduped Volumes 2,860
Dedupe Ratio 0.64
Dedupe % 36%

Compressed
190 TiB
Compressed Volumes 10,991
Compression Ratio 0.87
Compression % 13%

Pool Subscribed %
112%
Usable Capacity 5,819 TB
Used Capacity 2,362 TB
Block Allocated 8,604 TB
File Allocated 6,509 TB

Cost Savings
112%
Dedupe Cost Savings 5,819 TB
Compression Cost Savings 2,362 TB
Compaction Cost Savings 8,604 TB
Thin Cost Savings 6,509 TB

Efficiency Savings Detail *(Current Data)*

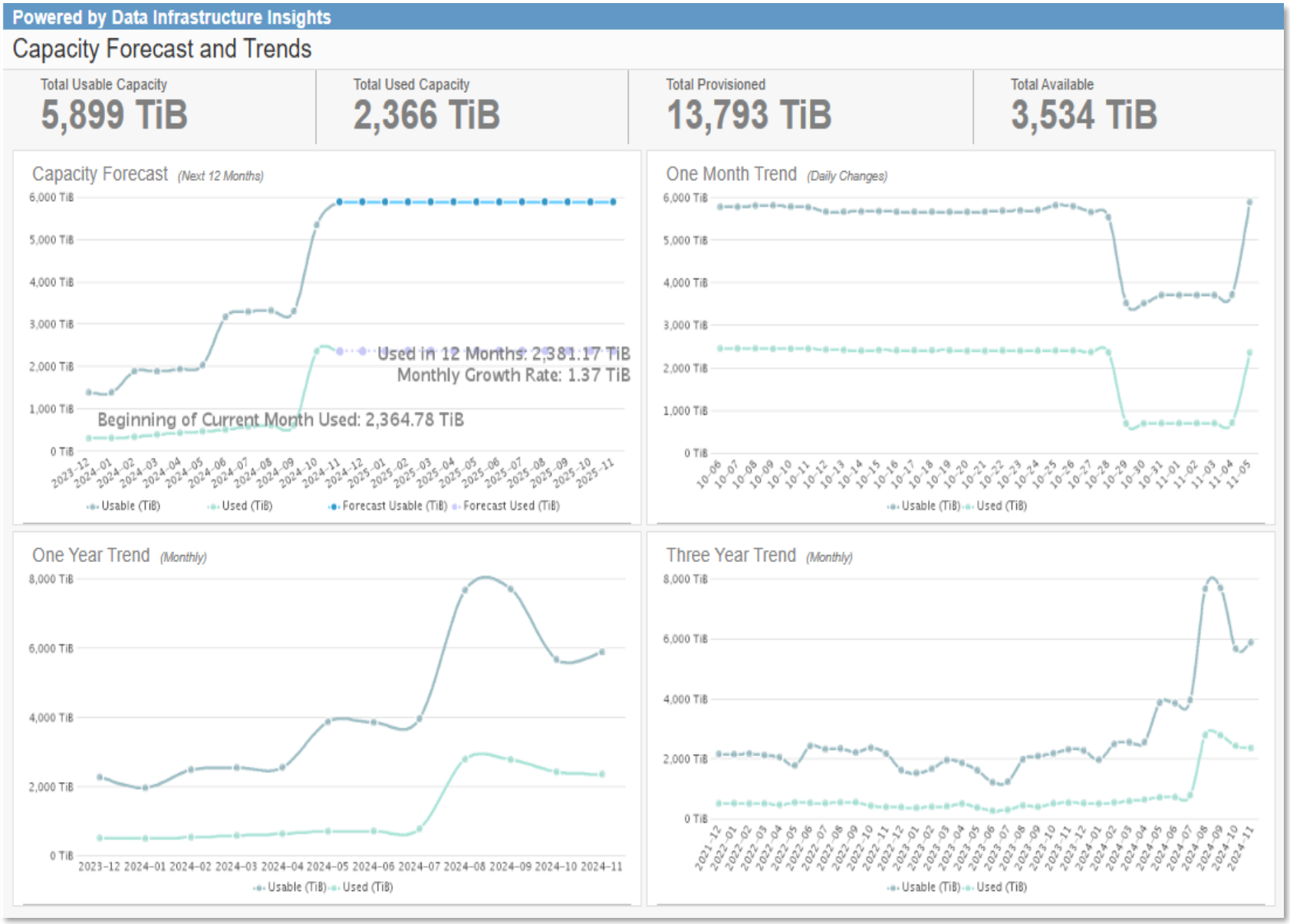
Node	Volume Name	Logical Allocated (GiB)	Physical Used (GiB)	Used (GiB)	Deduplicated (GiB)	Dedupe %	Compressed (GiB)	Compression %	Total Savings %	Dedupe Ratio	Compression Ratio	Dedupe Enabled	Compression Enabled	isEncrypted
A250-42	A250-41-42-43:nfs_vserver:trident_pvc_volume94	100.00	0.02	0.01	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	A250-41-42-43:nfs_vserver:trident_pvc_e185f725_2ed3_4483_b34c_39c2501a795e	8.00	0.01	0.01	0.30	95%	0.00	1%	96%	0.05	0.99	Yes	Yes	false
	A250-41-42-43:nfs_vserver:trident_pvc_volume16	100.00	0.02	0.01	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	A250-41-42-43:nfs_vserver:testmevol__0003	0.20	0.06	0.06	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	A250-41-42-43:nfs_vserver:trident_pvc_09cc2ac2_677b_49f8_9e89_979c2750509a	8.00	0.00	0.00	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	A250-41-42-43:nfs_vserver:trident_pvc_volume73	100.00	0.03	0.01	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	A250-41-42-43:nfs_vserver:trident_pvc_volume24	100.00	0.04	0.01	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	A250-41-42-43:nfs_vserver:trident_pvc_1667de41_7e89_4147_a434_40cc5aae6fa9	8.00	0.04	0.04	0.12	64%	0.02	13%	77%	0.36	0.87	Yes	Yes	false
	A250-41-42-43:nfs_vserver:trident_pvc_9de4784a_c4b2_41d4_8d6b_9e77d5169396	8.00	0.00	0.00	0.09	95%	0.00	1%	96%	0.05	0.99	Yes	Yes	false
	A250-41-42-43:nfs_vserver:trident_pvc_volume84	100.00	0.04	0.01	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	A250-41-42-43:nfs_vserver:trident_pvc_b562830d_d3c9_4feb_8212_dfd343b8476e	8.00	0.00	0.00	0.09	95%	0.00	1%	96%	0.05	0.99	Yes	Yes	false
	A250-41-42-43:nfs_vserver:trident_pvc_volume42	100.00	0.03	0.01	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	A250-41-42-43:svm_migr_d4faed18-087a-4613-a2d2-013864c7f0ae:root	1.00	1.00	0.00	0.00	0%	0.00	0%	0%	1	1	No	No	false
	A250-41-42-43:nfs_vserver:trident_pvc_volume87	100.00	0.03	0.01	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	A250-41-42-43:nfs_vserver:trident_pvc_3c7fbc17_e893_44d8_81ab_6c5c4fbb3f80	8.00	0.01	0.01	0.12	93%	0.00	1%	94%	0.07	0.99	Yes	Yes	false
	A250-41-42-43:vs_test:vol_dev_test2	0.02	0.00	0.00	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	A250-41-42-43:nfs_vserver:trident_pvc_volume18	100.00	0.04	0.01	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	A250-41-42-43:nfs_vserver:trident_pvc_volume6	100.00	0.04	0.01	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	A250-41-42-43:nfs_vserver:trident_pvc_volume39	100.00	0.03	0.01	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	A250-41-42-43:s3-new-svm:fg_oss_1705881359__0003	3,449.26	0.07	0.07	0.01	16%	0.00	0%	16%	0.84	1	Yes	Yes	false
	A250-41-42-43:nfs_vserver:trident_pvc_volume30	100.00	0.02	0.01	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	A250-41-42-43:nfs_vserver:dummy	1.05	0.00	0.00	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	A250-41-42-43:nfs_vserver:trident_pvc_volume44	100.00	0.03	0.01	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	A250-41-42-43:nfs_vserver:trident_pvc_volume83	100.00	0.03	0.01	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	A250-41-42-43:nfs_vserver:trident_pvc_04ce3c2f_1b25_4b32_98be_34488a0a18c7	8.00	0.00	0.00	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	A250-41-42-43:harvest-POC:harvest_POC_root	1.00	1.00	0.00	0.00	0%	0.00	0%	0%	1	1	No	No	false
	A250-41-42-43:nfs_vserver:trident_pvc_967dd978_14df_4c79_960b_6f70bc2aab34	8.00	0.00	0.00	0.12	95%	0.00	1%	96%	0.05	0.99	Yes	Yes	false
	A250-41-42-43:nfs_vserver:trident_pvc_volume26	100.00	0.03	0.01	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	A250-41-42-43:nfs_vserver:trident_pvc_06dba5cc_aad5_4ce6_85a1_ab058be368d9	8.00	0.00	0.00	0.09	95%	0.00	1%	96%	0.05	0.99	Yes	Yes	false
	A250-41-42-43:nfs_vserver:trident_pvc_volume10	100.00	0.03	0.01	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	A250-41-42-43:nfs_vserver:testmevol__0001	0.20	0.06	0.06	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false
	A250-41-42-43:nfs_vserver:share_b2cc2f2d_fedb_42c3_9b43_65c5c7ce2552	1.00	1.00	0.02	0.00	0%	0.00	0%	0%	1	1	Yes	No	false
	A250-41-42-43:nfs_vserver:trident_pvc_volume65	100.00	0.03	0.01	0.00	0%	0.00	0%	0%	1	1	Yes	Yes	false

Description: This report shows internal volume storage efficiency savings for nodes and individual workloads.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 3.2 Internal Volume Efficiency Savings

3.3 Capacity Forecast and Trends



Description: This report shows capacity trends for storage pools / aggregates including linear regression forecasting and monthly growth rates.

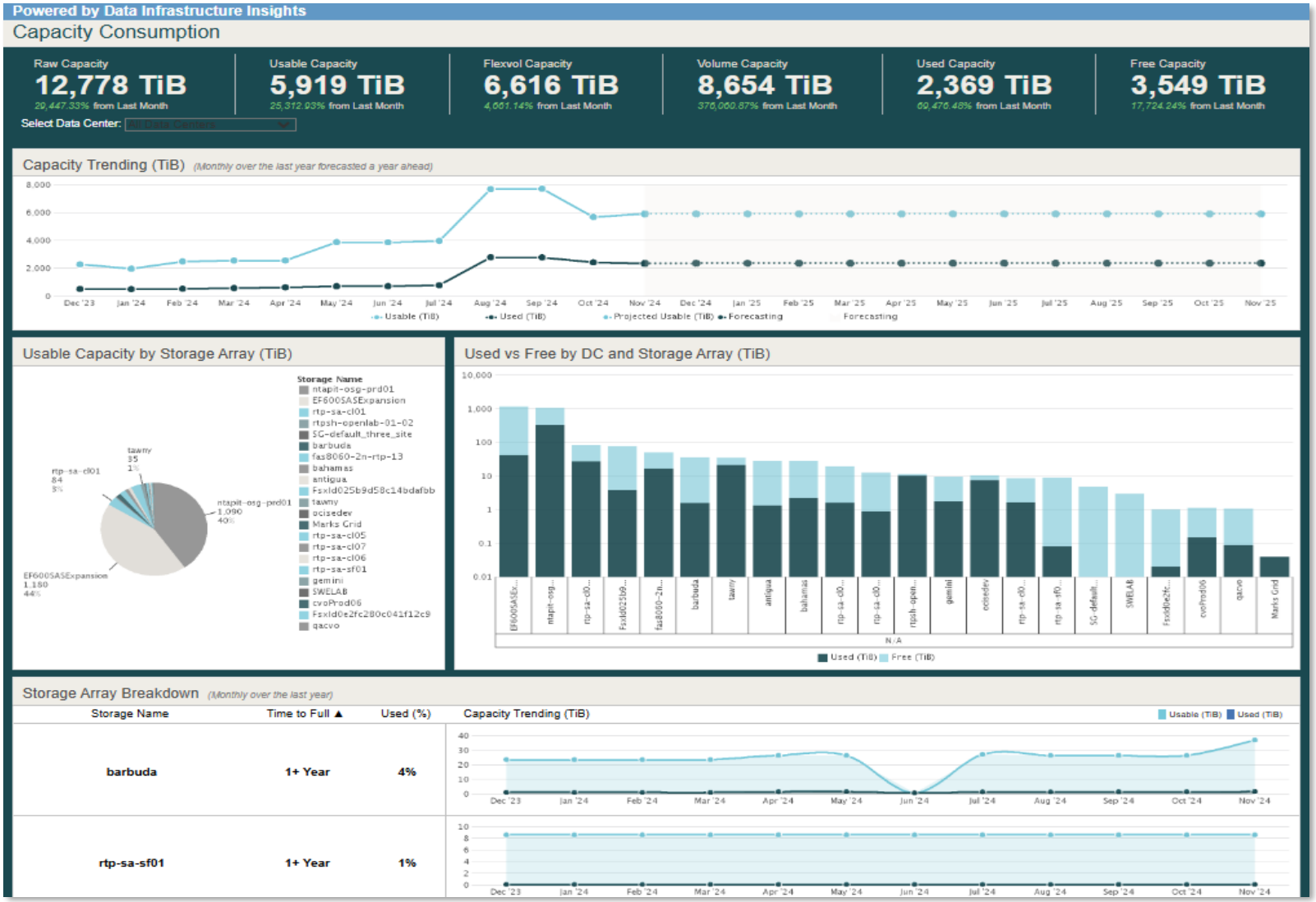
Prerequisites: Data Infrastructure Insights (DII) reporting enabled. At least 2 months of historical data is required to show projections.

Report XML: 3.3 Capacity Forecast and Trends

3.3 Capacity Forecast and Trends Definitions

Metric/Attribute	Description
Storage Device	Name of the storage device discovered and monitored by DII
Total Usable Capacity (TiB)	Sum of all Usable capacity allocated for a storage-pool as reported by the storage-array in Tebibytes (Base 2 units)
Total Used Capacity (TiB)	Sum of all Capacity used in a storage-pool as reported by the storage-array in TIB
Internal Volume Allocated (TiB)	Total allocated capacity of internal volumes (Flexvols) on this storage pool in Tebibytes
Volume Allocated (TiB)	Provisioned capacity of all SAN/Block volumes on this storage pool in Tebibytes
Total Provisioned (TiB)	IF Internal Volume Allocated (TiB) > Volume Allocated (TiB) THEN Internal Volume Allocated (TiB) ELSE Volume Allocated (TiB)
Total Available (TiB)	Total Usable Capacity (TiB) - Total Available (TiB)
Usable (TiB)	Usable capacity allocated for a storage-pool as reported by the storage-array in Tebibytes (Base 2 units)
Used (TiB)	Used capacity in Tebibytes as reported by the storage pool or aggregate. If Thin Provisioned, then Used = Written. If Thick Provisioned then Used = Allocated
Forecast Usable (TiB)	Usable Capacity in Tebibytes for the future 12 month period. This field is the basis for the intercept as a result of linear regression and projected used capacity. The field is contained in the Storage and Storage Pools Capacity FUTURE Fact table
Forecast Used (TiB)	Forecast Used Capacity in Tebibytes for the future 12 month period
Used in 12 Months	IF([MaxDate]=[Full Date]) THEN ([Forecast Used (TiB)]) ELSE (0)
Monthly Growth Rate	([Used (TiB) in 12 Months]-[Current for Report])/12
Date	Full Date field available in the DWH Date Dimension table

3.4 Capacity Consumption



Description: This report shows capacity consumption by data center for mult-vendor storage devices.

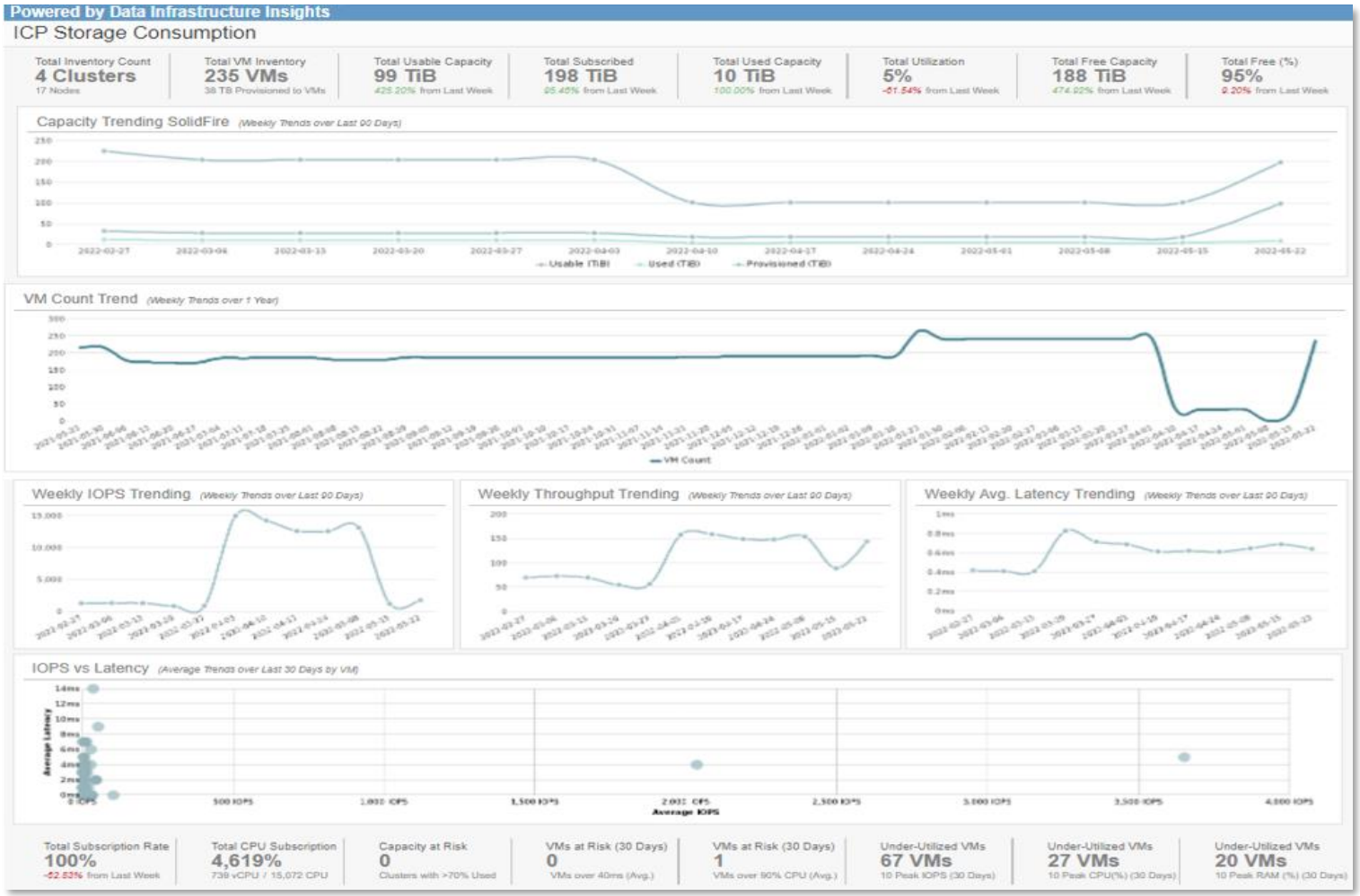
Prerequisites: Data Infrastructure Insights (DII) reporting enabled. At least 2 months of historical data is required to show projections.

Report XML: 3.4 Capacity Consumption

3.4 Capacity Consumption Definitions

Metric/Attribute	Description
Data Center	DII configured annotation. DII configured annotation. Defines the location of the device
Storage Array	Name of the storage device discovered and monitored by DII
Future Days	DATEDIFF(IF(SUM(Projected Usable (TiB)) <= SUM(Projected Used (TiB)), FullDate,'9999-01-01'), NOW())
Time to Full	IF(MIN(Future Days) > 365,1+ Year', CONCAT(FLOOR(MIN(future.days) / 30), ' Months, ', MIN(future.days) % 30, ' Days')
Raw Capacity (TiB)	Pre-RAID Raw Capacity in TiB of all disks as reported by the storage device monitored by DII and contained in the Storage and Storage Pool Capacity Fact table. Represented as: capacity * rawToUsableRatio
Usable (TiB)	Usable capacity allocated for a storage-pool as reported by the storage-array in Tebibytes (Base 2 units)
Used (TiB)	Used capacity in Tebibytes as reported by the storage pool or aggregate. If Thin Provisioned, then Used = Written. If Thick Provisioned then Used = Allocated
Used %	Used (TiB) / Usable (TiB)
Free (TiB)	Usable (TiB) - Used (TiB)
Projected Usable (TiB)	Usable Capacity in Tebibytes for the future 12 month period. This field is the basis for the intercept as a result of linear regression and projected used capacity. The field is contained in the Storage and Storage Pools Capacity FUTURE Fact table.
Forecasting (Projected Used TiB)	Forecast Used Capacity in Tebibytes for the future 12 month period
Flexvol Capacity (TiB)	Total allocated capacity of internal volumes (Flexvols) on this storage pool in Tebibytes
Volume Capacity (TiB)	Provisioned capacity of all SAN/Block volumes on this storage pool in Tebibytes
Used Capacity (TiB)	Same as Used (TiB)
Free Capacity (TiB)	Usable (TiB) - Used (TiB)
Date	Full Date field available in the DWH Date Dimension table

3.5 ICP Storage Consumption



Description: This report shows ICP storage consumption by capacity and performance.

ICP (Internet Computer Protocol) is orchestrated by permissionless decentralized governance and is hosted on sovereign hardware devices run by independent parties. Its purpose is to extend the public internet with native cloud computing functionality

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 3.5 ICP Storage Consumption

3.5 ICP Storage Consumption Definitions

Metric/Attribute	Description
Total Numbers Top of Page	
Total Inventory Count	Total count of all ScaleIO and SolidFire clusters.
Node Count	Total count of all ScaleIO and SolidFire nodes.
Total VM Inventory	Total count of all ScaleIO and SolidFire VMs.
Provisioned TB	The amount of provisioned in TB capacity that has been given to all of the scaleIO and SolidFire VMs.
Total Usable Capacity	Amount of allocated capacity in TB given to all storage pools on the ScaleIO and SolidFire clusters.
Usable Change	Amount of change over the past week in usable capacity.
Total Subscribed	Amount of capacity in TB given to the volumes on the ScaleIO and SolidFire. This is compared to the usable space given to storage pools.
Subscribed Change	Amount of capacity in TB given to the volumes on the ScaleIO and SolidFire that has changed in the past week. This is compared to the usable space given to storage pools.
Total Used Capacity	Total Used Capacity in TB on all Storage Pools on ScaleIO and SolidFire.
Total Used Capacity Change	Total Used Capacity in TB change over past week on all Storage Pools on ScaleIO and SolidFire.
Total Utilization	Total Used Capacity in percentage on all Storage Pools on ScaleIO and SolidFire.
Total Utilization Change	Total Used Capacity percentage change over past week on all Storage Pools on ScaleIO and SolidFire.
Total Free Capacity	Total Free Capacity in TB on all Storage Pools on ScaleIO and SolidFire.
Total Free Capacity Change	Total Free Capacity in TB change over one week on all Storage Pools on ScaleIO and SolidFire.
Total Free %	Total Free Capacity in percentage on all Storage Pools on ScaleIO and SolidFire.
Total Free % Change	Total Free Capacity percentage change over past week on all Storage Pools on ScaleIO and SolidFire.
Charts	
Usable TB	Amount of allocated capacity in TB given to all storage pools over 90 days on the ScaleIO and SolidFire clusters. Weekly data points used in the chart.
Used TB	Total Used Capacity in TB on all Storage Pools over 90 days on ScaleIO and SolidFire. Weekly data points used in the chart.
Provisioned TB	The amount of provisioned in TB capacity over 90 days that has been given to all of the scaleIO and SolidFire VMs.
VM Count	VM count trend over 1 year using weekly data points.
Total IOPS	90 day trend of the total IOPS summed up at the storage level. Weekly data points used in the charts.
Total Throughput	90 day trend of the total Throughput summed up at the storage level. Weekly data points used in the charts.
Total Latency	90 day trend of the average latency averaged up at the storage level. Weekly data points used in the charts.
Average IOPS vs Average Latency	Average VM IOPS and average VM latency seen over 30 days and then compared.

NetApp

Bottom Totals

Total Subscription Rate	Amount of capacity in percent given to the volumes on the ScaleIO and SolidFire. This is compared to the storage pool usable capacity.
Subscription Rate Change	Amount of capacity percentage change in the volumes on the ScaleIO and SolidFire. This is compared to the storage pool usable capacity.
Total CPU Subscription	Total CPU subscription percentage based on the following: VM vCPU Provisioned count/Hypervisor CPU count.
Capacity at Risk: Clusters with >70% used	Clusters with over 70% of usable space used on their storage pools.
VMs at Risk 30 Days: VMs over 40ms latency	Count of VMs that have had on average greater than 40ms latency over 30 days.
VMs at Risk 30 Days: VMs over 90% CPU	Count of VMs that have had on average greater than 90% CPU utilization over 30 days.
Under Utilized VMS : 10 peak IOPS over 30 Days	Count of VMs that have had on average less than 10 peak IOPS over 30 days.
Under Utilized VMS : 10% peak CPU% over 30 Days	Count of Vms that have had on average less than 10% peak CPU utilization over 30 days.
Under Utilized VMS : 10% peak RAM % over 30 Days	Count of VMs that have had on average less than 10% peak memory utilization over 30 days.

3.6 Volume Capacity Growth

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Volume Capacity Growth

Total Volumes at Risk	Capacity at Risk	Volumes Less than 50 Days to Full	NAS Volumes at Risk	SAN Volumes at Risk
23	109 GiB	2	13	1

Top Volumes by Capacity Growth Differential *(last 12 months, showing only those volumes less 365 days to full)*

Protocol	Node	Volume	Current Allocated GiB	Current Used GiB	Monthly Growth Rate GiB	Growth Diff GiB	Days to Full Capacity
NAS	trinidad-01	trinidad:svm_mscheckel:vol1	0.02	0.00	0.06	0.36	8
NAS	osa4-02	osa4:tsukioka_svm2:tsukioka_mirrortest_dest	0.17	0.01	0.18	1.08	26
None/Flexvol	rtp-sa-select01-1	rtp-sa-select01:SelectSVM:vol_test2	0.05	0.01	0.02	0.12	70
NAS	trinidad-01	trinidad:svm_alexeym40:sm_test_dst	10.00	2.80	2.66	12.8	84
NAS	trinidad-01	trinidad:svm_hland:svmhland_vol0	1.00	0.01	0.32	1.92	93
None/Flexvol	rtp-sa-cl01-07	rtp-sa-cl01:rtp-demo-01:leaftydemo01_clone_463	0.10	0.01	0.02	0.12	133
NAS	Fsxid0e2fc280c041f12c9-01	Fsxid0e2fc280c041f12c9:cilabfsxsvm03:filesMO	16.00	0.09	3.51	10.53	136
NAS	rtp-sa-cl05-02	rtp-sa-cl05:NYC_Test_2_dest_0:cm_src	1.00	0.01	0.20	1.2	148
None/Flexvol	rtp-sa-select01-1	rtp-sa-select01:SelectSVM:selectboundvol_dest	0.17	0.02	0.03	0.18	151
NAS	rtp-sa-cl06-01	rtp-sa-cl06:dpsvm01_dest:leafty_snaplockvault_src_01	1.00	0.00	0.19	1.14	157
SAN	grenada-03	grenada:svm-snapcenter:test01	10.30	0.63	1.61	9.66	180
NAS	grenada-04	grenada:svm-snapcenter:kw_scw1_DATA	5.90	4.88	0.16	0.96	192
NAS	rtp-sa-select01-1	rtp-sa-select01:SelectSVM:share_52a3873e_c41e_4a76_ba82_123060753697	1.00	0.01	0.12	0.72	248
NAS	rtp-sa-select01-1	rtp-sa-select01:sa-db-prod:aixdbarch1	50.00	45.41	0.53	3.18	260
None/Flexvol	barbuda-01	barbuda:barbuda:MDV_CRS_3da52ee5dbce11eeb54a00a098f23270_B	10.00	0.09	1.10	6.6	270
None/Flexvol	rtp-sa-select01-2	rtp-sa-select01:SelectSVM:rest_sm_dest2	0.12	0.03	0.01	0.06	296
NAS	rtp-sa-cl07-02	rtp-sa-cl07:rtp-sa-cl07-svm-01:mirror_samplesource1_dest	0.12	0.03	0.01	0.06	296
None/Flexvol	rtp-sa-select01-2	rtp-sa-select01:SelectSVM:rest_sm_dest4	0.12	0.03	0.01	0.06	299
None/Flexvol	rtp-sa-select01-2	rtp-sa-select01:SelectSVM:rest_sm_dest3	0.12	0.03	0.01	0.06	299
None/Flexvol	rtp-sa-select01-2	rtp-sa-select01:SelectSVM:rest_sm_dest5	0.12	0.02	0.01	0.06	302
NAS	rtp-sa-cl05-01	rtp-sa-cl05:test:cm_src_dest	0.12	0.02	0.01	0.06	316
NAS	rtp-sa-select01-2	rtp-sa-select01:SelectSVM:share_8235eece_55b7_4f80_b9e7_de60f609c2c8	1.00	0.02	0.09	0.54	326
None/Flexvol	rtp-sa-select01-1	rtp-sa-select01:SelectSVM:vol1	1.00	0.01	0.09	0.54	329

Description: This report shows volume capacity growth using compound average growth ratio to achieve Days to Full Capacity for individual workloads.

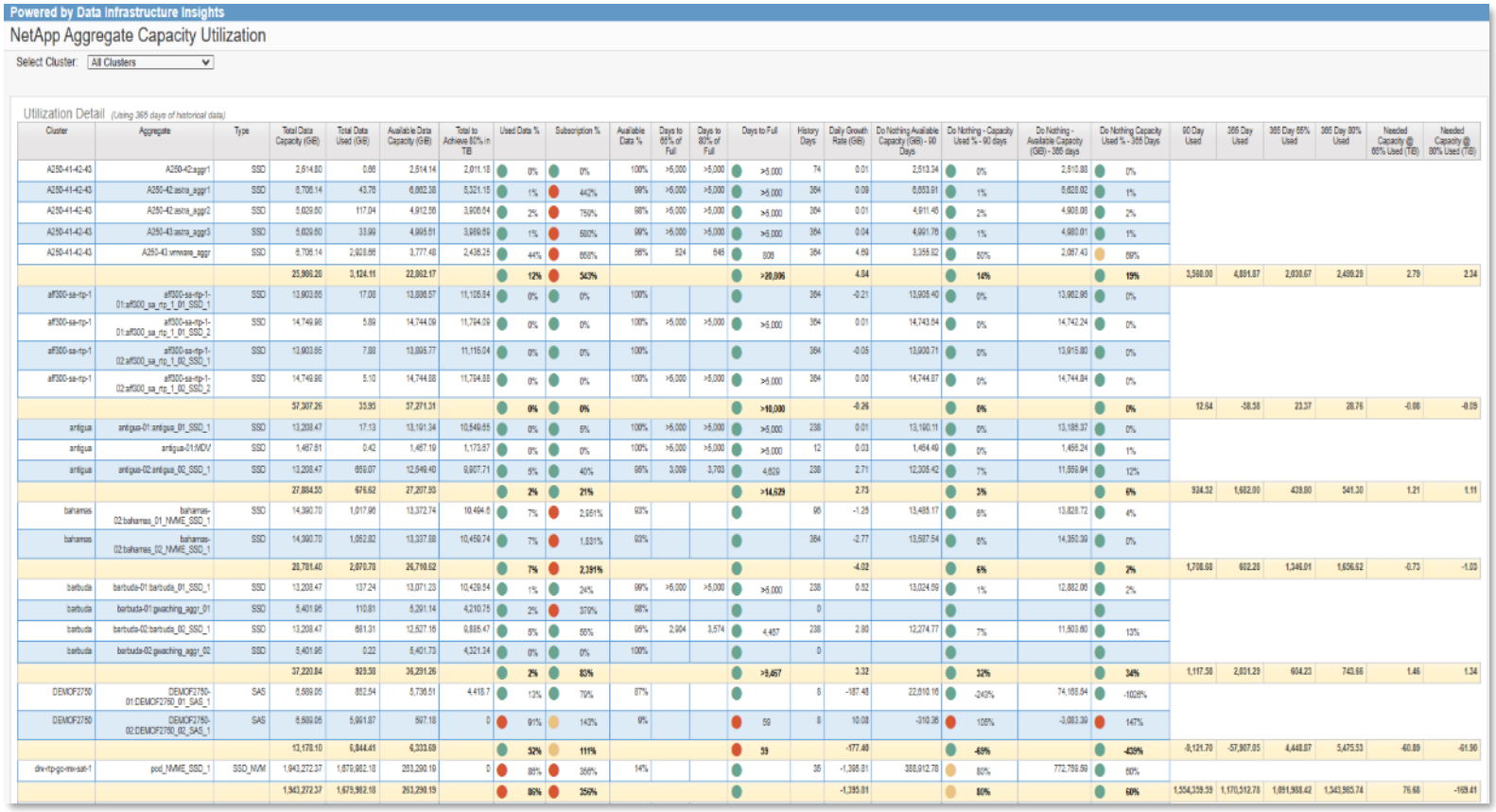
Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 3.6 Volume Capacity Growth

3.6 Volume Capacity Growth Definitions

Metric/Attribute	Description
Protocol	Protocol used for delivery of volume capacity e.g. NAS, SAN, NoneFlexvol
Node	Name of the storage node associated with the cluster discovered by DII
Volume	Name of the volume associated with the storage node
Current Allocated GiB	Allocated capacity in Gibibytes associated with the volume
Current Used GiB	Used capacity in Gibibytes associated with the volume. For block volumes that are thick provisioned, Used will always equal Allocated.
Begin Used GiB	Used capacity in Gibibytes associated with the volume beginning 190 days (or less) from the current date
Monthly Growth Rate GiB	Using a compound average growth rate function: power(Current Used GiB / Beginning Used GiB, 1/TIMESTAMPDIFF(MONTH,begin.date,end.date))-1
Data Points	TIMESTAMPDIFF(MONTH,begin.date,end.date)
Growth Diff GiB	Data Points * Monthly Growth Rate
Days to Full Capacity	IF(Monthly Growth Rate GiB <=0 OR (AllocatedGiB - UsedGiB)/(Monthly Growth Rate GiB /30) > 730 OR Data Points < 3 , null, (AllocatedGiB -UsedGiB)/(Monthly Growth Rate GiB /30))
Total Volumes at Risk	Total number of volumes with Days to Full < 365
Capacity at Risk GiB	Amount of capacity in Gibibytes of all volumes at risk
Volumes Less than 50 Days to Full	Number of volumes that have 50 days or less until full
NAS Volumes at Risk	Number of NAS volumes with Days to Full < 365
SAN Volumes at Risk	Number of SAN volumes with Days to Full < 365

3.7 NetApp Aggregate Capacity Utilization



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NetApp Aggregate Capacity Utilization

Select Cluster: All Clusters

Utilization Detail (Using 365 days of historical data)

Cluster	Aggregate	Type	Total Data Capacity (GiB)	Total Data Used (GiB)	Available Data Capacity (GiB)	Total to Achieve 80% in TiB	Used Data %	Subscription %	Available Data %	Days to 66% of Full	Days to 80% of Full	Days to Full	History Days	Daily Growth Rate (GiB)	Do Nothing Available Capacity (GiB) - 90 Days	Do Nothing - Capacity Used % - 90 days	Do Nothing - Available Capacity (GiB) - 365 days	Do Nothing Capacity Used % - 365 Days	90 Day Used	365 Day Used	365 Day 66% Used	365 Day 80% Used	Needed Capacity @ 66% Used (TiB)	Needed Capacity @ 80% Used (TiB)
A250-41-42-43	A250-42:aggr1	SSD	2,514.80	0.66	2,514.14	2,011.18	0%	0%	100%	>5,000	>5,000	>5,000	74	0.01	2,513.34	0%	2,510.88	0%						
A250-41-42-43	A250-42:astra_aggr1	SSD	6,706.14	43.78	6,662.38	5,321.15	1%	442%	99%	>5,000	>5,000	>5,000	364	0.09	6,653.91	1%	6,628.02	1%						
A250-41-42-43	A250-42:astra_aggr2	SSD	5,029.50	117.04	4,912.55	3,906.64	2%	759%	98%	>5,000	>5,000	>5,000	364	0.01	4,911.45	2%	4,908.08	2%						
A250-41-42-43	A250-43:astra_aggr3	SSD	5,029.50	33.99	4,995.51	3,989.89	1%	680%	99%	>5,000	>5,000	>5,000	364	0.04	4,991.76	1%	4,980.01	1%						
A250-41-42-43	A250-43:vmware_aggr	SSD	6,706.14	2,928.66	3,777.48	2,436.25	44%	668%	56%	524	845	808	364	4.69	3,355.82	50%	2,067.43	69%						
			25,986.28	3,124.11	22,862.17		12%	543%				>20,806		4.84		14%		19%	3,560.00	4,801.87	2,030.67	2,499.29	2.79	2.34
aff300-sa-rtp-1	aff300-sa-rtp-1-01:aff300_sa_rtp_1_01_SSD_1	SSD	13,903.65	17.08	13,886.57	11,105.64	0%	0%	100%				364	-0.21	13,905.40	0%	13,982.95	0%						
aff300-sa-rtp-1	aff300-sa-rtp-1-01:aff300_sa_rtp_1_01_SSD_2	SSD	14,749.98	5.89	14,744.09	11,794.09	0%	0%	100%	>5,000	>5,000	>5,000	364	0.01	14,743.64	0%	14,742.24	0%						
aff300-sa-rtp-1	aff300-sa-rtp-1-02:aff300_sa_rtp_1_02_SSD_1	SSD	13,903.65	7.88	13,895.77	11,116.04	0%	0%	100%				364	-0.05	13,900.71	0%	13,915.80	0%						
aff300-sa-rtp-1	aff300-sa-rtp-1-02:aff300_sa_rtp_1_02_SSD_2	SSD	14,749.98	5.10	14,744.88	11,794.88	0%	0%	100%	>5,000	>5,000	>5,000	364	0.00	14,744.87	0%	14,744.84	0%						
			57,307.26	35.95	57,271.31		0%	0%				>10,000		-0.26		0%		0%	12.64	-58.58	23.37	28.76	-0.06	-0.09
antigua	antigua-01:antigua_01_SSD_1	SSD	13,208.47	17.13	13,191.34	10,549.85	0%	6%	100%	>5,000	>5,000	>5,000	238	0.01	13,190.11	0%	13,186.37	0%						
antigua	antigua-01:NDV	SSD	1,467.81	0.42	1,467.19	1,173.67	0%	0%	100%	>5,000	>5,000	>5,000	12	0.03	1,464.40	0%	1,466.24	1%						
antigua	antigua-02:antigua_02_SSD_1	SSD	13,208.47	659.07	12,549.40	9,907.71	5%	40%	95%	3,009	3,703	4,629	238	2.71	12,305.42	7%	11,559.94	12%						
			27,884.55	676.62	27,207.93		2%	21%				>14,529		2.75		3%		6%	934.52	1,682.00	439.80	541.30	1.21	1.11
bahamas	bahamas-02:bahamas_01_NVME_SSD_1	SSD	14,390.70	1,017.96	13,372.74	10,494.8	7%	2,951%	93%				96	-1.25	13,485.17	6%	13,828.72	4%						
bahamas	bahamas-02:bahamas_02_NVME_SSD_1	SSD	14,390.70	1,052.82	13,337.88	10,450.74	7%	1,831%	93%				364	-2.77	13,587.54	6%	14,350.39	0%						
			28,781.40	2,070.78	26,710.62		7%	2,391%						-4.02		6%		2%	1,708.68	602.28	1,346.01	1,656.62	-0.73	-1.03
barbuda	barbuda-01:barbuda_01_SSD_1	SSD	13,208.47	137.24	13,071.23	10,429.54	1%	24%	99%	>5,000	>5,000	>5,000	238	0.52	13,024.59	1%	12,882.00	2%						
barbuda	barbuda-01:gwaching_aggr_01	SSD	5,401.95	110.81	5,291.14	4,210.75	2%	379%	98%				0											
barbuda	barbuda-02:barbuda_02_SSD_1	SSD	13,208.47	681.31	12,527.16	9,885.47	5%	55%	95%	2,904	3,574	4,467	238	2.80	12,274.77	7%	11,503.60	13%						
barbuda	barbuda-02:gwaching_aggr_02	SSD	5,401.95	0.22	5,401.73	4,321.34	0%	0%	100%				0											
			37,220.84	929.58	36,291.26		2%	83%				>9,457		3.32		32%		34%	1,117.58	2,801.29	604.23	743.66	1.46	1.34
DEMOF2750	DEMOF2750-01:DEMOF2750_01_SAS_1	SAS	6,589.06	852.54	5,736.51	4,418.7	13%	70%	87%				8	-187.48	22,610.16	-243%	74,168.54	-1026%						
DEMOF2750	DEMOF2750-02:DEMOF2750_02_SAS_1	SAS	6,589.06	5,991.87	597.18	0	91%	143%	9%			59	8	10.08	-310.36	105%	-3,083.39	147%						
			13,178.10	6,844.41	6,333.69		52%	111%				59		-177.40		-53%		-439%	-9,121.70	-57,907.05	4,448.87	5,475.53	-60.89	-91.90
dnv-rtp-go-nw-sat-1	pod_NVME_SSD_1	SSD_NVM	1,943,272.37	1,679,982.18	263,290.19	0	86%	356%	14%				35	-1,395.81	388,912.78	80%	772,799.59	60%						
			1,943,272.37	1,679,982.18	263,290.19		86%	356%						-1,395.81		80%		60%	1,554,339.59	1,170,512.78	1,091,988.42	1,343,965.74	76.68	-169.41

Description: This report shows the critical capacity status for NetApp aggregates. Custom metrics provide capacity recommendations and alerting.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 3.7 NetApp Aggregate Capacity Utilization

3.7 NetApp Aggregate Capacity Utilization Definitions

Metric/Attribute	Description
Cluster	Name of the CDOT cluster discovered and monitored by DII
Aggregate	Name of the aggregate associated with the CDOT cluster
Type	Underlying disk type that supports the aggregate
Total Data Capacity (GiB)	Usable capacity allocated for the aggregate as reported by the storage-array in Gibibytes (Base 2 units)
Total Data Used (GiB)	Used capacity in Gibibytes as reported by the storage pool or aggregate. If Thin Provisioned, then Used = Written. If Thick Provisioned then Used = 100%
Available Data Capacity (GiB)	Total Data Capacity (GiB) - Total Data Used (GiB)
Provisioned Capacity (GiB)	Allocated capacity in Gibibytes associated with block volumes
Total to Achieve 80 % in (TiB)	IF((Total Data Used (GiB) / Total Data Capacity (GiB)) >.80) THEN (0) ELSE ((.80- (Total Data Used (GiB)] / Total Data Capacity (GiB))) * Total Data Capacity (GiB))
Used Data %	Total Data Used (GiB) / Total Data Capacity (GiB) ● Used Data % > .80 ● Used Data % Between .65 and .80
Subscription %	Provisioned Capacity (GiB) / Total Data Capacity (GiB) ● Subscription % > 1.5 ● Subscription % Between 1 and 1.5
Available Data %	Available Data Capacity (GiB) / Total Data Capacity (GiB)
Days to 65% of Full	([Total Data Capacity (GiB) - Total Data Used (GiB))*.65) / Daily Growth Rate (GiB)
Days to 80% of Full	(Total Data Capacity (GiB) - Total Data Used (GiB) *.80) / Daily Growth Rate (GiB)
Days to Full	((Total Data Capacity (GiB) - Total Data Used (GiB)) / Daily Growth Rate (GiB) ● Days to Full < 120 ● Days to Full Between 120 and 365
End.date	Current Date
Begin.date	The Current Date – 190 days
History Days	TIMESTAMPDIFF(DAY,begin.date,end.date)
Daily Growth Rate (GiB)	(end.UsedCapacityGiB - begin.UsedCapacityGiB) / TIMESTAMPDIFF(DAY,begin.date,end.date)
Do Nothing – Available Capacity (GiB) – 90 Days	Available Data Capacity (GiB) - (90* Daily Growth Rate (GiB))
Do Nothing – Capacity Used % – 90 Days	(Total Data Capacity (GiB) - Do Nothing Available Capacity (GiB) - 90 Days) *100/ Total Data Capacity (GiB)
Do Nothing – Available Capacity (GiB) – 365 Days	Available Data Capacity (GiB) - (365*[Daily Growth Rate (GiB))
Do Nothing – Capacity Used % - 365 Days	(Total Data Capacity (GiB)- Do Nothing - Available Capacity (GiB) - 365 Days) * 100/Total Data Capacity (GiB)
90 Day Used	Total Data Used (GiB) + (90 * Daily Growth Rate (GiB))
365 Day Used	Total Data Used (GiB) + (365 * Daily Growth Rate (GiB))
365 Day 65% Used	Total Data Used (GiB) *.65
365 Day 80% Used	Total Data Used (GiB) *.8

NetApp

Needed Capacity @ 65% Used (TiB)	(365 Day Used - 365 Day 65% Used) / 1024
Needed Capacity @ 80% Used (TiB)	(365 Day Used - 365 Day 80% Used) / 1024

3.8 QoS Policies for SAN and NAS

Powered by Data Infrastructure Insights

QoS Policies for SAN and NAS Volumes

Total QoS Volumes	Volumes at IOPS Limit	IO Extreme Volumes	NAS Volumes	SAN Volumes
475	0	22	437	38

Detail *(Current Data)*

Array	Volume	Type	Allocated (GiB)	Used (GiB)	Used %	14-day Avg Total IOpS	14-day Max Total IOpS	QoS Limit IOPS	Avg Latency (ms)	Total IO Density	Total MBps	Block Size (Avg KB/IOPS)	Threshold Status	QoS Limit MBps	QoS Policy
rtp-cilab-fas2750	vmwareDSfc01:Tier3_VMwareDS01:/vol/Tier3_VMwareDS01/Tier3_VMwareDS01	SAN	256	64.67	25%	1,237	1,732	2000.0	7	19,836	1,654	1,369.2	87.0% of Limit		vmware-prod-db
jamaica	jamaica:DmoESX_jamaica:aboell01	NAS	114.02	21.55	19%	181	24,914	50000.0	0	10,225	269	1,521.9	50.0% of Limit	1562.0	extreme-fixed
grenada	grenada:svm-kvm:cbc_proxmox_ds_01	NAS	10,240	5,416.24	53%	1,450	7,619	50000.0	0	324	10,879	7,682.8	15.0% of Limit	1530.0	extreme-fixed
rtp-sa-fas8200-infra	rtp-sa-fas8200-infra:ESX-FC:oradata_vmfs_ds1	NAS	2,060.54	2.96	0%	2	2	20.0	0	666	33	16,896.0	10.0% of Limit	0.0	OTV_QOS_FAH_Max20_1718721472115
umeng-aff300-01-02	umeng-aff300-01-02:osc:RahulTest	NAS	2,211.84	321.5	15%	3,734	4,988	50000.0	0	11,940	68,613	18,816.2	10.0% of Limit		
cluster1	cluster1:svm1_cluster1:nfs34vol1	NAS	5	4.08	82%	39	4,983	50000.0	0	372,600	53	1,391.6	10.0% of Limit		
A250-41-42-43	A250-41-42-43:astra_ci_vc_esxi_24_75_data:blueXP_datastore_donot_delete1	NAS	4,608	2,977.81	65%	299	3,532	50000.0	0	112	3,205	10,976.3	7.0% of Limit		
rtp-sa-fas8200-infra	rtp-sa-fas8200-infra:ESX-NFS:ISO	NAS	500	388.39	78%	3	627	15000.0	0	10	53	18,090.7	4.0% of Limit		
barbuda	barbuda:DmoESX_barbuda:mc_DmoESX_barbuda_nfs_1	NAS	2,048	68.21	3%	3	19	600.0	1	44	15	5,120.0	3.0% of Limit		
grenada	grenada:svm-sap01:H03_data	NAS	200	123.6	62%	30	575	30000.0	1	268	586	20,002.1	2.0% of Limit		
rtp-sa-fas8200-infra	rtp-sa-fas8200-infra:earlyaccess:eapesxds0	NAS	647.26	647.26	100%	26	259	30000.0	0	42	59	2,323.7	1.0% of Limit		

Defined Policies *(Current Data)*

QoS Policy	QoS Limit IOPS
1000IOPS	1,000
Citrix	5,000
ConstrainTesting01	1,500
default	15,000
DmoESX_antigia_750IOPs	750
DmoESX_antigia_900IOPs	900
DmoESX_barbuda_1300IOPs	1,300
DmoESX_barbuda_600IOPs	600
dummy	200,000,000
extreme	0
extreme-fixed	50,000
Gold_dr	15,000
h10	100
h8	0
monitor	0
monitor1	0
NSLM_SelectSVM_Value_17_0	0
NSLM_VMware_SVM_Value_17_0	0
OTV_QOS_FAH_Max20_1718721472115	20
performance-fixed	30,000
qos_smb	2,500
qos_vol_AZV_TNT	5,000
qos_vol_BSH_TNT	5,000
qos_vol_SVM_TNT	5,000
qos100	100
RShared	50,000
seb-qos	10
sql_dr	200,000
value-fixed	15,000
vmware-prod-db	2,000

Description: This report shows QoS policies with capacity and performance metrics for individual volume workloads.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled. QoS Policies enabled.

Report XML: 3.8 QoS Policies for SAN and NAS

3.8 QoS Policies for SAN and NAS Definitions

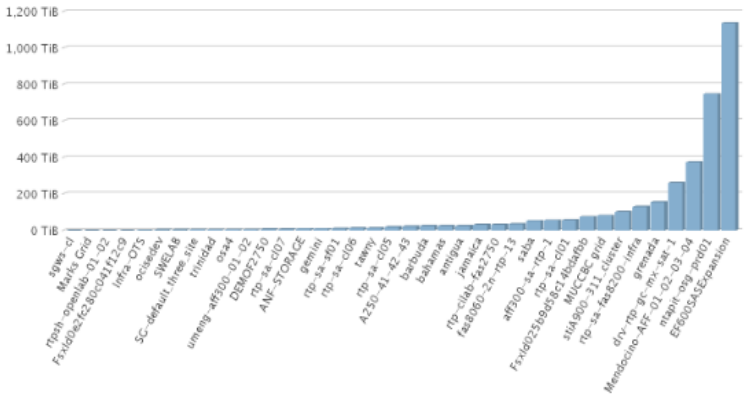
Metric/Attribute	Description
Array	Name of the storage device discovered and monitored by DII
Volume	Name of the volume associated with the storage device
Type	Volume type e.g. SAN or NAS
Allocated (GiB)	Allocated capacity in Gibibytes associated with block volumes
Used (GiB)	Consumed capacity in Gibibytes associated with block volumes
Used %	Used (GiB) / Allocated (GiB)
14-day Avg Total IOpS	Measures the total number of average I/O service requests (read+write) on the volume for 14 days hourly data points (measured in I/O per sec).
14-day Max Total IOpS	Maximum total IOPS over 14 days for each our per day
QoS Limit IOPS	IOPS limits associated with the QoS Policy
IOPS % of Limit	([14-day Max Total IOpS] / [QoS Limit IOPS] * 100
Avg Latency (ms)	The time it takes from the moment a request for information arrives at the storage device to the time when the storage device begin to send the information back in response. This is the actual latency of the device in milliseconds
Total IO Density	Measured in IOPS /TiB of capacity
Total MBps	Measures the total throughput in Megabytes per second (read+write) for 14 days hourly data points
Block Size (Avg KB/IOPS)	(Total MBps * 1024) / 14-day Avg Total IOpS
Threshold Status	● IOPS % of Limit >= 99 ● IOPS % of Limit >= 97 ● IOPS % of Limit Between 70 and 98
QoS Limit MBps	Throughput limits in Megabytes per second associated with the QoS Policy
QoS Policy	Name of the QoS Policy associated with the volume workload
Total QoS Volumes	Total number of volumes that have a valid QoS Policy
Volumes at IOPS Limit	Total number of volumes that have reached their QoS IOPS Limit
IO Extreme Volumes	The count of volumes where Total IO Density > 8000
NAS Volumes	The count of volumes that are identified as NAS
SAN Volumes	The count of volumes that are identified as SAN

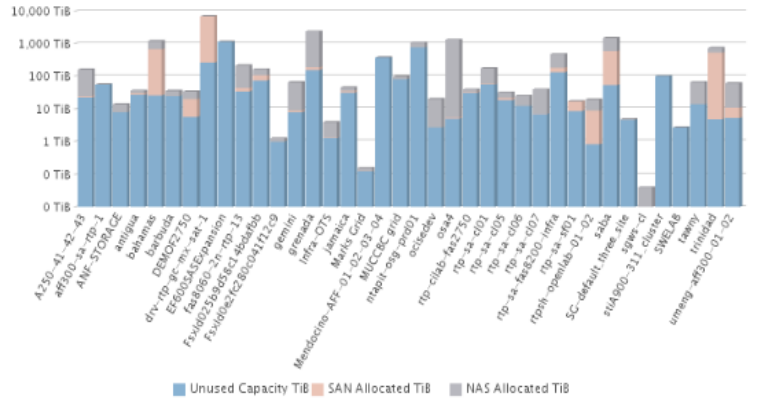
3.9 Global Usable Capacity

Powered by Data Infrastructure Insights

Global Usable Capacity

Free Capacity	Total Usable Capacity	Total Used Capacity	Total Provisioned	Subscribed %
3,532 TiB	5,904 TiB	2,372 TiB	13,734 TiB	233%





Capacity Detail (Current)

Storage Name	Manufacturer	Model	Serial Number	Capacity TiB	Used TiB	Unused Capacity TiB	% Used	SAN Allocated TiB	SAN Unallocated TiB	SAN Orphaned TiB	NAS Allocated TiB	NAS Used TiB	NAS % Used
A250-41-42-43	NetApp	AFF-A250	1-80-000011	25.69	3.38	22.31	13%	2.31	0.07	0.06	138.12	3.79	3%
aff300-sa-rtp-1	NetApp	AFF-A300	6814d4e7-f547-11eb-98ec-00a098d1fb56	55.96	0.04	55.92	0%	0	0	0	0	0	0%
ANF-STORAGE	Azure	Azure NetApp Files	890df2fb-c027-40fc-88ad-7dc5308deacc	14	6.12	7.88	44%	0	0	0	6.12	0	0%
antigua	NetApp	AFF-A300	1-80-000011	27.95	1.36	26.59	5%	4	0	0	6.38	0.75	12%
bahamas	NetApp	AFF-A400	1-80-000011	28.42	2.32	26.1	8%	633.33	201.02	201.02	533.08	1.63	0%
barbuda	NetApp	AFF-A300	1-80-000011	26.52	1.48	25.04	6%	0	0	0	10.87	0.89	8%
DEMOF2750	NetApp	FAS2750	1-80-140753	13.18	7.51	5.67	57%	14	0	0	14.62	3.24	22%
drv-rtp-gc-mx-sat-1	NetApp	ASA-A1K	49176b37-3e83-11ef-be38-d039eaa9ea2d	1,897.73	1,637.76	259.97	86%	6,752.15	2,802.56	2,802.56	0	0	0%
EF600SASExpansion	NetApp	6000	SHFFG1830001226	1,180.3	42.54	1,137.76	4%	8.97	0	0	0	0	0%
fas8060-2n-rtp-13	NetApp	FAS8060	1-80-000099	51.13	16.9	34.23	33%	9.95	0.1	0.09	173.79	10.97	6%
Fsxld025b9d58c14bdafbb	Amazon	FSx for ONTAP	1-80-000011	79.06	3.84	75.22	5%	30.1	0.1	0.1	59.33	3.35	6%
Fsxld0e2fc280c041f12c9	Amazon	FSx for ONTAP	1-80-000011	1	0.02	0.98	2%	0	0	0	0.32	0.01	3%
gemini	NetApp	AFF8040	1-80-000011	9.72	1.78	7.94	18%	1.01	1	1	57.01	1.13	2%
grenada	NetApp	AFF-A800	1-80-000011	265.43	110.66	154.77	42%	34.41	4.9	4.9	2,148.54	138.1	6%
Infra-OTS	NetApp	FASDvM300	4eba977e-df7b-11ed-971f-005056983fb2	1.68	0.36	1.32	21%	0.03	0	0	2.59	0.11	4%
jamaica	NetApp	AFF-A700	8651b1a8-435d-11ef-a000-00a098c7f6c5	31.53	0.62	30.91	2%	4.93	0	0	10	0.48	5%
Marks Grid	NetApp	Webscale	000000	0.16	0.04	0.12	25%	0	0	0	0.04	0.04	100%
Mendocino-AFF-01-02-03-04	NetApp	ASA_DS-A900	57ade9dc-9525-11ef-84c8-d039ea47c53b	381.68	7.53	374.15	2%	12.7	12.7	12.7	0	0	0%

Description: This report shows Free capacity by storage array, capacity distribution by storage array and then a breakdown of capacity detail by storage array.

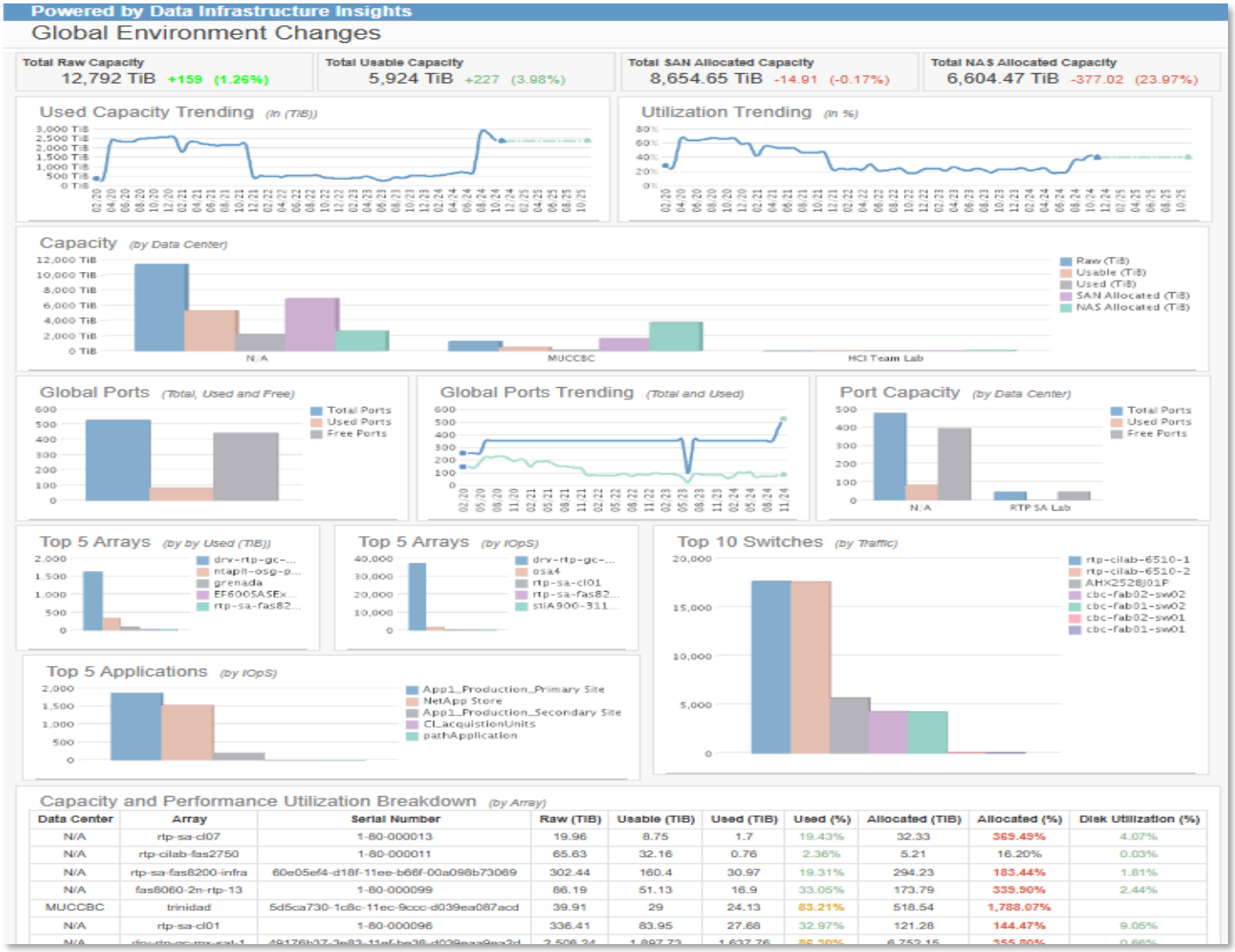
Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 3.9 Global Usable Capacity

3.9 Global Usable Capacity Definitions

Metric/Attribute	Description
Storage Name	Name of the storage device discovered and monitored by DII
Manufacturer	Manufacturer of the storage device
Model	Model name of the storage device
Serial Number	Serial Number of the storage device
Capacity TiB	Usable capacity in Tebibytes as reported by the storage pool or aggregate and contained in the Storage and Storage Pool Capacity Fact table
Used TiB	Used capacity in Tebibytes as reported by the storage pool or aggregate. If Thin Provisioned, then Used = Written. If Thick Provisioned then Used = Allocated
Unused Capacity TiB	Capacity TiB - Unused Capacity TiB
% Used	Used TiB / Capacity TiB
SAN Allocated TiB	Volume Allocated capacity in Tebibytes as reported by the storage pool or aggregate
SAN Unallocated TiB	Volume UnAllocated capacity in Tebibytes as reported by the storage pool or aggregate
Masked Volume Capacity TiB	Volume capacity that is masked to storage initiators as reported by the storage pool or aggregate
SAN Orphaned TiB	SAN Allocated TiB – Masked Volume Capacity TiB
NAS Allocated TiB	Internal Volume Allocated capacity in Tebibytes as reported by the storage pool or aggregate
NAS Used TiB	Internal Volume Used capacity in Tebibytes as reported by the storage pool or aggregate. IF Space Guarantee is ENABLED, then Used will equal Allocated
NAS % Used	NAS Used TiB / NAS Allocated TiB
Free Capacity	Capacity TiB - Unused Capacity TiB
Total Usable Capacity	Sum of Capacity TiB
Total Used Capacity	Sum of Used TiB
Total Provisioned	Sum of SAN Allocated TiB
Subscription %	Total Provisioned / Total Usable Capacity

3.10 Global Environment Changes



Data Center	Array	Serial Number	Raw (TiB)	Usable (TiB)	Used (TiB)	Used (%)	Allocated (TiB)	Allocated (%)	Disk Utilization (%)
N/A	rtp-sa-cl07	1-80-000013	19.96	8.75	1.7	19.43%	32.33	369.49%	4.07%
N/A	rtp-cilab-fas2750	1-80-000011	65.63	32.16	0.76	2.36%	5.21	16.20%	0.03%
N/A	rtp-sa-fas8200-infra	60e05ef4-d18f-11ee-b66f-00a098b73089	302.44	160.4	30.97	19.31%	294.23	183.44%	1.81%
N/A	fas8060-2n-rtp-13	1-80-000099	86.19	51.13	16.9	33.05%	173.79	339.90%	2.44%
MUCCBC	trinidad	5d5ca730-1c8c-11ec-9ccc-d039ea087acd	39.91	29	24.13	83.21%	518.54	1,788.07%	
N/A	rtp-sa-cl01	1-80-000096	336.41	83.95	27.68	32.97%	121.28	144.47%	9.05%

Description: This dashboard depicts the overall physical storage footprint as well as global ports (excludes logical ports) within the global infrastructure. The first half gives an overall view of Raw, Usable, and Provisioned Capacity (both SAN and NAS volumes) and their changes from the previous month, as well as trending and breakdown by Data Center. The second half gives a high-level overview of the infrastructures top resources and breaks down the Capacity and Performance (average data disk utilization) metrics of each array

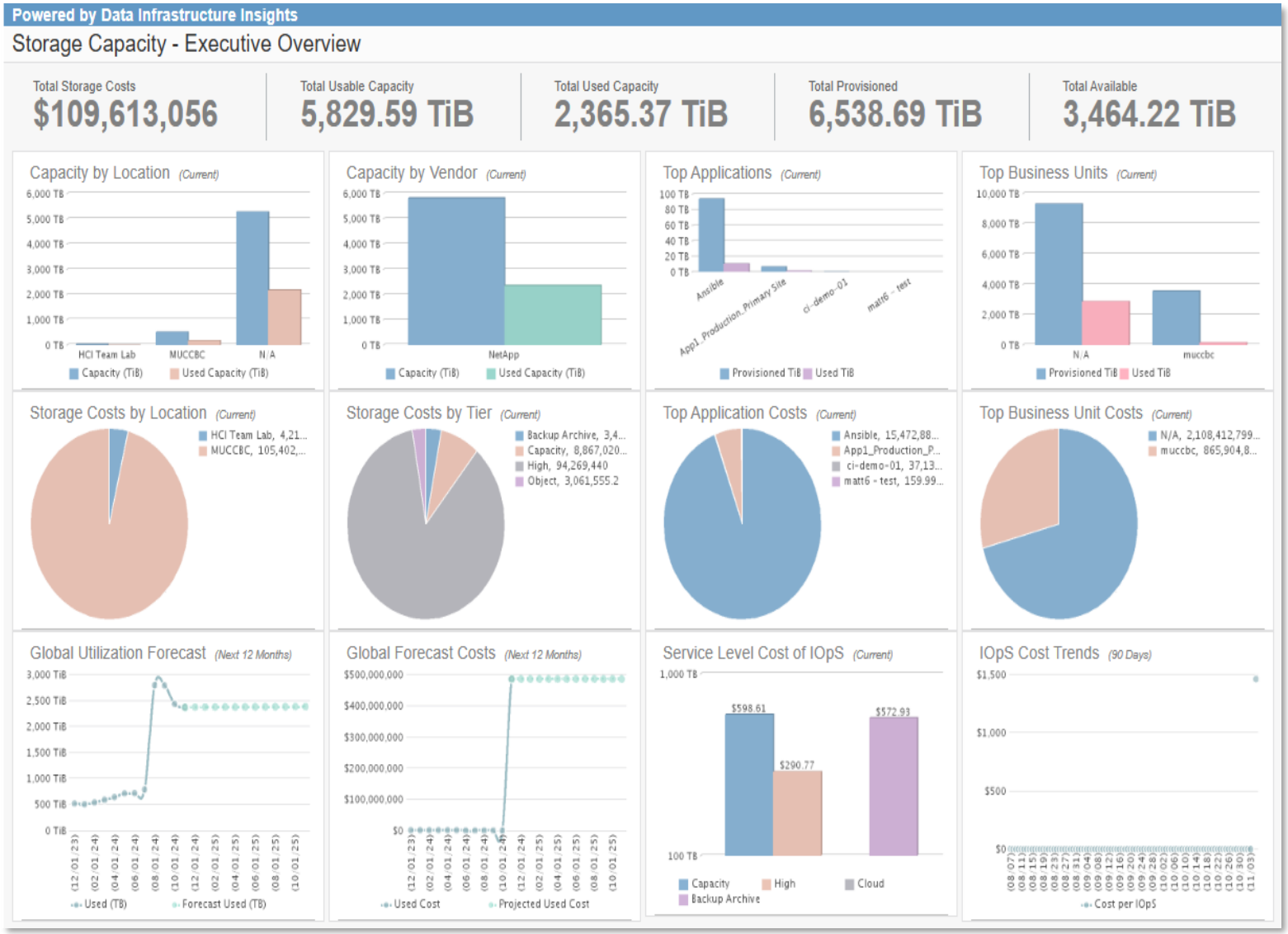
Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 3.10 Global Environment Changes

3.10 Global Environment Changes Definitions

Metric/Attribute	Description
Data Center	DII configured annotation. Defines the location of the device
Application	DII configured annotation. Defines the application associated with the virtual machine or backend storage capacity
Array	Name of the storage device discovered and monitored by DII
Serial Number	Serial Number of the storage device
Raw (TiB)	Pre-RAID Raw Capacity in Tebibytes of all disks as reported by the storage device monitored by DII and contained in the Storage and Storage Pool Capacity Fact table. Represented as: capacity * rawToUsableRatio
Usable (TiB)	Usable capacity allocated for a storage-pool as reported by the storage-array in Tebibytes (Base 2 units)
Used (TiB)	Used capacity in Tebibytes as reported by the storage pool or aggregate. If Thin Provisioned, then Used = Written. If Thick Provisioned then Used = Allocated
Projected Used (TiB)	Used Capacity in Tebibytes for the future 12 month period. The field is contained in the Storage and Storage Pools Capacity FUTURE Fact table
Used (%)	Used (TiB) / Usable (TiB)
Projected Used (%)	Projected Used (TiB) / Projected Usable (TiB)
Allocated (TiB)	Volume Allocated capacity in Tebibytes as reported by the storage pool or aggregate
Allocated (%)	Allocated (TiB) / Usable (TiB)
Disk Utilization (%)	The percentage % of post-cache service time used for requests out of the available sample time. This metric indicates what portion of the time the disk is busy servicing requests
Total Raw Capacity	Pre-RAID Raw Capacity in TiB of all disks as reported by the storage device monitored by DII and contained in the Storage and Storage Pool Capacity Fact table. Represented as: capacity * rawToUsableRatio
Total Usable Capacity	Sum of Usable (TiB) for the report
Total SAN Allocated Capacity	Sum of Allocated (TiB) for the report
Total NAS Allocated Capacity	Sum of Internal Volume Allocated (TiB) for the report
Total Ports	Total number of ports associated with each switch
Used Ports	Total number of used ports associated with each switch
Free Ports	Total number of free ports associated with each switch
Total IOPS	Measures the total number of I/O service requests (read+write) on the volume during the selected time period (measured in I/O per sec)
Switch	Name of the SAN switch discovered and monitored by DII
Traffic	Switch traffic = Receiving Traffic in Megabytes + Transmitting Traffic in Megabytes

3.11 Storage Capacity – Executive Overview



Report XML: 3.11 Storage Capacity - Executive Overview

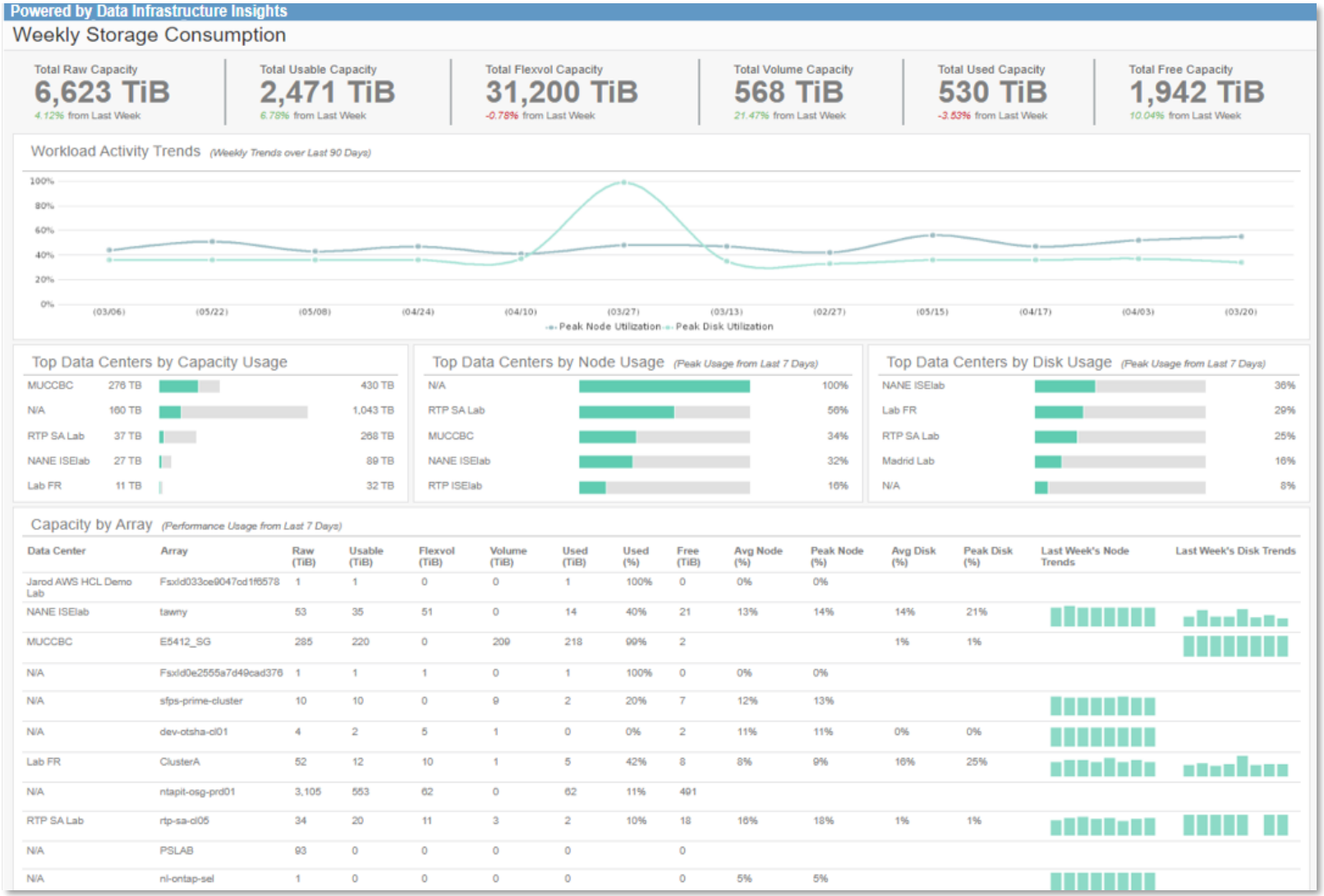
Description: This dashboard shows Global Capacity (Usable, Used, Allocated and Available) as well as overall existing Capacity broken down by location, vendor, provisioned capacity by Application, and provisioned capacity by Business Unit.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.
Data Center, Tier, Application, Business Unit, Service Level and Tier/Service Level Cost annotations must be deployed before running this report.

3.11 Storage Capacity – Executive Overview Definitions

Metric/Attribute	Description
Data Center	DII configured annotation. Defines the location of the device
Application	DII configured annotation. Defines the application associated with the virtual machine or backend storage capacity
Business Unit	DII configured annotation. Defines the Business Unit associated with the virtual machine or backend storage capacity
Tier Name	DII configured annotation. Defines tiers of storage based on disk type, disk speed, etc.
Tier Cost	DII configured annotation. Defines cost of tiers per Gibibyte
Service Level	DII configured annotation. Defines Service Levels based on IO Density (IOPS/TiB)
Capacity (TiB)	Usable capacity allocated for a storage-pool as reported by the storage-array in Tebibytes (Base 2 units)
Used Capacity (TiB)	Used capacity in Tebibytes as reported by the storage pool or aggregate. If Thin Provisioned, then Used = Written. If Thick Provisioned then Used = Allocated
Provisioned (TiB)	Volume Allocated capacity in Tebibytes as reported by the storage pool or aggregate
Cost per IOpS	Service Level Cost * Total IO Density (IOPS/TiB)
Forecast Used (TiB)	Used Capacity in Tebibytes for the future 12 month period. The field is contained in the Storage and Storage Pools Capacity FUTURE Fact table
Used Cost	Used Capacity (TiB) * Tier Cost
Forecast Used Cost	Forecast Used (TiB) * Tier Cost
Total Storage Cost	Sum of Tier Cost * Usable Capacity (GiB) for report
Total Usable Capacity	Sum of Capacity (TiB) for report
Total Used Capacity	Sum of Used Capacity (TiB) for report
Total Provisioned	Sum of Provisioned (TiB) for report
Total Available	Sum of (Capacity (TiB) – Used Capacity (TiB)) for report
Date	Full Date field available in the DWH Date Dimension table

3.12 Weekly Storage Consumption



Description: NetApp Node dashboard showing high level capacity metrics for the selected location, node performance utilization and top 10 volumes identified as a 'potential resource contention' device. Maps on right show Data Center location by state/country and major city with Usable Capacity values

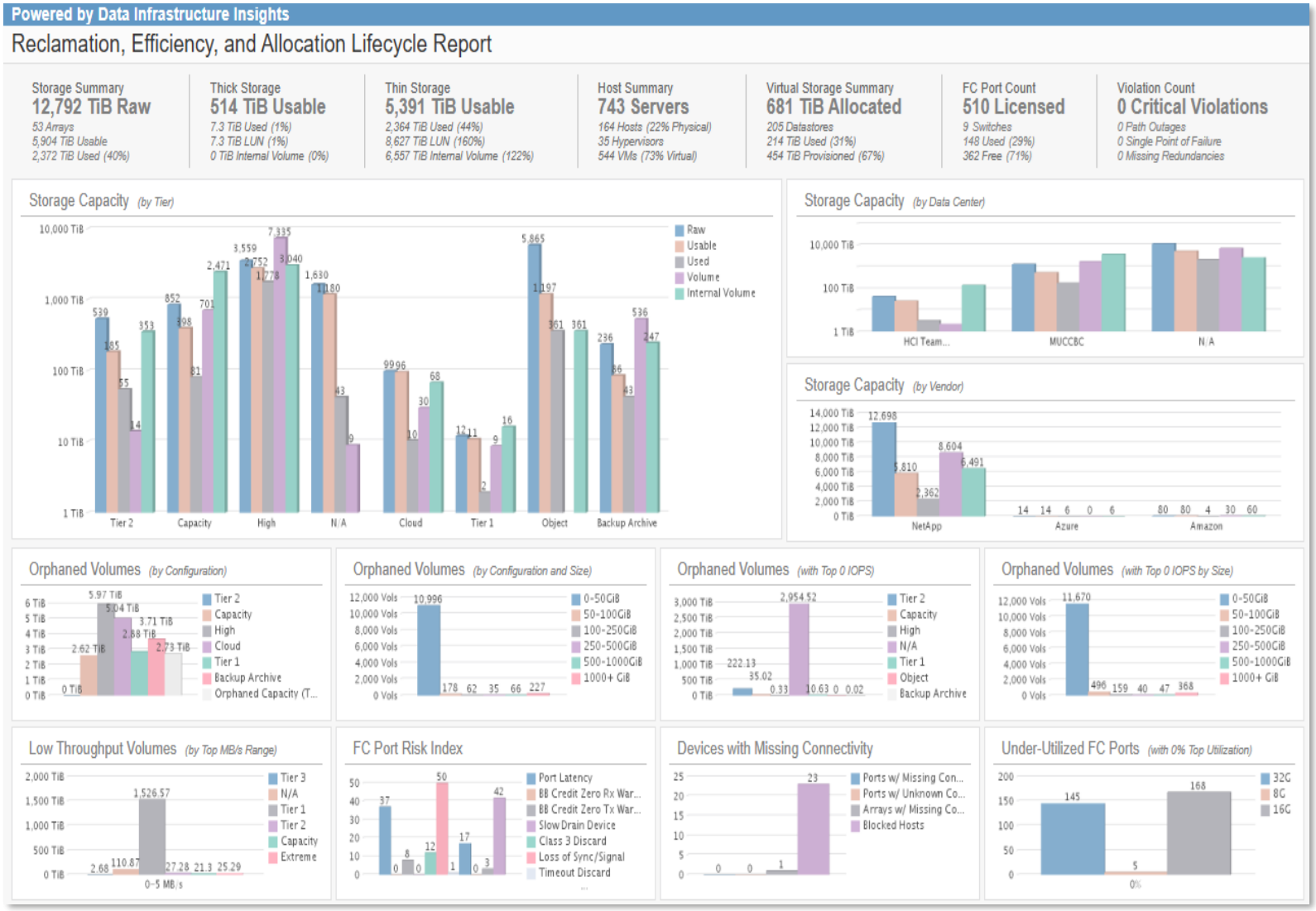
Prerequisites: Data Infrastructure Insights (DII) reporting enabled. Data Center annotations must be deployed before running this report.

Report XML: 3.12 Weekly Storage Consumption

3.12 Weekly Storage Consumption Definitions

Metric/Attribute	Description
Data Center	DII configured annotation. Defines the location of the device
Array	Name of the storage device discovered and monitored by DII
Raw (TiB)	Pre-RAID Raw Capacity in Tebibytes of all disks as reported by the storage device monitored by DII and contained in the Storage and Storage Pool Capacity Fact table. Represented as: capacity * rawToUsableRatio
Usable (TiB)	Usable capacity allocated for a storage-pool as reported by the storage-array in Tebibytes (Base 2 units)
Used (TiB)	Used capacity in Tebibytes as reported by the storage pool or aggregate. If Thin Provisioned, then Used = Written. If Thick Provisioned then Used = Allocated
Flexvol (TiB)	Total allocated capacity in Tebibytes of internal volumes (NAS/Flexvol) on this storage pool /aggregate
Volume (TiB)	Volume Allocated capacity in Tebibytes as reported by the storage pool or aggregate
Used (%)	Used (TiB) / Usable (TiB)
Free (TiB)	Usable (TiB) - Used (TiB)
Avg Node (%)	Node CPU Utilization shows the percentage of time that one or more CPUs were busy. In DII, this is based on the higher of CPU, WAFL_EX and Kahuna Processor Domain metrics. Details are as follows: • System – avg_processor_busy, cpu_elapsed_time1 • WAFL – total_cp_msecs, cp_phase_times.P2_FLUSH • Processor – domain_busy, processor_elapsed_time Overall node utilization then is displayed as the higher of the 3 (system, WAFL or processor domains) which all indicate a controller's ability (utilization) to process read/write requests
Peak Node (%)	Max CPU utilization for the collection period
Avg Disk (%)	The percentage % of post-cache service time used for requests out of the available sample time. This metric indicates what portion of the time the disk is busy servicing requests
Peak Disk (%)	Max Disk Busy % for the collection period
Date	Full Date field available in the DWH Date Dimension table

3.14 Reclamation, Efficiency, and Allocation Life Cycle Report – Physical Infrastructure



Description: This report shows storage and compute capacity and performance distribution by Data Center and Tier, Orphaned capacity by configuration and performance, SAN anomalies and compute reclaimation candidates.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.
Data Center and Tier annotations must be deployed before running this report.

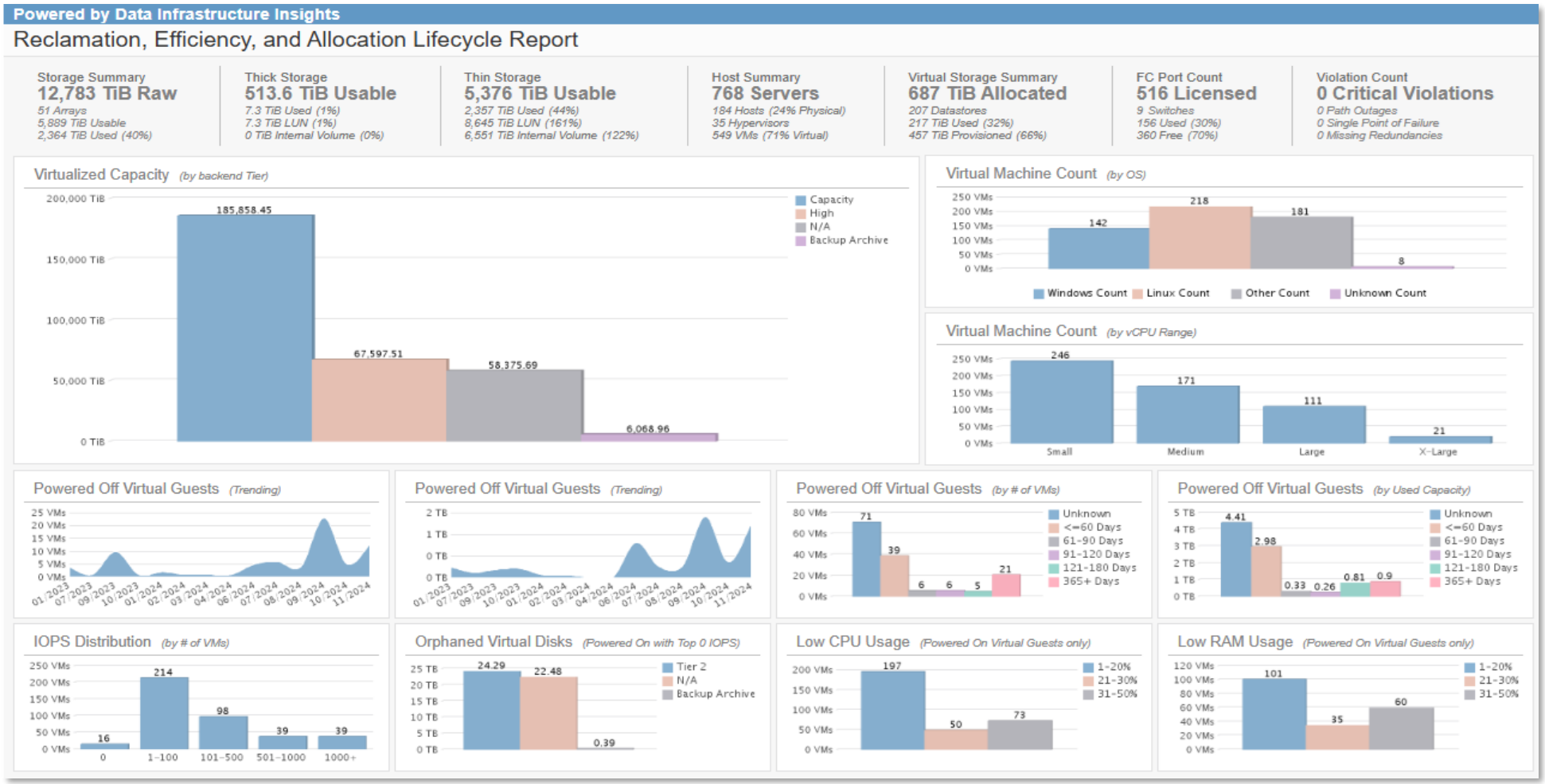
Report XML: 3.14 Reclamation-Efficiency and Allocation Lifecycle Report

3.14 Reclamation, Efficiency, and Allocation Life Cycle Report – Physical Definitions

Metric/Attribute	Description
Data Center	DII configured annotation. Defines the location of the device
Tier Name	DII configured annotation. Defines tiers of storage based on disk type, disk speed, etc.
TiB Raw	Pre-RAID Raw Capacity in TiB of all disks as reported by the storage device monitored by DII and contained in the Storage and Storage Pool Capacity Fact table. Represented as: capacity * rawToUsableRatio
TiB Usable	Usable capacity allocated for a storage-pool as reported by the storage-array in Tebibytes (Base 2 units)
TiB Used	Used capacity in Tebibytes as reported by the storage pool or aggregate. If Thin Provisioned, then Used = Written. If Thick Provisioned then Used = Allocated or 100%
TiB LUN or Volume	Provisioned capacity of all block/SAN volumes on this storage pool in TiB
TiB Internal Volume	Total allocated capacity of internal volumes (NAS/Flexvol) on this storage pool in TiB
Thick Storage	All capacity metrics include thinProvisioningSupported = 0
Thin Storage	All capacity metrics include thinProvisioningSupported = 1
Datastore TiB Allocated	Amount of capacity in Gibibytes allocated to the datastore
Datastore TiB Used	The amount of data-store capacity being used (vm_capacity_fact.ActualMB/1024)
Datastore TiB Provisioned	The amount of data-store capacity provisioned (vm_capacity_fact.provisionedMB/1024)
Ports Used	Total number of used ports associated with the SAN switch discovered by DII
Ports Free	Total number of free ports
Violation Count	Not currently supported in DII
Raw	Pre-RAID Raw Capacity in TiB of all disks as reported by the storage device monitored by DII and contained in the Storage and Storage Pool Capacity Fact table. Represented as: capacity * rawToUsableRatio
Usable	Usable capacity allocated for a storage-pool as reported by the storage-array in Tebibytes (Base 2 units)
Used	Used capacity in Tebibytes as reported by the storage pool or aggregate. If Thin Provisioned, then Used = Written. If Thick Provisioned then Used = Allocated or 100%
Volume	Provisioned capacity of all block/SAN volumes on this storage pool in TiB
Internal Volume	Total allocated capacity of internal volumes (NAS/Flexvol) on this storage pool in TiB
Orphaned (TiB)	Amount of capacity in Tebibytes associated with inactive volumes from the volume_capacity_fact table (orphanedCapacityMB/1024/1024)
Capacity Range	WHEN orphanedGiB BETWEEN 0 AND 50 THEN '0-50GiB' WHEN orphanedGiB BETWEEN 50 AND 100 THEN '50-100GiB' WHEN orphanedGiB BETWEEN 100 AND 250 THEN '100-250GiB' WHEN orphanedGiB BETWEEN 250 AND 500 THEN '250-500GiB' WHEN orphanedGiB BETWEEN 500 AND 1000 THEN '500-1000GiB' ELSE '1000+ GiB'
Service Level	DII configured annotation. DII configured annotation. Defines Service Levels based on IO Density (IOPS/TiB)
Capacity (TiB)	Same as Usable
Throughput Range	WHEN throughputMax BETWEEN 0 AND 5 THEN '0-5 MB/s' WHEN throughputMax BETWEEN 5 AND 10 THEN '5-10 MB/s' WHEN throughputMax BETWEEN 10 AND 25 THEN '10-25 MB/s'

	WHEN throughputMax BETWEEN 25 AND 50 THEN '25-50 MB/s' WHEN throughputMax BETWEEN 50 AND 100 THEN '50-100 MB/s' ELSE '100+ MB/s'
FC Port Risk Index	
Port Latency	FC Switch Port latency as measured by bbCreditZeroMsTx
BB Credit Zero Rx Warning	BB Credits Zero Rx > 1,000,000 that will begin to affect slow drain *SUM(IF(bbCreditZeroRx > 1000000, 1, 0))*
BB Credit Zero Tx Warning	BB Credits Zero Tx > 1,000,000 that will begin to affect slow drain *SUM(IF(bbCreditZeroRx > 1000000, 1, 0))*
Slow Drain Device	"Slow drain" refers to a situation where a connected device, like a server or storage array, is unable to receive data at a fast enough rate, causing a backlog of traffic and congestion on the network due to its inability to clear the incoming data quickly enough. Slow drain metric: *SUM(IF(bbCreditZeroRx > 1000000 AND bbCreditZeroMsTx > 0, 1, 0))*
Class 3 Discard	A type of frame discard that occurs on a Fibre Channel network switch, typically due to a timeout issue where a frame could not be delivered to its intended destination within a specified time period
Loss of Sync/Signal	Indicates a disruption in the physical connection between the switch and another device *SUM(IF(signalLossCount > 0 OR syncLossCount > 0, 1, 0))*
Timeout Discard	A situation where a Storage Area Network (SAN) switch drops a data frame because it has exceeded a predefined time limit waiting for a response *SUM(IF(portErrorsTimeoutDiscardTx > 0, 1, 0))*
Ports w/ Missing Connectivity	Total number of ports on a Storage Area Network (SAN) switch are not able to communicate with connected devices
Ports w/ Unknown Connectivity	Total number of ports on a switch within a Storage Area Network (SAN) that are unable to establish a connection with a specific port, likely due to a faulty cable, incorrect configuration, or a problem with the connected device, leaving the switch with no information about that port's status or functionality
Arrays w/ Missing Connectivity	Total number of array ports that are not able to communicate to a SAN switch
Blocked Hosts	Total number of blocked hosts. A host that has been blocked from accessing the network due to connection-rate filtering. This happens when a port is configured to block high connection rates, and a host triggers that filter
Count of FC Ports	Total number of FC ports
Port Speed	Total number of FC ports for each port speed metric e.g. 32 G, 16 G, 8 G
Utilization Range	WHEN ROUND(GREATEST(MAX(rxMax), MAX(txMax))/100,4) = 0 THEN '0%' WHEN ROUND(GREATEST(MAX(rxMax), MAX(txMax))/100,4) BETWEEN 0 AND .25 THEN '1-25%' WHEN ROUND(GREATEST(MAX(rxMax), MAX(txMax))/100,4) BETWEEN .25 AND .50 THEN '25-50%' WHEN ROUND(GREATEST(MAX(.rxMax), MAX(txMax))/100,4) BETWEEN .50 AND .75 THEN '50-75%' ELSE '75-100%'

3.14 Reclamation, Efficiency, and Allocation Life Cycle Report – Virtual Infrastructure



Report XML: 3.14 Reclamation-Efficiency and Allocation Lifecycle Report

3.16 Volume Capacity Growth

Powered by Data Infrastructure Insights

Volume Capacity Growth

Total Volumes at Risk	Capacity at Risk	Volumes Less than 50 Days to Full	NAS Volumes at Risk	SAN Volumes at Risk
26	117 GiB	3	17	1

Volumes by Growth Rate *(last 12 months history using linear regression)*

Array	Vendor	Family	Model	Pool/Aggregate	Volume	Used (GiB)	Allocated (GiB)	Growth Rate per/mo
rtp-sa-fas8200-infra	NetApp	FAS8000	FAS8200	rtp-sa-fas8200-1b:rtp_sa_fas8200_1b_SAS_1	rtp-sa-fas8200-infra:ESX-NFS:ProdSelectPool2	9.20	28,672.00	356.32 GiB
rtp-sa-fas8200-infra	NetApp	FAS8000	FAS8200	rtp-sa-fas8200-1b:rtp_sa_fas8200_1b_SAS_1	rtp-sa-fas8200-infra:ESX-NFS:ProdSelectPool1	9.47	28,672.00	230.66 GiB
osa4	NetApp	AFF	AFF-A220	osa4-02:aggr1_osa4_02	osa4:zeus:mn_ds2	79.40	102,400.00	75.94 GiB
N/A	N/A	N/A	N/A	rtp-sa-select01-2:aggr_n2_01	rtp-sa-select01:sa-db-prod:cxscdb1_oraredo1	28.92	1,024.00	43.97 GiB
osa4	NetApp	AFF	AFF-A220	osa4-01:aggr1_osa4_01	osa4:zeus:otani	0.03	10.00	25.46 GiB
grenada	NetApp	AFF	AFF-A800	grenada-03:aggr1_grenada_03	grenada:svm-snapcenter:hyperv_csv01	814.40	1,024.00	21.53 GiB
grenada	NetApp	AFF	AFF-A800	grenada-03:aggr1_grenada_03	grenada:svm-credativ:credativ_proxmox_02	77.01	1,077.89	14.93 GiB
A250-41-42-43	NetApp	AFF	AFF-A250	A250-42:astra_aggr1	A250-41-42-43:msaravan_iscsi_vserver:data_vol4	2.68	200.00	11.32 GiB
rtp-sa-cl01	NetApp	FAS8000	FAS8020	rtp-sa-cl01-06:aggr_cl01_06_SSD	rtp-sa-cl01:OpenStack_SVM:cinder_vol	0.02	1,024.00	9.89 GiB
grenada	NetApp	AFF	AFF-A800	grenada-04:aggr1_grenada_04	grenada:svm-sap01:D02_sapdb2	28.87	150.00	8.5 GiB
rtp-sa-fas8200-infra	NetApp	FAS8000	FAS8200	rtp-sa-fas8200-1b:rtp_sa_fas8200_1b_SAS_1	rtp-sa-fas8200-infra:ESX-FC:oradata_vmfs_ds1	2.65	2,060.54	8.35 GiB
N/A	N/A	N/A	N/A	rtp-sa-select01-1:aggr_n1_01	rtp-sa-select01:sa-db-prod:oradb_oraarchive	47.37	60.00	6.99 GiB
trinidad	NetApp	FAS2000	FAS2750	trinidad-01:aggr1_trinidad_01	trinidad:svm_alexz_astra_demo:del_vol_SVM_TNT_dbarch_001	0.03	65.00	6.88 GiB
rtp-sa-cl01	NetApp	FAS8000	FAS8020	rtp-sa-cl01-06:aggr_cl01_06_SSD	rtp-sa-cl01:nj-demo-01:V01_log_mnt00001	0.01	41.05	6.35 GiB
trinidad	NetApp	FAS2000	FAS2750	trinidad-01:aggr1_trinidad_01	trinidad:svm_alexz_astra_demo:del_vol_SVM_TNT_dbdata_001	0.03	228.75	6.05 GiB
trinidad	NetApp	FAS2000	FAS2750	trinidad-01:aggr1_trinidad_01	trinidad:svm_alexz_astra_demo:del_vol_SVM_TNT_exe_001	0.03	200.00	6.05 GiB
trinidad	NetApp	FAS2000	FAS2750	trinidad-01:aggr1_trinidad_01	trinidad:svm_alexz_astra_demo:del_del_del_vol_SVM_TNT_dbdata_001	0.04	237.50	5.63 GiB
grenada	NetApp	AFF	AFF-A800	grenada-03:aggr1_grenada_03	grenada:svm-snapcenter:hyperv_csv03	141.60	10,240.00	5.12 GiB
rtp-sa-cl01	NetApp	FAS8000	FAS8020	rtp-sa-cl01-06:aggr_cl01_06_SSD	rtp-sa-cl01:nj-demo-01:V01_data_mnt00001	0.02	41.05	4.73 GiB
osa4	NetApp	AFF	AFF-A220	osa4-01:aggr1_osa4_01	osa4:Kang_Dataops_test:Kang_Dataops_copy	0.00	105.26	4.35 GiB

Description: This report shows the capacity used growth rate per month in Gibybytes for NetApp Flexvols.

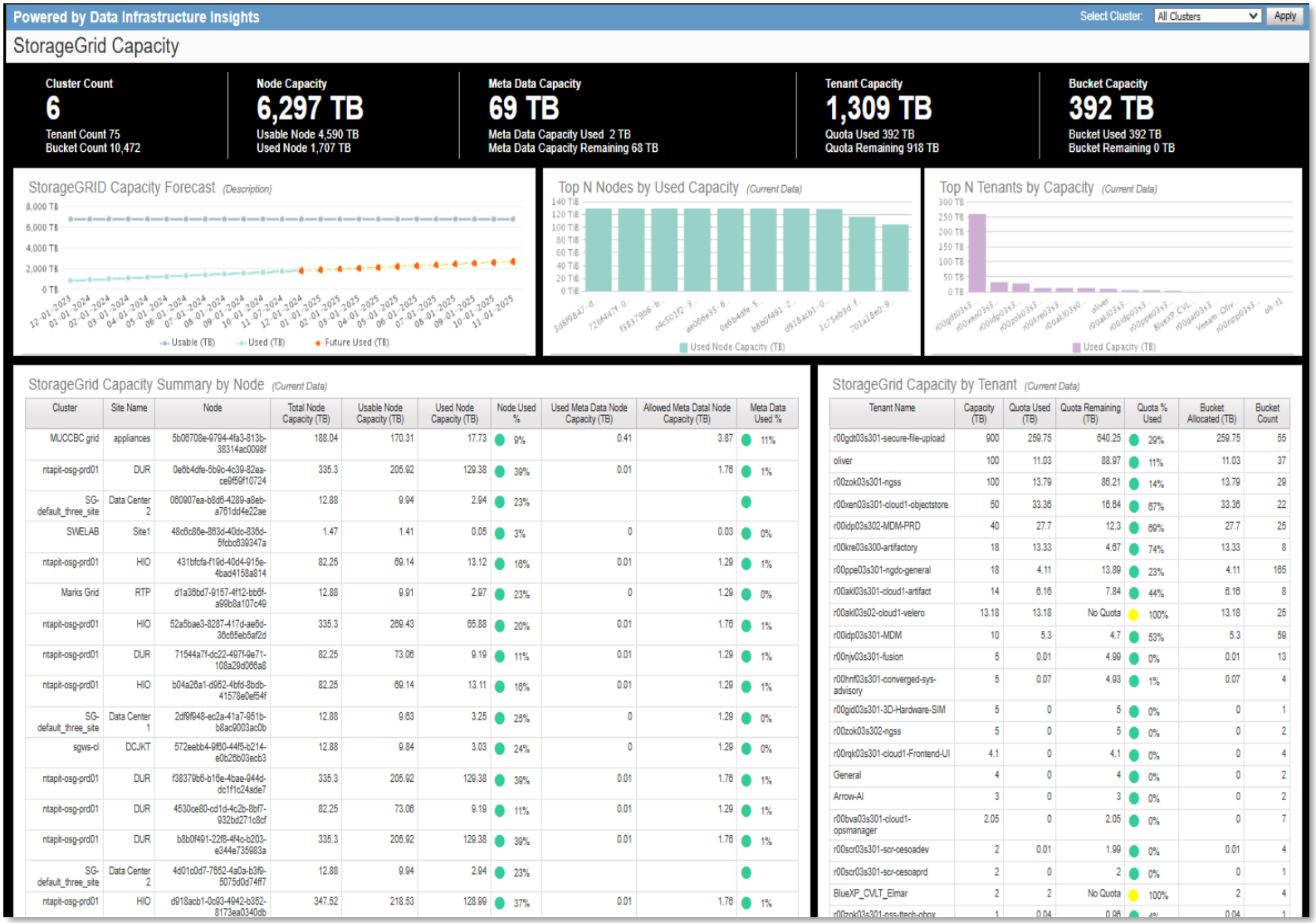
Prerequisites: Data Infrastructure Insights (DII) reporting enabled.
Data Center annotations must be deployed before running this report.

Report XML: 3.16 Volume Capacity Growth

3.16 Volume Capacity Growth Definitions

Metric/Attribute	Description
Array	Name of the storage device discovered and monitored by DII
Vendor	Manufacturer of the storage device
Family	Family of the storage device
Model	Model name of the storage device
Pool/Aggregate	Name of the storage pool or aggregate associated with the storage device
Volume	Name of the volume associated with the storage pool or aggregate
Used (GiB)	Total used capacity in Gibibytes of internal volumes (NAS/Flexvol) on this storage pool /aggregate
Allocated (GiB)	Total allocated capacity in Gibibytes of internal volumes (NAS/Flexvol) on this storage pool /aggregate
Growth Rate per/mo	Linear regression result of volume used capacity over a 12 month historical period

3.17 StorageGRID Capacity with Forecast



Description: This report shows StorageGRID specific capacity metrics for Node, Tenant and Bucket. Linear regression forecast along with Top N nodes by Used Capacity are visible. StorageGRID uses BASE-10 capacity units.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 3.17 StorageGRID Capacity with Forecast

3.17 StorageGRID Capacity Definitions

Metric/Attribute	Description
Cluster	Name of the storageGrid cluster discovered and monitored by DII
Site Name	Refers to the unique identifier given to a specific location within a StorageGrid system
Node	Name of the StorageGrid node. StorageGrid Nodes manage and store object data and metadata. Each StorageGRID system must have at least three Storage Nodes. If you have multiple sites, each site within your StorageGRID system must also have three Storage Nodes
Total Node Capacity (TB)	Total capacity" refers to the entire raw storage space in Terabytes available on all nodes, while "usable capacity" is the actual amount of space that can be used to store data. This data is available in the storage_node_capacity_fact table
Usable Node Capacity (TB)	The total usable space in Terabytes (Base-10) for a Storage Node is calculated by adding together the available space on all object stores within the node
Used Node Capacity (TB)	The amount of the Total usable space in Terabytes that has been used for object data
Node Used %	Used Node Capacity (TB) / Total Node Capacity (TB)
Used Meta Data Node Capacity (TB)	The bytes of the allowed metadata space in Terabytes that have been used on this Storage Node
Allowed Meta Data Node Capacity (TB)	Capacity in Terabytes reserved for Node Meta Data. Each Storage Node's actual reserved space for metadata is subdivided into the space available for object metadata (the *allowed metadata space*) and the space required for essential database operations (such as compaction and repair) and future hardware and software upgrades. The allowed metadata space governs overall object capacity
Meta Data Used %	Used Meta Data Node Capacity (TB) / Allowed Meta Data Node Capacity (TB)
Tenant Name	Name of the StorageGrid tenant associated with the node. A tenant is a separate, isolated space within a NetApp StorageGRID system where a user or organization can store and retrieve data. In the DII model, the StorageGrid Tenant is represented as a storage pool.
Capacity (TB)	Usable capacity allocated for the tenant in Terabytes (Base 10 units)
Quota Used (TB)	Used capacity in Terabytes as reported by the tenant
Quota Remaining (TB)	IF(Capacity (TB) = Quota Used (TB)) THEN (null) ELSE (Capacity (TB) - Quota Used (TB))
Quota % Used	Quota Used (TB) / Capacity (TB)
Bucket	A "StorageGRID bucket" refers to a container within the NetApp StorageGRID object storage system. In the DII model, a bucket is the same as an internal volume
Bucket Allocated (TB)	Total Allocated capacity in Terabytes (Base-10) e.g. internal volume AllocatedCapacityMB/1024/1024 * 1.099511627776
Bucket Count	Total number of buckets associated with the tenant
Usable (TB)	Usable capacity allocated for the tenant in Terabytes (Base 10 units)
Used (TB)	Used capacity in Terabytes as reported by the tenant
Future Used (TB)	Customized linear regression based future capacity growth for 12 months

3.18 SVM Capacity

Powered by Data Infrastructure Insights

SVM Capacity

SVM Capacity Detail *(Current Data)*

Cluster	Family	SVM	Allocated Capacity (GiB)	Used Capacity (GiB)	Used %
umeng-aff300-01-02	AFF	xyz	6,452.20	4,848.55	75%
grenada	AFF	svm-grenada-atg	5,762.25	3,838.38	67%
jamaica	AFF	cbauer-jamaica	4.88	3.18	65%
gemini	AFF	paul-iscsi	48.02	31.22	65%
osa4	AFF	Kang_Dataops_test	2,149.93	1,335.51	62%
A250-41-42-43	AFF	A250-42	151.29	87.62	58%
osa4	AFF	osa4-01	151.29	85.86	57%
osa4	AFF	osa4-02	151.29	84.57	56%
Infra-OTS	FAS	paul-cifs	21.00	11.31	54%
grenada	AFF	grenada-03	151.29	74.70	49%
A250-41-42-43	AFF	A250-43	151.29	73.79	49%
grenada	AFF	grenada-04	151.29	72.69	48%
bahamas	AFF	bahamas-02	151.29	71.40	47%
saba	FAS	saba-02	151.29	70.77	47%
saba	FAS	saba-01	151.29	70.20	46%
barbuda	AFF	DmoNAS_barbuda	1,078.89	493.82	46%
antigua	AFF	DmoNAS_antigua	1,078.89	489.62	45%
gemini	AFF	test_flexgroup	1,325.00	472.18	36%
grenada	AFF	svm-esx	283,181.55	91,335.84	32%
saba	FAS	cbc-san-iscsi8	201.00	60.62	30%
barbuda	AFF	barbuda-02	348.62	95.42	27%
barbuda	AFF	barbuda-01	348.62	89.58	26%
gemini	AFF	test_snap_dr	111.00	28.46	26%
grenada	AFF	svm-grenada-nas	8,662.94	2,208.32	25%
antigua	AFF	antigua-01	348.62	87.96	25%
antigua	AFF	antigua-02	348.62	84.63	24%
bahamas	AFF	bahamas-01	151.29	35.11	23%
grenada	AFF	svm-kvm	31,260.64	7,245.41	23%
saba	FAS	cbc-san-fcp8	32,769.00	7,487.34	23%
grenada	AFF	svm-snapcenter	46,122.03	9,989.65	22%
A250-41-42-43	AFF	astra_ci_vc_esxi_24_75_data	16,415.34	3,454.76	21%
jamaica	AFF	ransomwareDEMO01	638.05	127.61	20%
saba	FAS	cbc-san-nvme8	32,769.00	6,428.61	20%
A250-41-42-43	AFF	msaravan_iscsi_vserver	1,302.60	252.13	19%
umeng-aff300-01-02	AFF	osc	13,499.66	2,530.66	19%
grenada	AFF	svm_nse_demo	1,723.00	256.95	15%
gemini	AFF	gemini-04	348.62	50.50	14%
A250-41-42-43	AFF	vs_test	3.20	0.46	14%
grenada	AFF	svm-grenada-san	14,741.26	2,039.11	14%
gemini	AFF	gemini-03	348.62	47.51	14%
grenada	AFF	svm-credativ	13,967.28	1,770.58	13%

Description: This report shows allocated and used capacity for NetApp Storage Virtual Machines.

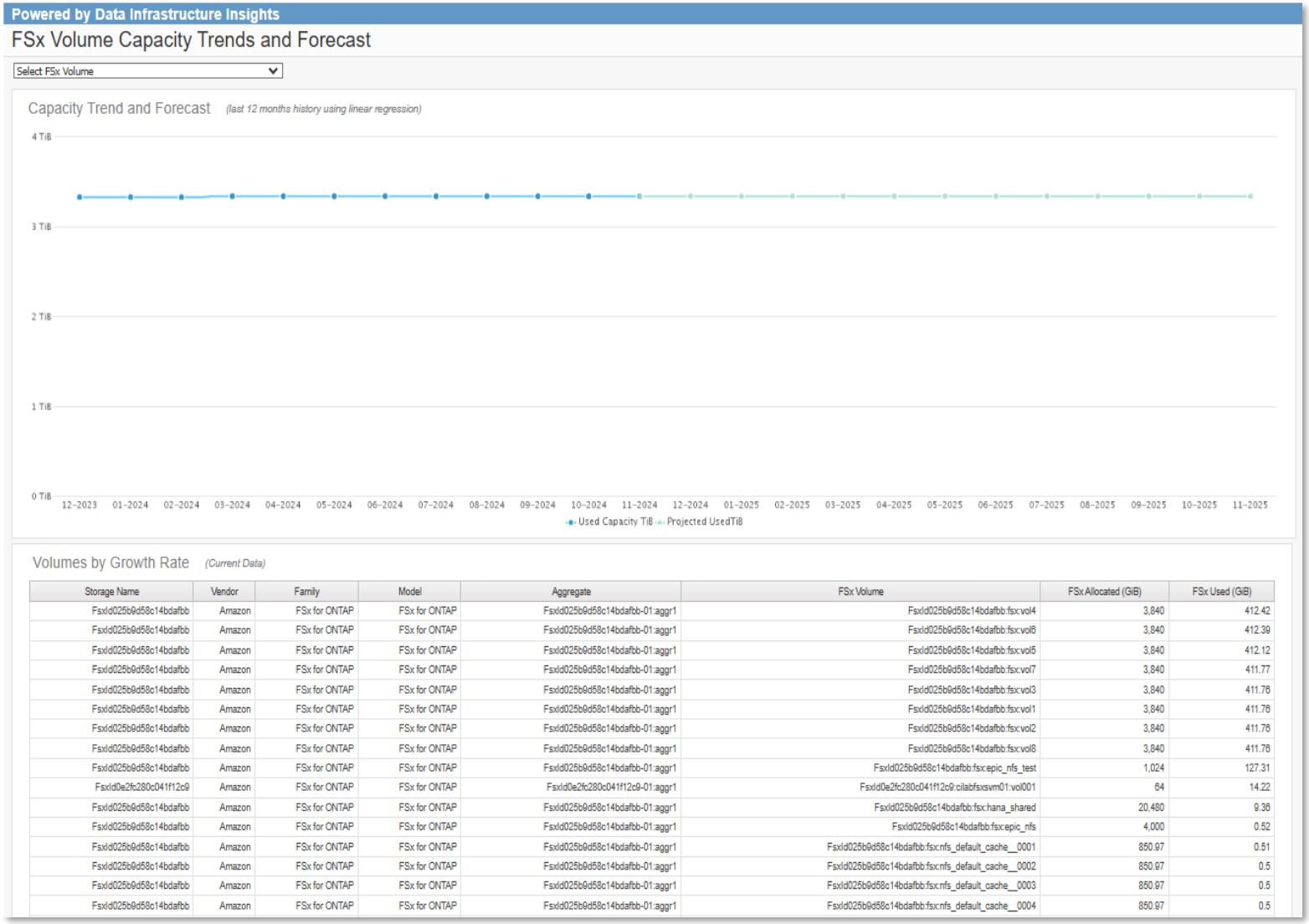
Prerequisites: Data Infrastructure Insights (DII) reporting enabled.
Data Center annotations must be deployed before running this report.

Report XML: 3.18 SVM Capacity

3.18 SVM Capacity Definitions

Metric/Attribute	Description
Cluster	Name of the CDOT cluster discovered and monitored by DII
Family	Family name of the CDOT cluster
SVM	Storage Virtual Machine associated with the CDOT cluster
Allocated Capacity (GiB)	Internal Volume (Flexvol) allocated capacity in Gibibytes (BASE-2) associated with the SVM
Used Capacity (GiB)	Internal Volume used capacity in Gibibytes
Used %	Used Capacity (GiB) / Allocated Capacity (GiB)

3.19 FSx Volume Capacity Trends and Forecast



Storage Name	Vendor	Family	Model	Aggregate	FSx Volume	FSx Allocated (GiB)	FSx Used (GiB)
Fsxid025b9d58c14bdafbb	Amazon	FSx for ONTAP	FSx for ONTAP	Fsxid025b9d58c14bdafbb-01:aggr1	Fsxid025b9d58c14bdafbb:fsx:vol4	3,840	412.42
Fsxid025b9d58c14bdafbb	Amazon	FSx for ONTAP	FSx for ONTAP	Fsxid025b9d58c14bdafbb-01:aggr1	Fsxid025b9d58c14bdafbb:fsx:vol6	3,840	412.39
Fsxid025b9d58c14bdafbb	Amazon	FSx for ONTAP	FSx for ONTAP	Fsxid025b9d58c14bdafbb-01:aggr1	Fsxid025b9d58c14bdafbb:fsx:vol5	3,840	412.12
Fsxid025b9d58c14bdafbb	Amazon	FSx for ONTAP	FSx for ONTAP	Fsxid025b9d58c14bdafbb-01:aggr1	Fsxid025b9d58c14bdafbb:fsx:vol7	3,840	411.77
Fsxid025b9d58c14bdafbb	Amazon	FSx for ONTAP	FSx for ONTAP	Fsxid025b9d58c14bdafbb-01:aggr1	Fsxid025b9d58c14bdafbb:fsx:vol3	3,840	411.76
Fsxid025b9d58c14bdafbb	Amazon	FSx for ONTAP	FSx for ONTAP	Fsxid025b9d58c14bdafbb-01:aggr1	Fsxid025b9d58c14bdafbb:fsx:vol1	3,840	411.76
Fsxid025b9d58c14bdafbb	Amazon	FSx for ONTAP	FSx for ONTAP	Fsxid025b9d58c14bdafbb-01:aggr1	Fsxid025b9d58c14bdafbb:fsx:vol2	3,840	411.76
Fsxid025b9d58c14bdafbb	Amazon	FSx for ONTAP	FSx for ONTAP	Fsxid025b9d58c14bdafbb-01:aggr1	Fsxid025b9d58c14bdafbb:fsx:vol8	3,840	411.76
Fsxid025b9d58c14bdafbb	Amazon	FSx for ONTAP	FSx for ONTAP	Fsxid025b9d58c14bdafbb-01:aggr1	Fsxid025b9d58c14bdafbb:fsx:epic_nfs_test	1,024	127.31
Fsxid0e2fc280c041f12c9	Amazon	FSx for ONTAP	FSx for ONTAP	Fsxid0e2fc280c041f12c9-01:aggr1	Fsxid0e2fc280c041f12c9:cilabfsxsvm01:vol001	64	14.22
Fsxid025b9d58c14bdafbb	Amazon	FSx for ONTAP	FSx for ONTAP	Fsxid025b9d58c14bdafbb-01:aggr1	Fsxid025b9d58c14bdafbb:fsx:hana_shared	20,480	9.36
Fsxid025b9d58c14bdafbb	Amazon	FSx for ONTAP	FSx for ONTAP	Fsxid025b9d58c14bdafbb-01:aggr1	Fsxid025b9d58c14bdafbb:fsx:epic_nfs	4,000	0.52
Fsxid025b9d58c14bdafbb	Amazon	FSx for ONTAP	FSx for ONTAP	Fsxid025b9d58c14bdafbb-01:aggr1	Fsxid025b9d58c14bdafbb:fsx:nfs_default_cache__0001	850.97	0.51
Fsxid025b9d58c14bdafbb	Amazon	FSx for ONTAP	FSx for ONTAP	Fsxid025b9d58c14bdafbb-01:aggr1	Fsxid025b9d58c14bdafbb:fsx:nfs_default_cache__0002	850.97	0.5
Fsxid025b9d58c14bdafbb	Amazon	FSx for ONTAP	FSx for ONTAP	Fsxid025b9d58c14bdafbb-01:aggr1	Fsxid025b9d58c14bdafbb:fsx:nfs_default_cache__0003	850.97	0.5
Fsxid025b9d58c14bdafbb	Amazon	FSx for ONTAP	FSx for ONTAP	Fsxid025b9d58c14bdafbb-01:aggr1	Fsxid025b9d58c14bdafbb:fsx:nfs_default_cache__0004	850.97	0.5

Description: This report shows capacity trending and forecast for FSx workloads in the cloud. Detailed volume data is displayed at bottom. You can select individual FSx volumes after run-time.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled. FSx Data Collectors configured in DII.

Report XML: 3.19 FSx Volume Capacity Trends and Forecast

3.19 FSx Volume Capacity Trends and Forecast Definitions

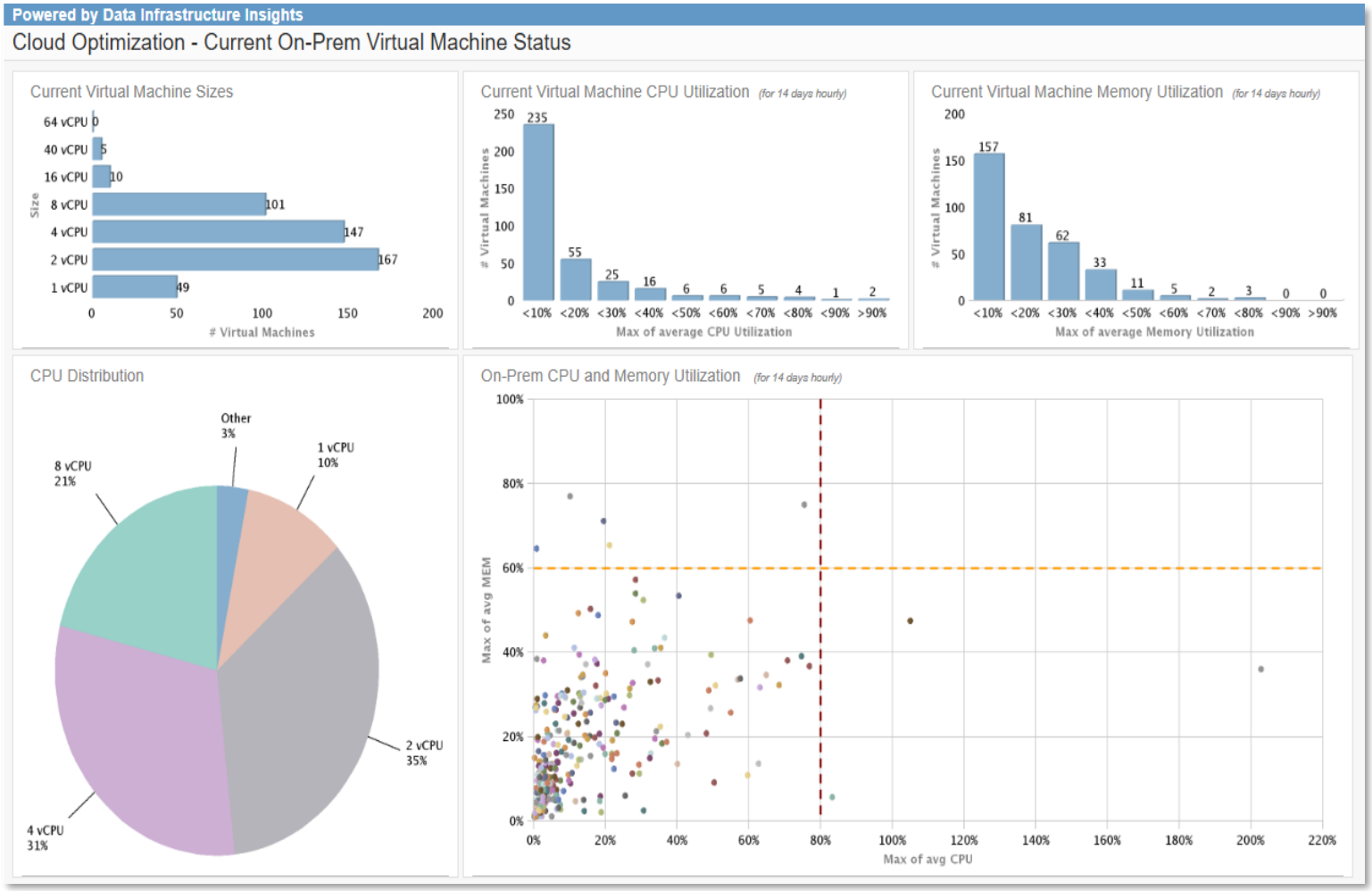
Metric/Attribute	Description
Storage Name	Name of the storage device discovered and monitored by DII
Vendor	Manufacturer of the storage device
Family	Family name of the storage device
Model	Model name of the storage device
Aggregate	Aggregate name associated with the storage device
FSx Volume	Name of the FSx volume associated with the aggregate
FSx Allocated (GiB)	Allocated capacity in Gibibytes of FSx volumes on this aggregate. Capacity is derived from the internal_volume_capacity_fact with a constraint of Model LIKE '%FSx%'
FSx Used (GiB)	Used capacity in Gibibytes of FSx volumes on this aggregate.
Used Capacity TiB	Same as FSx Used (GiB)
Projected Used TiB	Customized linear regression formula using internal_volume_capacity_fact.usedCapacity projected 12 months
Date	Full Date field available in the DWH Date Dimension table

Cloud Overview

Data Infrastructure Insights provides robust visibility into Cloud specific business use cases. Use this catalog section to determine which area of focus you need to address whether you are actively managing Cloud resources or intent on migrating there soon.

- ❑ Compute Optimization / Cloud Migration
- ❑ Cloud Compute Capacity and Performance by Instance
- ❑ Cloud Infrastructure
- ❑ Virtual Machine Candidates for Re-sizing or Re-Tiering
- ❑ Cloud Consumption
- ❑ Cloud Performance
- ❑ Cloud Ready Analysis
- ❑ Cloud Ready Analysis – Reclamation, Re-Sizing, Migration
- ❑ Compute Infrastructure Summary
- ❑ Cloud Monthly Comparison
- ❑ Idle Cloud Instances
- ❑ Virtual Instances Powered Down
- ❑ Cloud Reclamation and Optimization Cost Savings

4.0 Cloud Optimization – Virtual Machine Analysis



Description: This report shows how you can optimize your on-prem or cloud resources for cost savings and efficiency. It is available for AWS, AZURE, GCP and GOVCloud.

This current page shows what you're OnPREM virtual machine infrastructure looks like and the likely candidates for migration to the cloud.

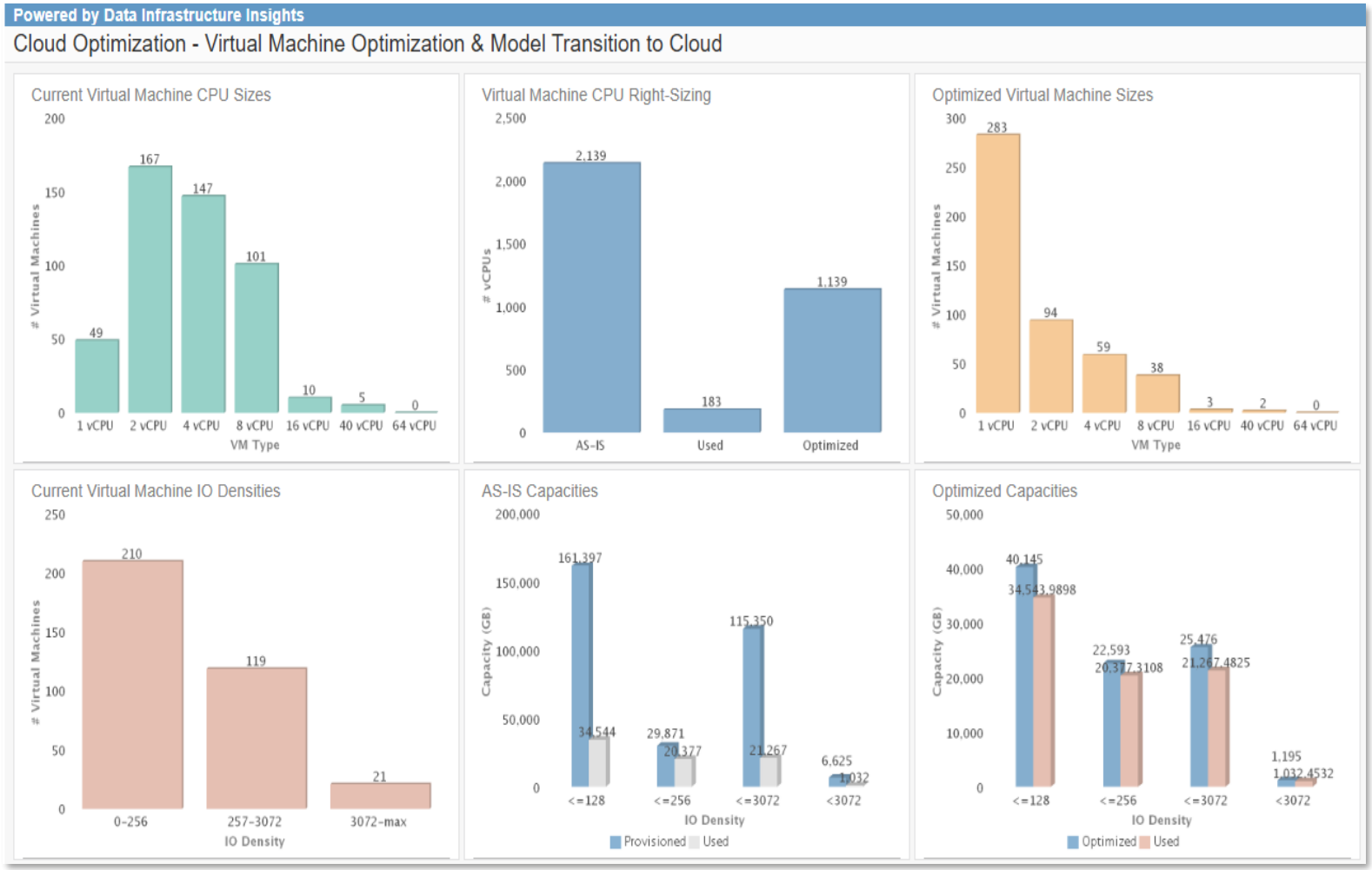
Report XML for AWS: 4.0 Cloud Optimization - AWS

Report XML for AZURE: 4.0 Cloud Optimization - AZURE

Report XML for GCP: 4.0 Cloud Optimization - Google Cloud (GCP)

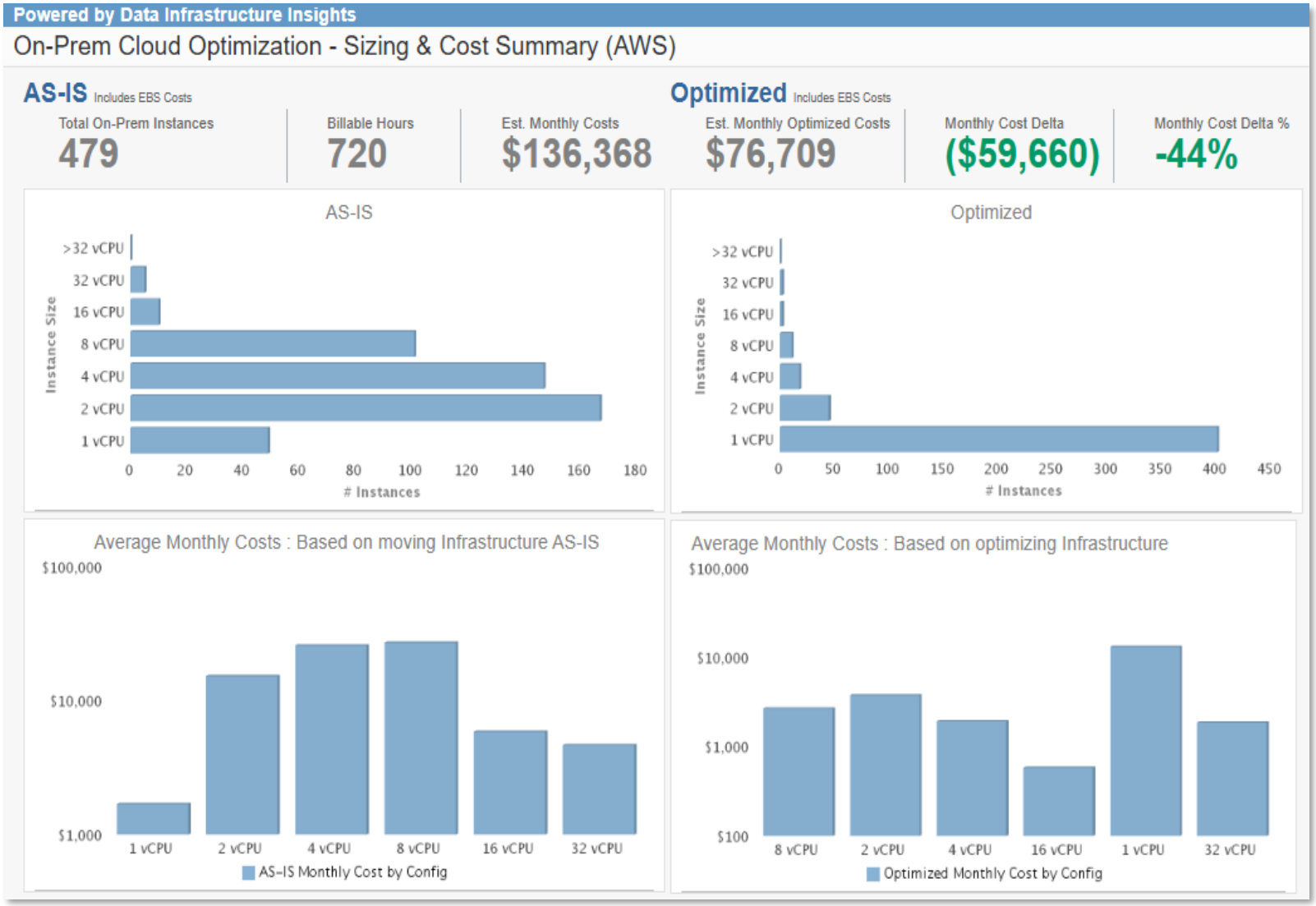
Report XML for GOVcloud: 4.0 Cloud Optimization - GOV Cloud

4.0 Cloud Optimization – Virtual Machine Optimization & Transition



Description: This page shows how virtual machines can be classified and right-sized before transitioning to the cloud. Preliminary optimization results are visible in the left-most charts.

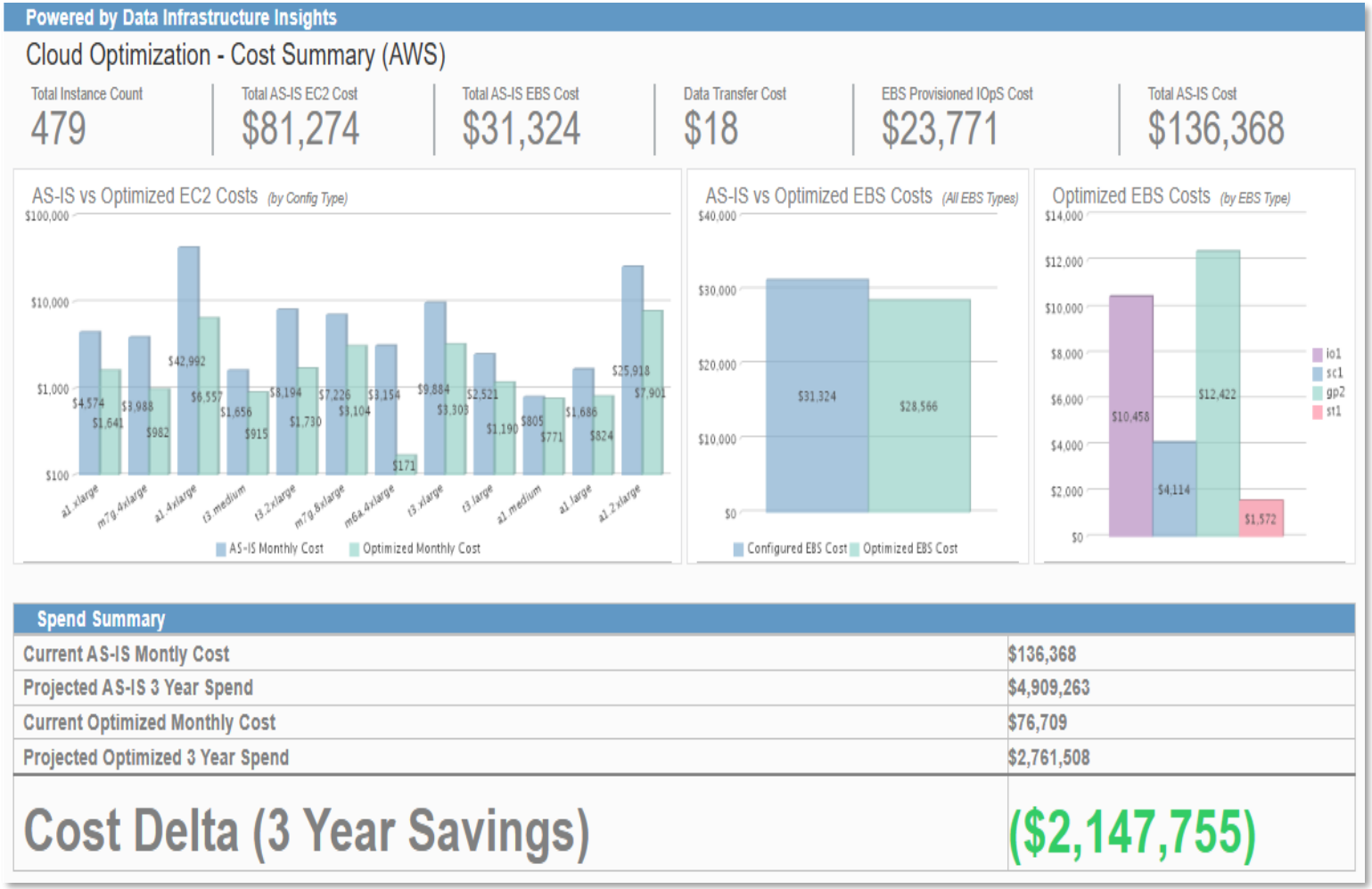
4.0 Cloud Optimization – On-Prem Cloud Analysis – Sizing and Costing Summary



Description: This page shows your AS-IS costs compared with optimization results. Significant cost savings is realized in almost all cases.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

4.0 Cloud Optimization – Cost Summary



Description: This page shows a breakdown of costs by EC2 type, EBS volumes and Data Transfer estimates as well as a 3 year savings total.

4.0 Cloud Optimization – Virtual Machine Details - On PREM

Powered by Data Infrastructure Insights

Cloud Optimization - Virtual Machine Details (AWS - On Prem)

Application	Instance	Type	Platform	Cores	Memory(GB)	Provisioned Capacity(GB)	Used Capacity(GB)	AS-IS Configured	Configured EBS	Configured EBS IOPS Cost	Configured EBS Cost	AS-IS Monthly Cost	Max IOPS	Max Throughput	Max of avg CPU	Max of avg MEM	Used Cores	Used Memory	IOPS 95th	IOD 95th	Monthly Data Transfer (GB)	Data Transfer Cost	Optimized Capacity	OptimizedEBS	OptimizedEBSCost	Optimized CPU	Optimized MEM(GB)	Proposed Config Type	Optimized Monthly Cost	Monthly Savings
N/A	au07ubuntu	On-Prem	Linux	2	16	1,144.08	61.41	a1.2xlarge	gp2	$6.05	$114.41	$258.41	93	4	0.19%	0.27%	0.37	4.39	4	67	4.07	$0.41	82	sc1	$2.05	1	7	a1.xlarge	$74.05	$184.3
N/A	rtp-sa-linux01	On-Prem	Linux	1	2	100.00	14.06	a1.medium	gp2	$1.13	$10.00	$31.60	17	1	0.04%	0.09%	0.04	0.18	3	219	0	$0.00	19	st1	$0.88	1	1	a1.medium	$22.46	$9.1
N/A	stjema-influx	On-Prem	Linux	1	2	118.42	17.26	a1.medium	gp2	$0.02	$11.84	$33.44	0	0	0%	0.01%	0	0.03	0	0	0	$0.00	24	sc1	$0.60	1	1	a1.medium	$22.20	$11.2
N/A	ohaensel-win80	On-Prem	Windows	4	12	224.00	106.82	t3.xlarge	gp2	$0.00	$22.40	$196.20	0	0	0%	0%	0	0	0	0	0	$0.00	143	sc1	$3.58	1	1	t3.micro	$17.98	$177.2
N/A	backuprestore-2012R2	On-Prem	Windows	4	16	124.35	58.06	t3.xlarge	gp2	$0.37	$12.44	$185.24	6	1	0%	0.02%	0.02	0.3	2	35	0	$0.00	78	sc1	$1.95	1	1	t3.micro	$18.35	$168.8
N/A	racn2	On-Prem	Linux	4	8	108.08	108.08	a1.xlarge	gp2	$18.79	$10.81	$82.81	289	35	0.27%	0.31%	1.07	2.51	172	1,629	0.21	$0.02	109	gp2	$10.90	2	4	a1.large	$46.90	$35.9
N/A	andrease_perf02	On-Prem	Windows	2	16	100.00	19.94	t3.xlarge	gp2	$2,505.06	$10.00	$182.80	38,539	150	0.51%	0.32%	1.01	5.14	7	359	0.01	$0.00	27	gp2	$2.70	2	8	t3.large	$81.90	$100.9
N/A	jumphost	On-Prem	Windows	2	4	40.00	37.19	t3.medium	gp2	$6.56	$4.00	$47.20	101	6	0.2%	0.3%	0.4	1.21	21	579	0.02	$0.00	41	gp2	$4.10	1	2	t3.small	$32.90	$14.3
N/A	kw_scw1	On-Prem	Windows	8	32	140.00	74.34	t3.2xlarge	gp2	$1.37	$14.00	$359.60	21	4	0.02%	0.05%	0.19	1.51	13	179	2.05	$0.20	100	st1	$4.50	1	3	t3.medium	$47.70	$311.9
N/A	johannew_linux	On-Prem	Linux	4	8	16.00	0.00	a1.xlarge	gp2	$0.00	$1.60	$73.60	0	0	0%	0.01%	0.01	0.08	0	0	0	$0.00	10	sc1	$0.25	1	1	a1.medium	$21.85	$51.7
N/A	grid-gateway01	On-Prem	Linux	8	24	100.43	34.29	a1.4xlarge	gp2	$0.29	$10.04	$305.24	4	0	0.02%	0.02%	0.19	0.59	3	90	0.02	$0.00	46	sc1	$1.15	1	1	a1.medium	$22.75	$282.4
N/A	jmike-sles11sp3	On-Prem	Linux	2	1	75.85	6.14	a1.large	gp2	$0.00	$7.58	$43.58	0	0	0%	0%	0	0	0	0	0	$0.00	10	sc1	$0.25	1	1	a1.medium	$21.85	$21.7
N/A	paul-win2022	On-Prem	Windows	2	8	98.13	98.13	t3.large	gp2	$46.57	$9.81	$89.01	716	9	0.05%	0.09%	0.09	0.72	3	31	0.01	$0.00	99	sc1	$2.48	1	2	t3.small	$31.28	$57.7
N/A	dummy-02	On-Prem	Other	4	16	2,315.64	2,195.79	a1.2xlarge	gp2	$83.87	$231.56	$375.56	1,290	29	0.13%	0.27%	0.51	4.31	404	188	2.96	$0.30	2,316	st1	$104.22	1	7	a1.xlarge	$178.22	$199.3
N/A	E-Series Web Proxy	On-Prem	Windows	2	4	60.00	39.92	t3.medium	gp2	$33.83	$6.00	$49.20	521	14	0.57%	0.34%	1.14	1.34	24	615	0.04	$0.00	54	gp2	$5.40	2	2	t3.small	$34.20	$15.0
N/A	Jorge-JumpHost	On-Prem	Windows	4	8	90.00	64.97	t3.xlarge	gp2	$91.33	$9.00	$181.80	1,405	91	0.17%	0.38%	0.68	3.06	28	442	0.68	$0.07	87	gp2	$8.70	2	5	t3.large	$87.90	$93.9
N/A	rtp-sa-otv10n01	On-Prem	Linux	12	24	248.00	62.47	a1.4xlarge	gp2	$30.35	$24.80	$320.00	467	52	0.28%	0.54%	3.39	12.95	467	7,666	0	$0.00	84	io1	$10.50	6	19	a1.4xlarge	$305.70	$14.3
N/A	amer-sa-liapenn-win10	On-Prem	Windows	2	16	48.86	0.00	t3.xlarge	gp2	$0.00	$4.89	$177.69	0	0	0%	0%	0	0	0	0	0	$0.00	10	sc1	$0.25	1	1	t3.micro	$14.85	$163.0
N/A	rtp-sa-rubrik-53	On-Prem	Linux	4	24	1,116.66	1,092.28	a1.4xlarge	gp2	$0.00	$111.67	$406.87	0	0	0%	0%	0	0	0	0	0	$0.00	1,117	sc1	$27.92	1	1	a1.medium	$49.82	$357.3
N/A	niels-win2016-01	On-Prem	Windows	2	12	50.00	49.26	t3.xlarge	gp2	$40.65	$5.00	$177.80	625	11	0.12%	0.15%	0.25	1.75	11	229	0.02	$0.00	51	st1	$2.30	1	3	t3.medium	$45.50	$132.3

Description: This page shows individual EC2 instances with AS-IS costs and config types on the left. The right side of this table shows optimized config type recommendations as well as potential monthly savings.

The same report can be used for off-prem/cloud based instances.

4.0 Cloud Optimization Definitions

Current Virtual Machine Analysis - Definitions

Size	This is the size of the VM by CPU count
Max of Avg CPU Utilization	The Peak CPU Utilization % calculated from the hourly average over 14 days
Max of Avg Memory Utilization	The Peak Memory Utilization % calculated from the hourly average over 14 days
# of Virtual Machines	Count of Virtual Machines that fall into each criteria catagory

Virtual Machine Optimization & Model Transition to Cloud - Definitions

VM Type	This is the size of the VM by CPU count
# of Virtual Machines	Count of Virtual Machines that fall into each criteria catagory
# of vCPUs	Count of Virtual Machine CPUs that fall into each criteria catagory
AS-IS	A category defined by the CPU count for Virtual Machines BEFORE they are OPTIMIZED
Used	Total number of used CPU Cores. The formula is Max of Avg CPU Utilization * CPU Count.
OptimizedCPU	IF(x.MAXavgCPU is null, x.cpu, IF(x.MAXavgCPU>0.9, x.cpu+1, CEIL((x.cpu * x.MAXavgCPU) / .60)))
OptimizedMemGB	IF(x.MAXavgMEM is null, x.mem, IF(x.MAXavgMEM>0.9, x.mem*2, CEIL((x.mem * x.MAXavgMEM) / .70)))
IO Density	IO Density equals the 95th percentile of Peak Total IOpS / Used Capacity. Also refered to as IOpS/TB.
Provisioned GB	Capacity in GB that is provisioned from the Datastore to the VMDK as reported by the VM.
Used GB	Capacity in GB that is used by the VM. If thin provisioned then this value is equal to written. If thick provisioned then this value is equal to Provisioned GB.

On-Prem/Off-Prem Infrastructure Sizing & Costing Summary - Definitions

Total On-Prem/Off-Prem Instances	Count of Virtual Machines in either On-Prem or Off-Prem locations
Billable Hours	Total Billable Hours for the current month
Cost Delta	Difference between the AS-IS Monthly Cost and the Optimized Monthly Cost
AS-IS vs Optimized	Count of instances. An instance = a single VM Guest.
AS-IS Monthly Cost Totals	AS-IS Costs as defined by the AWS Rate Card and averaged for each vCPU size
Est. AS-IS Monthly and Est. Optimized Monthly Cost Totals	AS-IS and Optimized Costs as defined by the AWS Rate Card and averaged for each vCPU size.

On-Prem and Off-Prem Cloud Summary - Definitions

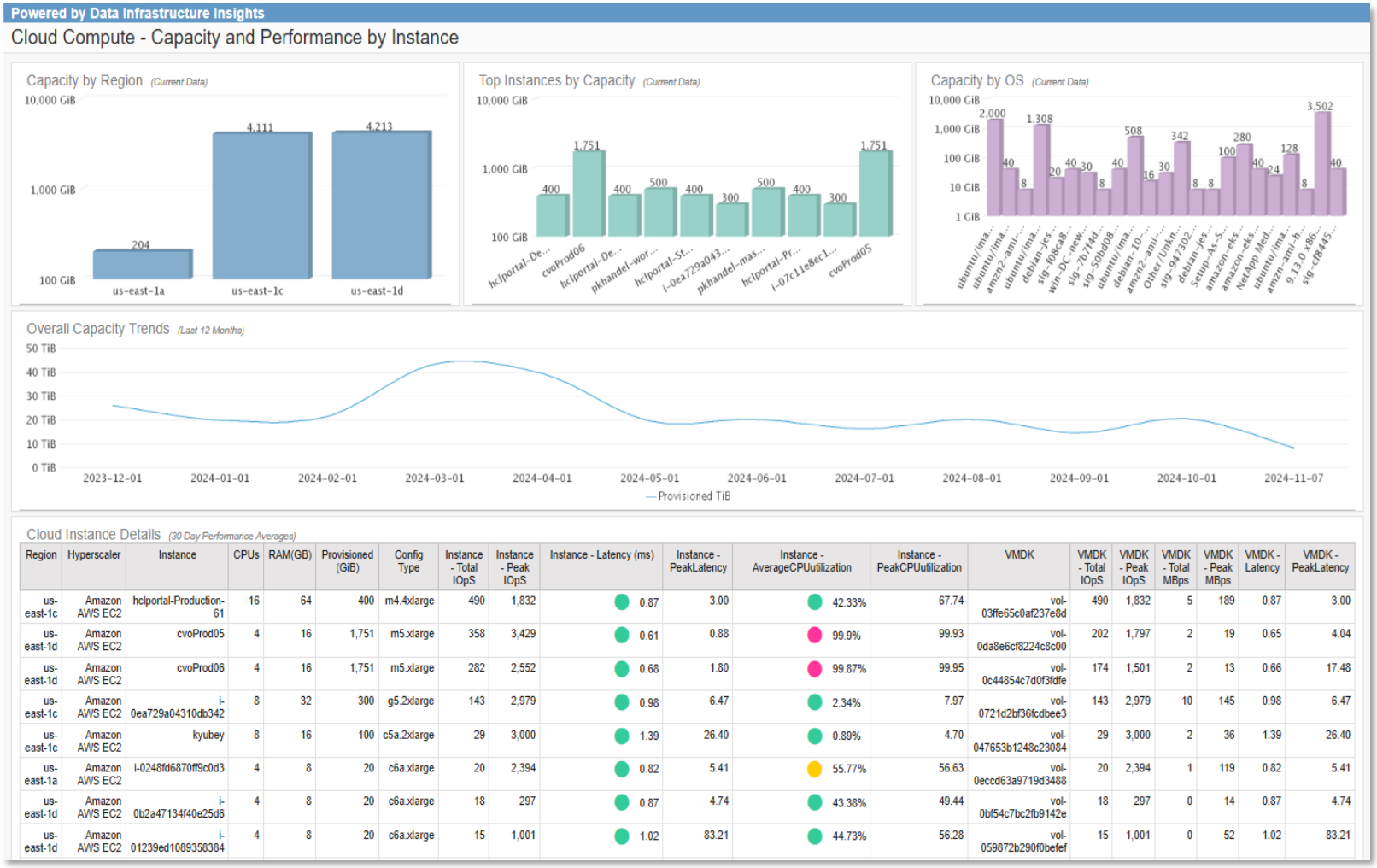
VMs Less Than 40% Peak CPU	As-Is Virtual Machines with CPU Utilization less than 40% divided by ALL Virtual Machine Instance count
Reduction in Large VMs	Sum of all As-Is Large VM instances less the sum of all Optimized Large instances divided by the sum of all As-Is instances
Cost avoid through optimisation	Cost Delta % * 100 *-1. Cost Delta % is total([Report].[Cost Delta (monthly)]) / total([Report].[Cost AS-IS (monthly)])
Cost avoid over 3 years	(([Cost Delta (monthly)]*-1)*36)/1000000. Cost Delta monthly is [Cost Optimised (monthly)] - [Cost AS-IS (monthly)]

NetApp

On-Prem/Off-Prem Infrastructure - Virtual Machine Detail - Definitions

Application	Name of the Application associated with the Virtual Machine as configured in OCI
Instance	The name of the On-Prem or Off-Prem Virtual Machine
OS	The operating system associated with the Virtual Machine. E.g. Windows or Linux
Cores	Number of vCPUs allocated to the Virtual Machine
Memory GB	Amount of RAM in GB allocated to the Virtual Machine
Provisioned Capacity (GB)	Amount of capacity in GB provisioned to the Virtual Machine
Used Capacity (GB)	Amount of used capacity in GB associated with the Virtual Machine
Type	The type of instance. E.g. On-Prem or Off-Prem
AS-IS Configured	AS-IS Configured is the Name of the Instance Type or AWS Tier associated with the AWS Rate Card. If the instance is On-Prem, then this would be the closes match to an AWS Tier
AS-IS Monthly Cost	AS-IS Monthly Cost is the estimated cost derived from the AWS Rate Card and applied to the AS-IS Configured type. Off-Prem would show the actual AWS Tier. Costs are a very good estimate only because of the vast amount of regions, rates and discounts associated with AWS Cloud. So the costs could vary slightly.
Max IOPS	This is the Maximum IOpS collected for the Virtual Machine Instance over a 14 day period at hourly intervals
Max Throughput	This is the Maximum Throughput in MB/second collected for the Virtual Machine Instance over a 14 day period at hourly intervals
Max of Avg CPU	Peak vCPU Utilization collected for the Virtual Machine Instance over a 14 day period at hourly intervals
Max of Avg Mem	Peak vRAM (Virtual Memory) Utilization collected for the Virtual Machine Instance over a 14 day period at hourly intervals
IOPS 95th	95th Percentile of Peak IOpS
IOD 95th	95th Percentile of IO Density (IOpS/TB)
Used Cores	The number of vCPU's that are actually utilized from a performance perspective. This is the Max of Avg CPU * cores
Used Memory	The number of vRAM in GB that are actually utilized from a performance perspective. This is the Max of Avg Mem * Memory GB
Optimized CPU	IF(x.MAXavgCPU is null, x.cpu, IF(x.MAXavgCPU>0.9, x.cpu+1, CEIL((x.cpu * x.MAXavgCPU) / .60)))
Optimized MEM(GB)	IF(x.MAXavgMEM is null, x.mem, IF(x.MAXavgMEM>0.9, x.mem*2, CEIL((x.mem * x.MAXavgMEM) / .70)))
Optimized Capacity	CASE WHEN (Used Capacity GB / Provisioned Capacity GB) > .75 THEN Provisioned Capacity WHEN x.usedGB <= 7.5 THEN 10 ELSE CEIL(x.usedGB / .75)
Proposed Config Type	This is the recommended AWS Tier that is derived from the Optimized vCPU and Optimized vRAM values provided by OCI measured over a 14 day hourly period. The Config Type (AWS Tier) evaluates the Optimized vCPU, Optimized vRAM, Virtual Machine IOpS and Virtual Machine provisioned capacity. The calculations are executed using SQL queries associated with the report.
Region	This is the AWS Region that was used for the Proposed Config Type (AWS Tier).
Billable Hours	This is the number of billable hours for the current month
Optimized Monthly Cost	This is the AWS Rate associated with the Proposed Config Type derived from the AWS Rate Card. This will vary depending on the Proposed Tier.
Monthly Savings	IF(([AS-IS Monthly Cost] - [Optimized Monthly Cost]) <= 0) THEN (0) ELSE ([AS-IS Monthly Cost] - [Optimized Monthly Cost])

4.1 Cloud Compute - Capacity and Performance by Instance



Cloud Instance Details (30 Day Performance Averages)

Region	Hyperscaler	Instance	CPUs	RAM(GB)	Provisioned (GiB)	Config Type	Instance - Total IOpS	Instance - Peak IOpS	Instance - Latency (ms)	Instance - PeakLatency	Instance - AverageCPUutilization	Instance - PeakCPUutilization	VMDK	VMDK - Total IOpS	VMDK - Peak IOpS	VMDK - Total MBps	VMDK - Peak MBps	VMDK - Latency	VMDK - PeakLatency
us-east-1c	Amazon AWS EC2	hclportal-Production-61	16	64	400	m4.4xlarge	490	1,832	0.87	3.00	42.33%	67.74	vol-03ffe65c0af237e8d	490	1,832	5	189	0.87	3.00
us-east-1d	Amazon AWS EC2	cvoProd05	4	16	1,751	m5.xlarge	358	3,429	0.61	0.88	99.9%	99.93	vol-0da8e6cf8224c8c00	202	1,797	2	19	0.65	4.04
us-east-1d	Amazon AWS EC2	cvoProd06	4	16	1,751	m5.xlarge	282	2,552	0.68	1.80	99.87%	99.95	vol-0c44854c7d0f3fdfe	174	1,501	2	13	0.66	17.48
us-east-1c	Amazon AWS EC2	i-0ea729a04310db342	8	32	300	g5.2xlarge	143	2,979	0.98	6.47	2.34%	7.97	vol-0721d2bf36fcdbee3	143	2,979	10	145	0.98	6.47
us-east-1c	Amazon AWS EC2	kyubey	8	16	100	c5a.2xlarge	29	3,000	1.39	26.40	0.89%	4.70	vol-047653b1248c23084	29	3,000	2	36	1.39	26.40
us-east-1a	Amazon AWS EC2	i-0248fd6870ff9c0d3	4	8	20	c6a.xlarge	20	2,394	0.82	5.41	55.77%	56.63	vol-0eccd63a9719d3488	20	2,394	1	119	0.82	5.41
us-east-1d	Amazon AWS EC2	i-0b2a47134f40e25d6	4	8	20	c6a.xlarge	18	297	0.87	4.74	43.38%	49.44	vol-0bf54c7bc2fb9142e	18	297	0	14	0.87	4.74
us-east-1d	Amazon AWS EC2	i-01239ed1089358384	4	8	20	c6a.xlarge	15	1,001	1.02	83.21	44.73%	56.28	vol-059872b290f0befef	15	1,001	0	52	1.02	83.21

Description: This report shows cloud instance capacity and performance for all hyper scalers. Currently, this example is displaying AWS.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled. AWS, AZURE or Google Cloud discovered by DII.

Report XML: 4.1 Cloud Compute - Capacity and Performance by Instance

4.1 Cloud Compute - Capacity and Performance by Instance Definitions

Metric/Attribute	Description
Region	The hyperscaler region associated with the instance discovered by DII
Hyperscaler	Name of the hyperscaler e.g. AWS, AZURE or Google Cloud
Instance	Name of the instance (virtual machine) discovered and monitored by DII
OS	Operating system name associated with the instance
CPUs	Number of processors allocated to the instance
RAM(GiB)	Amount of Memory in Gibibytes allocated to the instance
Provisioned (GiB)	Amount of capacity in Gibibytes allocated to the instance
Config Type	The configuration type associated with the virtual instance e.g. for AWS, a1.medium, a1.large, a1.xlarge etc.
Instance – Total IOpS	Measures the total number of I/O service requests (read+write) on the instance during the selected time period (measured in I/O per sec)
Instance – Peak IOpS	Maximum I/O service requests (read+write) on the instance for the collection period
Instance – Latency (ms)	The time it takes from the moment a request for information arrives at the instance to the time when the instance begins to send the information back in response. This is the actual latency of the device in milliseconds
Instance – Peak Latency (ms)	Maximum response time on the instance for the collection period
Instance – AverageCPUUtilization	The percentage of a physical CPU's processing power that is currently being used by that virtual machine, essentially measuring how much of the allocated CPU resources are actively being consumed by the VM
Instance – PeakCPUUtilization	Maximum CPU processing power on the instance for the collection period
VMDK	Name of the Virtual Disk associated with the instance
VMDK – Total IOpS	Measures the total number of I/O service requests (read+write) on the VMDK during the selected time period (measured in I/O per sec)
VMDK – Peak IOpS	Maximum I/O service requests (read+write) on the VMDK for the collection period
VMDK – Total MBps	Total throughput (read+write) for the VMDK. This is the rate at which data can be transferred to and from a VMDK, typically measured in megabytes per second (MB/s)
VMDK – Peak MBps	Maximum throughput in megabytes per second for the VMDK during the collection period
VMDK – Latency	Total average response time in milliseconds. This is the amount of time it takes for an instance to receive data from a virtual disk after requesting it, essentially measuring the delay between initiating a read/write operation and the start of data transfer
VMDK – Peak Latency	Maximum response time in milliseconds for the VMDK during the collection period
Date	Full Date field available in the DWH Date Dimension table

4.2 All Cloud Infrastructure

Powered by Data Infrastructure Insights

All Cloud Infrastructure

Infrastructure Detail *(Current Data)*

HyperScaler	VM	VM OS	vCPU	vRAM	Avg CPU Utilization %	Peak CPU Utilization %	Instance Type	Instance Cost	Disk	Disk Type	Capacity (GiB)	Disk Cost	Avg IOpS	Peak IOpS	Utilization	Optimization Cost Savings
aws	Active-Directory VSAQA Dont terminate	Windows	2	4	0.68%	0.68%	t2.medium	$33.41	vol-1d7b8507	EBS_standard	150	$7.50	7	55	Decrease Resources	$11.81
aws	AIDP	Linux	8	32	0.25%	0.25%	g5.2xlarge		vol-0bcbaba08f684c1b0	EBS_gp2	500	$50.00	52	170	Decrease Resources	0
aws	awsConnector03mc	Other Image	4	16	16.65%	16.65%	t3.xlarge	$119.81	vol-0f25ac8b407d86604	EBS_gp2	500	$50.00	34	260	Decrease Resources	$40.61
aws	CVO_DEV_AMI_TO_VMDK-20210510-2034	Linux	2	1	0.04%	0.04%	t3.micro	$7.49	vol-07f570661714c8e12	EBS_gp2	80	$8.00	0	2	Decrease Resources	0
aws	cvoProd05	Other Image	4	16	99.9%	99.9%	m5.xlarge	$138.24	vol-0950acc0095424680	EBS_gp2	2,700	$270.00	521	3,429	Resource Alert	$59.04
aws	cvoProd06	Other Image	4	16	99.87%	99.87%	m5.xlarge	$138.24	vol-04edfc9893d619658	EBS_gp2	2,700	$270.00	422	2,552	Resource Alert	$59.04
aws	ECS Instance - EC2ContainerService-kausik-test-graphql-book-cluster	Other Image	2	4	2.65%	2.65%	t2.medium	$33.41	vol-03ab3f1e1b61c05f8	EBS_gp2	150	$15.00	16	143	Decrease Resources	$11.81
aws	hclportal-dev	Linux	2	8	0.06%	0.06%	t2.large	$66.82	vol-a098924a	EBS_gp2	200	$20.00	1	8	Decrease Resources	$45.22
aws	hclportal-dev-1a	Other Image	2	8	0.25%	0.25%	t2.large	$66.82	vol-056152f7a715e42b5	EBS_gp2	200	$20.00	17	175	Decrease Resources	$45.22
aws	hclportal-dev-1b	Linux	2	8	0.44%	0.44%	t2.large	$66.82	vol-04325fa298da9d0f3	EBS_gp2	40	$4.00	43	273	Decrease Resources	$45.22
aws	hclportal-dev-2	Other Image	2	8	0.38%	0.38%	t2.large	$66.82	vol-0c726ff657dd232c7	EBS_gp2	200	$20.00	84	528	Decrease Resources	$45.22
aws	hclportal-dev-4	Other Image	2	8	0.15%	0.15%	t2.large	$66.82	vol-0b5b13324af181c49	EBS_gp2	200	$20.00	29	343	Decrease Resources	$45.22
aws	hclportal-Development-2	Linux	16	64	0.28%	0.28%	m4.4xlarge	$576.00	vol-0b0f84097e60b2604	EBS_gp2	2,000	$200.00	1	11	Decrease Resources	0
aws	hclportal-Development-3	Linux	16	64	0.28%	0.28%	m4.4xlarge	$576.00	vol-089011fedf9c43e49	EBS_gp2	2,000	$200.00	1	14	Decrease Resources	0
aws	hclportal-powershell	Other Image	2	4	0.24%	0.24%	t2.medium	$33.41	vol-6f115085	EBS_gp2	175	$17.50	2	16	Decrease Resources	$11.81
aws	hclportal-Production-61	Linux	16	64	44.08%	44.08%	m4.4xlarge	$576.00	vol-03ffe65c0af237e8d	EBS_gp2	2,000	$200.00	650	1,832	Properly Utilized	0
aws	hclportal-Staging-480	Linux	16	64	0.47%	0.47%	m4.4xlarge	$576.00	vol-01538f6113246ef4d	EBS_gp2	2,000	$200.00	77	214	Decrease Resources	0
aws	i-01239ed1089358384	Other Image	4	8	44.4%	44.4%	c6a.xlarge		vol-059872b290f0befef	EBS_gp2	100	$10.00	88	1,001	Properly Utilized	0
aws	i-01a6d85dad847ea40	Other Image	4	8	43.53%	43.53%	c6a.xlarge		vol-0b88407c18ddee6bd	EBS_gp2	100	$10.00	2	9	Properly Utilized	0
aws	i-0248fd6870ff9c0d3	Other Image	4	8	55.69%	55.69%	c6a.xlarge		vol-0eccd63a9719d3488	EBS_gp2	100	$10.00	225	2,394	Increase Resources	0
aws	i-038f797316c09b0f7	Other Image	2	4	32.99%	32.99%	t3.medium	$29.95	vol-04db54314024f6e1d	EBS_gp2	100	$10.00	62	736	Properly Utilized	$8.35
aws	i-04f10a18d56c47448	Other Image	2	4	43.68%	43.68%	t3.medium	$29.95	vol-06c48ad0f61a15a17	EBS_gp2	100	$10.00	3	29	Properly Utilized	$8.35

Description: This report shows cloud instance capacity and performance for all hyper scalers. Currently, this example is displaying AWS.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.
AWS, AZURE or Google Cloud discovered by DII.

Report XML: 4.2 All Cloud Infrastructure

4.1 Cloud Compute - Capacity and Performance by Instance Definitions

Metric/Attribute	Description
HyperScaler	Name of the hyperscaler e.g. AWS, AZURE or Google Cloud
VM	Name of the instance discovered and monitored by DII
VM OS	Operating system name associated with the instance
vCPU	Number of processors allocated to the instance
vRAM	Amount of Memory in Gibibytes allocated to the instance
Avg CPU Utilization %	The percentage of a physical CPU's processing power that is currently being used by that virtual machine, essentially measuring how much of the allocated CPU resources are actively being consumed by the VM
Peak CPU Utilization %	Maximum CPU processing power on the instance for the collection period
Instance Type	The configuration type associated with the virtual instance e.g. for AWS, a1.medium, a1.large, a1.xlarge etc.
Billable Hours	The number of billable hours for the current month. E.g. (DAY(LAST_DAY(NOW()))*24)
Instance Hourly Pricing	Instance cost per hour based on the published hyperscaler rate card. Example: WHEN [Instance Type]='a1.medium' THEN 0.0255 WHEN [Instance Type]='a1.large' THEN 0.051 WHEN [Instance Type]='a1.xlarge' THEN 0.102 WHEN [Instance Type]='a1.2xlarge' THEN 0.204 WHEN [Instance Type]='a1.4xlarge' THEN 0.408 WHEN [Instance Type]='a1.metal' THEN 0.408
Instance Cost	Billable Hours * Instance Hourly Pricing
Disk	Name of the virtual disk associated with the instance
Disk Type	The disk type e.g. EBS_gp2, EBS_gp3 etc..
Capacity (GiB)	Provisioned capacity in Gibibytes allocated to the instance via the virtual disk
Disk Cost	Disk cost per month based on the published hyperscaler rate card. Example: WHEN Disk Type contains 'gp' THEN .1 WHEN Disk Type contains 'io' THEN .125 WHEN Disk Type contains 'st1' THEN .045 WHEN Disk Type contains 'sc1' THEN .025 WHEN Disk Type contains 'standard' THEN .05 WHEN Disk Type contains 'snap' THEN .05 WHEN Disk Type contains 'Standard_LRS' THEN .045 WHEN Disk Type contains 'Premium_LRS' THEN .12
Avg IOpS	Measures the average number of I/O service requests (read+write) on the instance during the selected time period (measured in I/O per sec)
Peak IOpS	Maximum I/O service requests (read+write) on the instance for the collection period
Optimized Config	This is the recommended number of CPUs an individual virtual instance should have based on its resource consumption. If CPU utilization % is greater than 90 then we would add 1 vCPU else we would maintain or reduce vCPUs based on vCPU count * average utilization / 60 percent.

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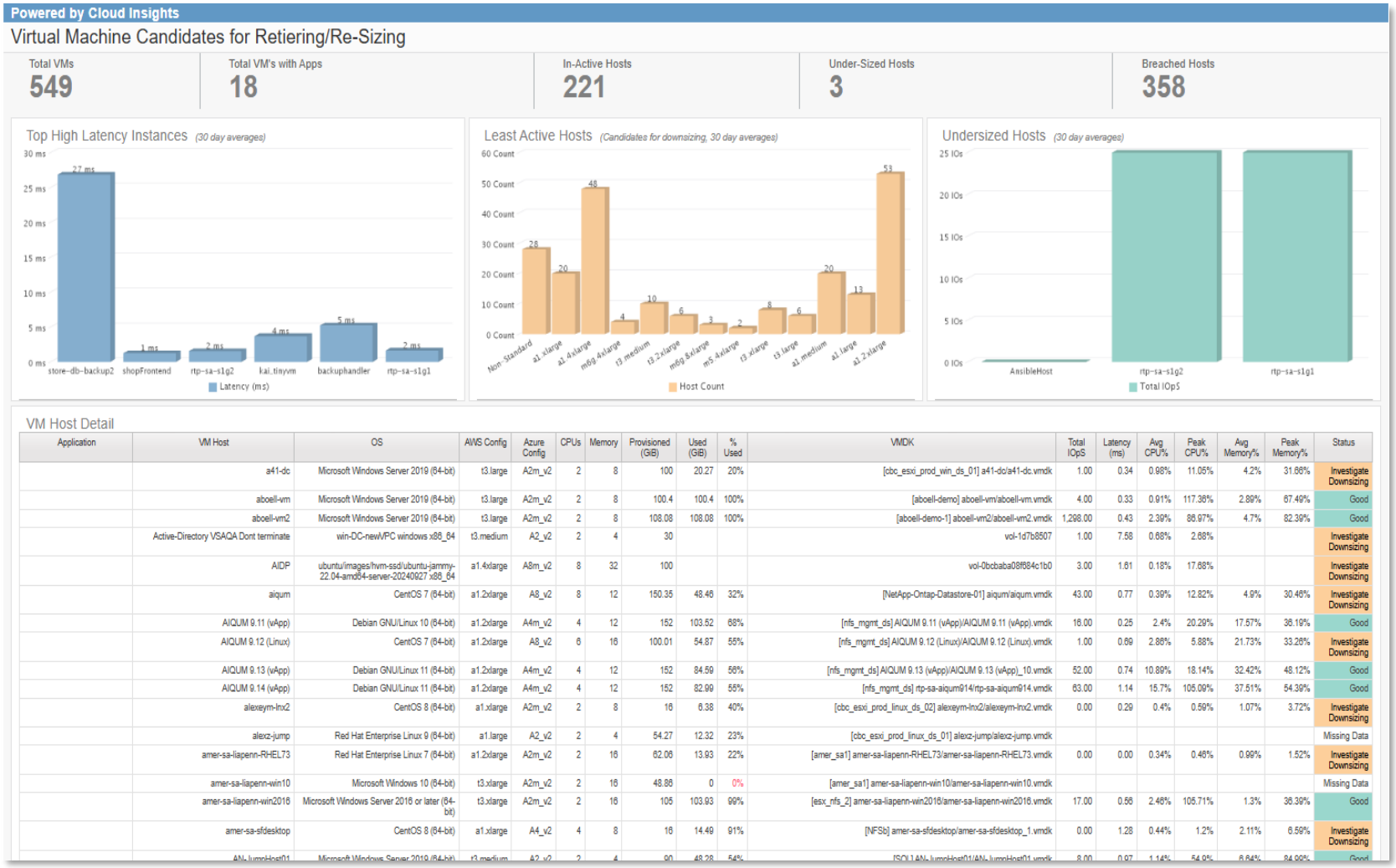
	Example: IF(AVG(AverageCPUutilization) is null, x.vCPU, IF(AVG(AverageCPUutilization)>0.9, x.vCPU+1, CEIL((x.vCPU * AVG(AverageCPUutilization)) / .60)))
Utilization	The percentage of a physical CPU's processing power that is currently being used by that virtual instance, essentially measuring how much of the allocated CPU resources are actively being consumed CASE WHEN [Avg CPU Utilization %] >=80 THEN 'Resource Alert' WHEN [Avg CPU Utilization %] BETWEEN 50 AND 80 THEN 'Increase Resources' WHEN [Avg CPU Utilization %] <=25 THEN 'Decrease Resources' WHEN [Avg CPU Utilization %] BETWEEN 25 AND 51 THEN 'Properly Utilized'
Optimization Cost Savings	The cost savings (if any) incurred by optimizing virtual instance resources like vCPU, vRAM or provisioned capacity. IF(Instance Cost -(Billable Hours * OptimizedConfig) <0) THEN (0) ELSE (Instance Cost -(Billable Hours * OptimizedConfig))

4.3 Virtual Machine Candidates for Re-tiering/Resizing



Application	VM Host	OS	AWS Config	Azure Config	CPUs	Memory	Provisioned (GiB)	Used (GiB)	% Used	VMDK	Total IOPS	Latency (ms)	Avg CPU%	Peak CPU%	Avg Memory%	Peak Memory%	Status
	a41-dc	Microsoft Windows Server 2019 (64-bit)	t3.large	A2m_v2	2	8	100	20.27	20%	[cbc_esxi_prod_win_ds_01] a41-dc/a41-dc.vmdk	1.00	0.34	0.98%	11.05%	4.2%	31.66%	Investigate Downsizing
	aboell-vm	Microsoft Windows Server 2019 (64-bit)	t3.large	A2m_v2	2	8	100.4	100.4	100%	[aboell-demo] aboell-vm/aboell-vm.vmdk	4.00	0.33	0.91%	117.36%	2.89%	67.49%	Good
	aboell-vm2	Microsoft Windows Server 2019 (64-bit)	t3.large	A2m_v2	2	8	108.08	108.08	100%	[aboell-demo-1] aboell-vm2/aboell-vm2.vmdk	1,298.00	0.43	2.39%	86.97%	4.7%	82.39%	Good
	Active-Directory VSAQA Dont terminate	win-DC-newVPC windows x86_64	t3.medium	A2_v2	2	4	30			vol-1d7b8507	1.00	7.58	0.68%	2.68%			Investigate Downsizing
	AIDP	ubuntu/images/hvm-ssd/ubuntu-jammy-22.04-amd64-server-20240927 x86_64	a1.4xlarge	A8m_v2	8	32	100			vol-0bcbaba08f884c1b0	3.00	1.61	0.18%	17.68%			Investigate Downsizing
	aiqum	CentOS 7 (64-bit)	a1.2xlarge	A8_v2	8	12	150.35	48.46	32%	[NetApp-Ontap-Datastore-01] aiqum/aiqum.vmdk	43.00	0.77	0.39%	12.82%	4.9%	30.46%	Investigate Downsizing
	AIQUM 9.11 (vApp)	Debian GNU/Linux 10 (64-bit)	a1.2xlarge	A4m_v2	4	12	152	103.52	68%	[nfs_mgmt_ds] AIQUM 9.11 (vApp)/AIQUM 9.11 (vApp).vmdk	16.00	0.25	2.4%	20.29%	17.57%	36.19%	Good
	AIQUM 9.12 (Linux)	CentOS 7 (64-bit)	a1.2xlarge	A8_v2	6	16	100.01	54.87	55%	[nfs_mgmt_ds] AIQUM 9.12 (Linux)/AIQUM 9.12 (Linux).vmdk	1.00	0.69	2.86%	5.88%	21.73%	33.26%	Investigate Downsizing
	AIQUM 9.13 (vApp)	Debian GNU/Linux 11 (64-bit)	a1.2xlarge	A4m_v2	4	12	152	84.59	56%	[nfs_mgmt_ds] AIQUM 9.13 (vApp)/AIQUM 9.13 (vApp)_10.vmdk	52.00	0.74	10.89%	18.14%	32.42%	48.12%	Good
	AIQUM 9.14 (vApp)	Debian GNU/Linux 11 (64-bit)	a1.2xlarge	A4m_v2	4	12	152	82.99	55%	[nfs_mgmt_ds] rtp-sa-aiqum914/rtp-sa-aiqum914.vmdk	63.00	1.14	15.7%	105.09%	37.51%	54.39%	Good
	alexeym-lnx2	CentOS 8 (64-bit)	a1.xlarge	A2m_v2	2	8	16	6.38	40%	[cbc_esxi_prod_linux_ds_02] alexeym-lnx2/alexeym-lnx2.vmdk	0.00	0.29	0.4%	0.59%	1.07%	3.72%	Investigate Downsizing
	alexz-jump	Red Hat Enterprise Linux 9 (64-bit)	a1.large	A2_v2	2	4	54.27	12.32	23%	[cbc_esxi_prod_linux_ds_01] alexz-jump/alexz-jump.vmdk							Missing Data
	amer-sa-liapenn-RHEL73	Red Hat Enterprise Linux 7 (64-bit)	a1.2xlarge	A2m_v2	2	16	62.06	13.93	22%	[amer_sa1] amer-sa-liapenn-RHEL73/amer-sa-liapenn-RHEL73.vmdk	0.00	0.00	0.34%	0.46%	0.99%	1.52%	Investigate Downsizing
	amer-sa-liapenn-win10	Microsoft Windows 10 (64-bit)	t3.xlarge	A2m_v2	2	16	48.86	0	0%	[amer_sa1] amer-sa-liapenn-win10/amer-sa-liapenn-win10.vmdk							Missing Data
	amer-sa-liapenn-win2016	Microsoft Windows Server 2016 or later (64-bit)	t3.xlarge	A2m_v2	2	16	105	103.93	99%	[esx_nfs_2] amer-sa-liapenn-win2016/amer-sa-liapenn-win2016.vmdk	17.00	0.56	2.46%	106.71%	1.3%	36.39%	Good
	amer-sa-sfdesktop	CentOS 8 (64-bit)	a1.xlarge	A4_v2	4	8	16	14.49	91%	[NFSb] amer-sa-sfdesktop/amer-sa-sfdesktop_1.vmdk	0.00	1.28	0.44%	1.2%	2.11%	6.59%	Investigate Downsizing
	AN-JumpHost01	Microsoft Windows Server 2019 (64-bit)	t3.medium	A2_v2	2	4	90	48.28	54%	[SOLI AN-JumpHost01/AN-JumpHost01.vmdk	8.00	0.97	1.14%	54.9%	6.64%	84.99%	Good

Description: This report shows

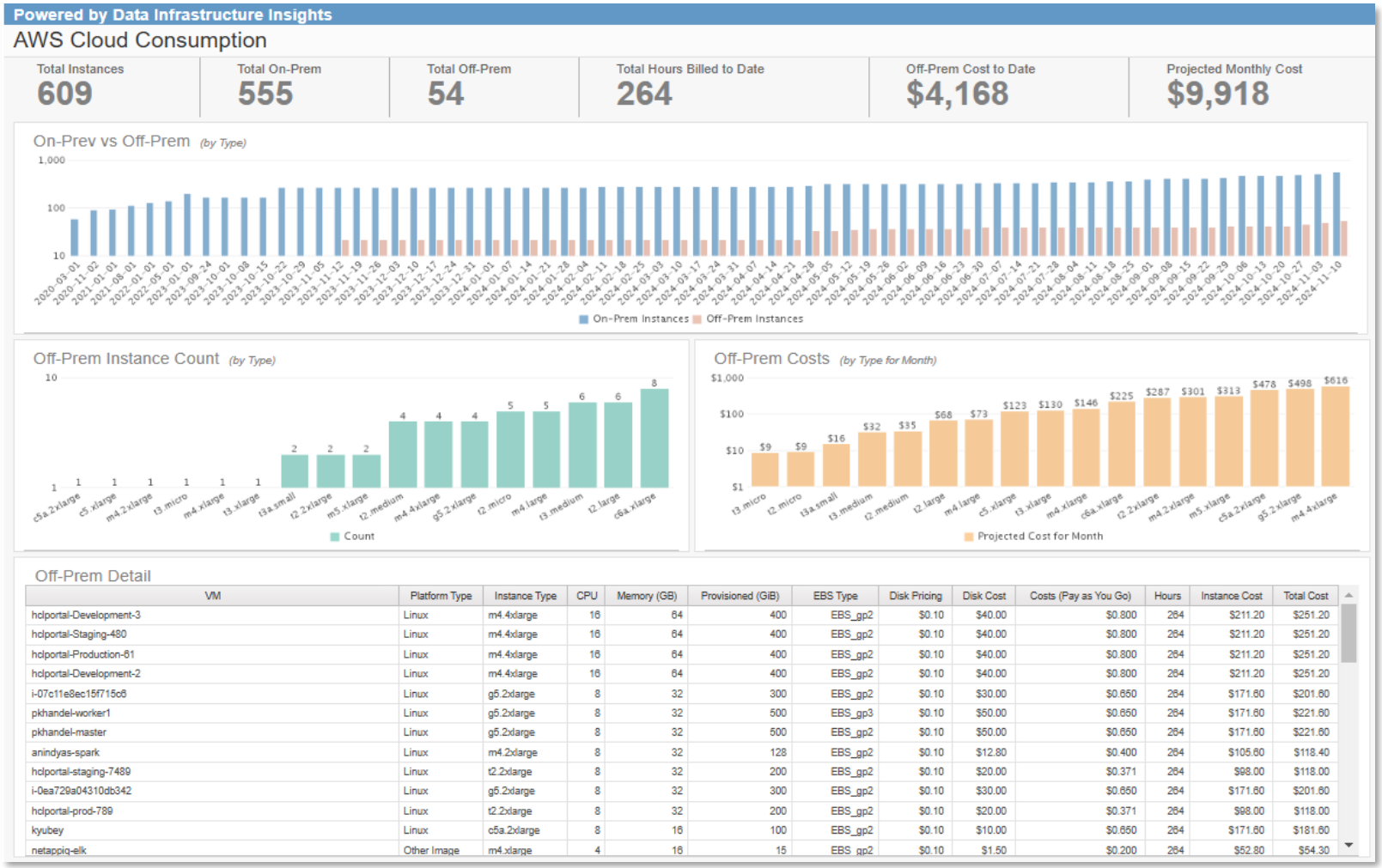
Prerequisites: Data Infrastructure Insights (DII) reporting enabled. VMware discovered by DII.

Report XML: 4.3 Virtual Machine Candidates for Re-Tiering or Resizing

4.3 Virtual Machine Candidates for Re-tiering/Resizing Definitions

Metric/Attribute	Description
Application	DII configured annotation. Defines the application associated with the virtual machine or backend storage capacity
VM Host	Name of the instance discovered and monitored by DII
OS	Operating system name associated with the instance
AWS Config	The configuration type associated with the AWS virtual instance e.g. a1.medium, a1.large, a1.xlarge etc.
Azure Config	The configuration type associated with the AZURE virtual instance e.g. A1_v2, A2_v2, A2m_v2 etc.
CPUs	Number of processors allocated to the instance
Memory	Amount of Memory in Gibibytes allocated to the instance
Provisioned (GiB)	Provisioned capacity in Gibibytes allocated to the instance via the virtual disk
Used (GiB)	Used capacity in Gibibytes allocated to the instance via the virtual disk
% Used	Used (GiB) / Provisioned (GiB)
VMDK	Name of the virtual disk associated with the instance
Total IOpS	Measures the total number of I/O service requests (read+write) on the instance during the selected time period (measured in I/O per sec)
Latency (ms)	The time it takes from the moment a request for information arrives at the instance to the time when the instance begins to send the information back in response. This is the actual latency of the device in milliseconds
Avg CPU%	The percentage of a physical CPU's processing power that is currently being used by that virtual instance, essentially measuring how much of the allocated CPU resources are actively being consumed
Peak CPU%	Maximum CPU% on the instance for the collection period
Avg Memory%	The percentage of the allocated RAM that is currently being used by the virtual machine, essentially indicating how much of its assigned memory is actively in use, often measured as a percentage of the total allocated memory to the virtual instance
Peak Memory%	Maximum Memory% on the instance for the collection period
Status	Provides a recommendation based on several performance scenarios for each virtual instance. E.g WHEN [Latency (ms)] > 25 THEN 'High Latency' WHEN [Total IOpS]>3000 AND [Avg CPU%]>50 AND [CPUs] <=4 THEN 'Needs Upsizing' WHEN [Total IOpS]>5000 AND [Avg CPU%]>50 AND [CPUs] >=8 THEN 'Needs Upsizing' WHEN [Avg CPU%]>60 THEN 'Needs Upsizing' WHEN [Total IOpS] < 50 AND [Peak CPU%] <20 THEN 'Investigate Downsizing' WHEN [Peak CPU%] < 10 AND [CPUs]<=4 THEN 'Investigate Downsizing' WHEN [Peak CPU%] < 20 AND [CPUs]>4 THEN 'Investigate Downsizing' WHEN [Total IOpS] is null THEN 'Missing Data' ELSE 'Good'
In-Active Hosts	This is the number of in-active or underutilized hosts. IF(Status ='Investigate Downsizing') THEN (1) ELSE (0)
Breached Hosts	If the STATUS is not equal to 'Good' then the count is incremented

4.4 Cloud Consumption



VM	Platform Type	Instance Type	CPU	Memory (GB)	Provisioned (GiB)	EBS Type	Disk Pricing	Disk Cost	Costs (Pay as You Go)	Hours	Instance Cost	Total Cost
hclportal-Development-3	Linux	m4.4xlarge	16	64	400	EBS_gp2	$0.10	$40.00	$0.800	264	$211.20	$251.20
hclportal-Staging-480	Linux	m4.4xlarge	16	64	400	EBS_gp2	$0.10	$40.00	$0.800	264	$211.20	$251.20
hclportal-Production-61	Linux	m4.4xlarge	16	64	400	EBS_gp2	$0.10	$40.00	$0.800	264	$211.20	$251.20
hclportal-Development-2	Linux	m4.4xlarge	16	64	400	EBS_gp2	$0.10	$40.00	$0.800	264	$211.20	$251.20
i-07c11e8ec15f715c6	Linux	g5.2xlarge	8	32	300	EBS_gp2	$0.10	$30.00	$0.650	264	$171.60	$201.60
pkhandel-worker1	Linux	g5.2xlarge	8	32	500	EBS_gp3	$0.10	$50.00	$0.650	264	$171.60	$221.60
pkhandel-master	Linux	g5.2xlarge	8	32	500	EBS_gp2	$0.10	$50.00	$0.650	264	$171.60	$221.60
anindyas-spark	Linux	m4.2xlarge	8	32	128	EBS_gp2	$0.10	$12.80	$0.400	264	$105.60	$118.40
hclportal-staging-7489	Linux	t2.2xlarge	8	32	200	EBS_gp2	$0.10	$20.00	$0.371	264	$98.00	$118.00
i-0ea729a04310db342	Linux	g5.2xlarge	8	32	300	EBS_gp2	$0.10	$30.00	$0.650	264	$171.60	$201.60
hclportal-prod-789	Linux	t2.2xlarge	8	32	200	EBS_gp2	$0.10	$20.00	$0.371	264	$98.00	$118.00
kyubey	Linux	c5a.2xlarge	8	16	100	EBS_gp2	$0.10	$10.00	$0.650	264	$171.60	$181.60
netappiq-elk	Other Image	m4.xlarge	4	16	15	EBS_gp2	$0.10	$1.50	$0.200	264	$52.80	$54.30

Description: This report shows resource consumption for AWS and AZURE cloud instances.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled. VMware, AWS or AZURE compute discovered by DII.

Report XML for AWS: 4.4 AWS Cloud Consumption

Report XML for AZURE: 4.8 AZURE Cloud Consumption

4.4 Cloud Consumption Definitions

Summary - Definitions	
Total Instances	Total count of virtual machines including On-Prem and Off-Prem
Total On-Prem	Total count of virtual machines designated as On-Prem
Total Off-Prem	Total count of virtual machines designated as Off-Prem
Total Hours Billed to Date	Number of hours billed in the current month
Off-Prem Costs to Date	Current Off-Prem instance costs as derived from the AWS Rate Cards imported into OCI DWH
Projected Monthly Cost	Projected Monthly Costs of All Off-Prem Instances
Config Types	Virtual Machine sizes as defined by the AWS Rate Cards. E.g. t2.micro, t2.medium etc
VM	Name of the Virtual Machine or VM
OS	Operating System associated with the Virtual Machine
Resource Group	The Resource Group associated with the Virtual Machine as reported by the Azure Data Source in OCI
CPU	Number of CPUs associated with the Virtual Machine
Memory (GB)	Amount of RAM allocated to the Virtual Machine in GB
Provisioned (GiB)	Provisioned Capacity in Gibybytes as reported by the Virtual Machine
Costs (Pay as You Go)	Cost associated with the Config Type or VM Size as provided by the AWS Rate Card imported into OCI DWH
Hours	Number of operational hours to date
Total Cost	Hours * Costs (Pay as You Go)

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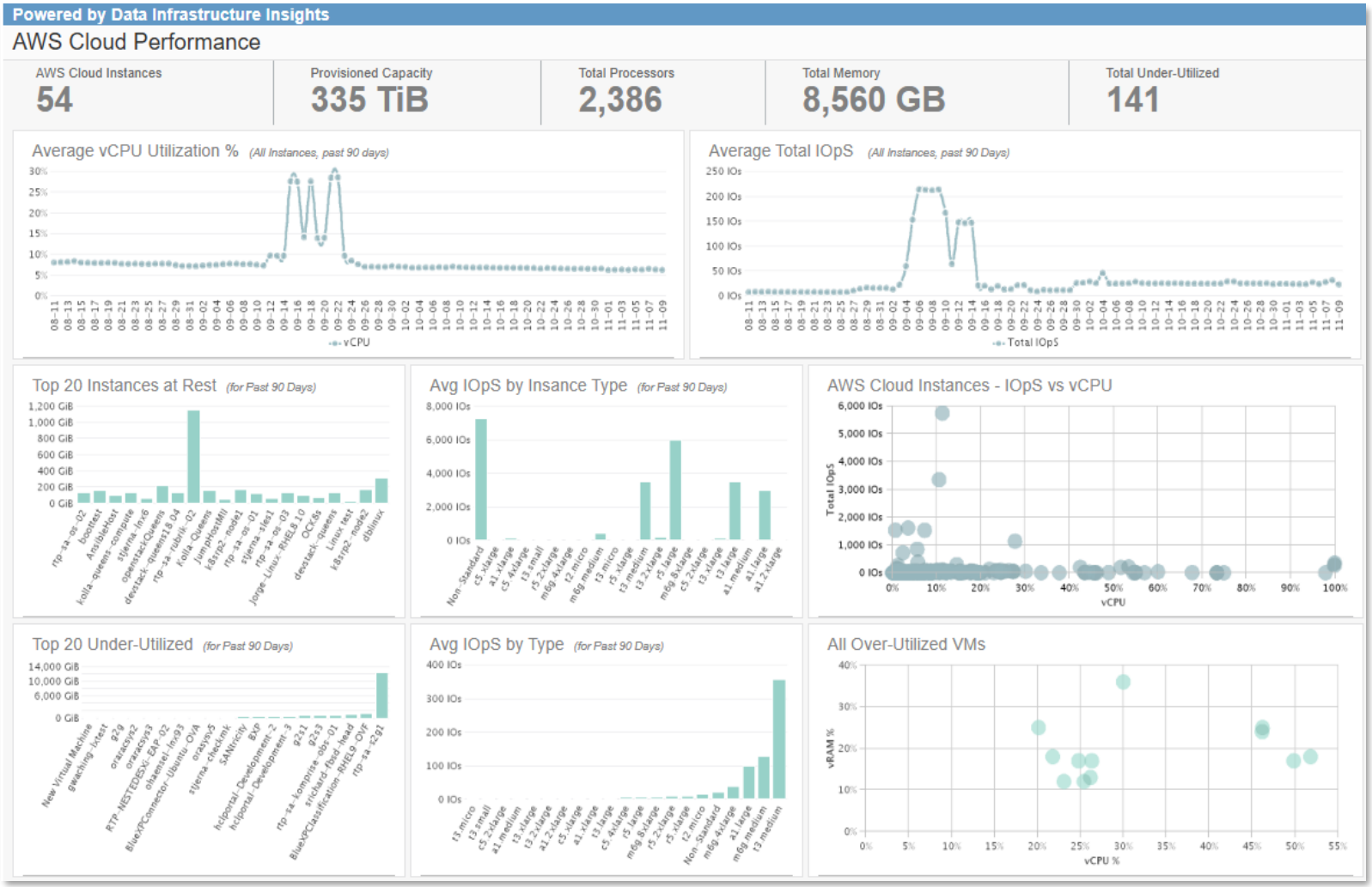
4.5 Cloud Performance



Description: This report shows resource performance for AWS and AZURE cloud instances. AWS example on left.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.
AWS or AZURE compute discovered by DII.

Report XML for AWS: 4.5 AWS Cloud Performance
Report XML for AZURE: 4.9 AZURE Cloud Performance

4.5 Cloud Performance Definitions

Summary - Definitions	
AWS Cloud Instances	Count of Virtual Machines that reside in the AWS Cloud
Provisioned Capacity	Total amount of Provisioned Capacity in TB as reported by the all Off-Prem Virtual Machines
Total Processors	Number of CPUs associated with the Virtual Machine
Total Memory	Amount of RAM allocated to the Virtual Machine in GB
Total Under-Utilized	A VM Instanced defined as having Peak IOpS between 1 and 11 and CPU Utilization % < 10 AND Peak IOpS ARE NOT NULL
Total At Rest	A VM Instance defined as having Peak IOpS = 0 AND Peak Throughput =0 AND Peak IOpS ARE NOT NULL
CPU %	CPU Utilization in % as reported by the Virtual Machine
Peak CPU %	Peak CPU Utilization in % as reported by the Virtual Machine
Memory Utilization %	Memory Utilization in % as reported by the Virtual Machine (On-Prem only)
Peak Memory %	Peak Memory Utilization in % as reported by the Virtual Machine (On-Prem only)
Total IOpS	Total IOpS (both Read and Write) as reported by the Virtual Machine for the designated time period
Peak IOpS	Peak IOpS as reported by the Virtual Machine for the designated time period
IOpS Threshold	IOpS Threshold as provided by the AWS Rate Card for the Off-Prem Config Type
Latency (ms)	Latency (both Read and Write response time) in milliseconds as reported by the Virtual Machine for the designated time period
Peak Latency (ms)	Peak Latency (maximum latency for the day or hour) as reported by the Virtual Machine
Provisioned (GiB)	Provisioned Capacity in Gibybytes as reported by the Virtual Machine
VM	Name of the Virtual Machine or VM
Date	Fulldate field available in the DWH Date Dimension table

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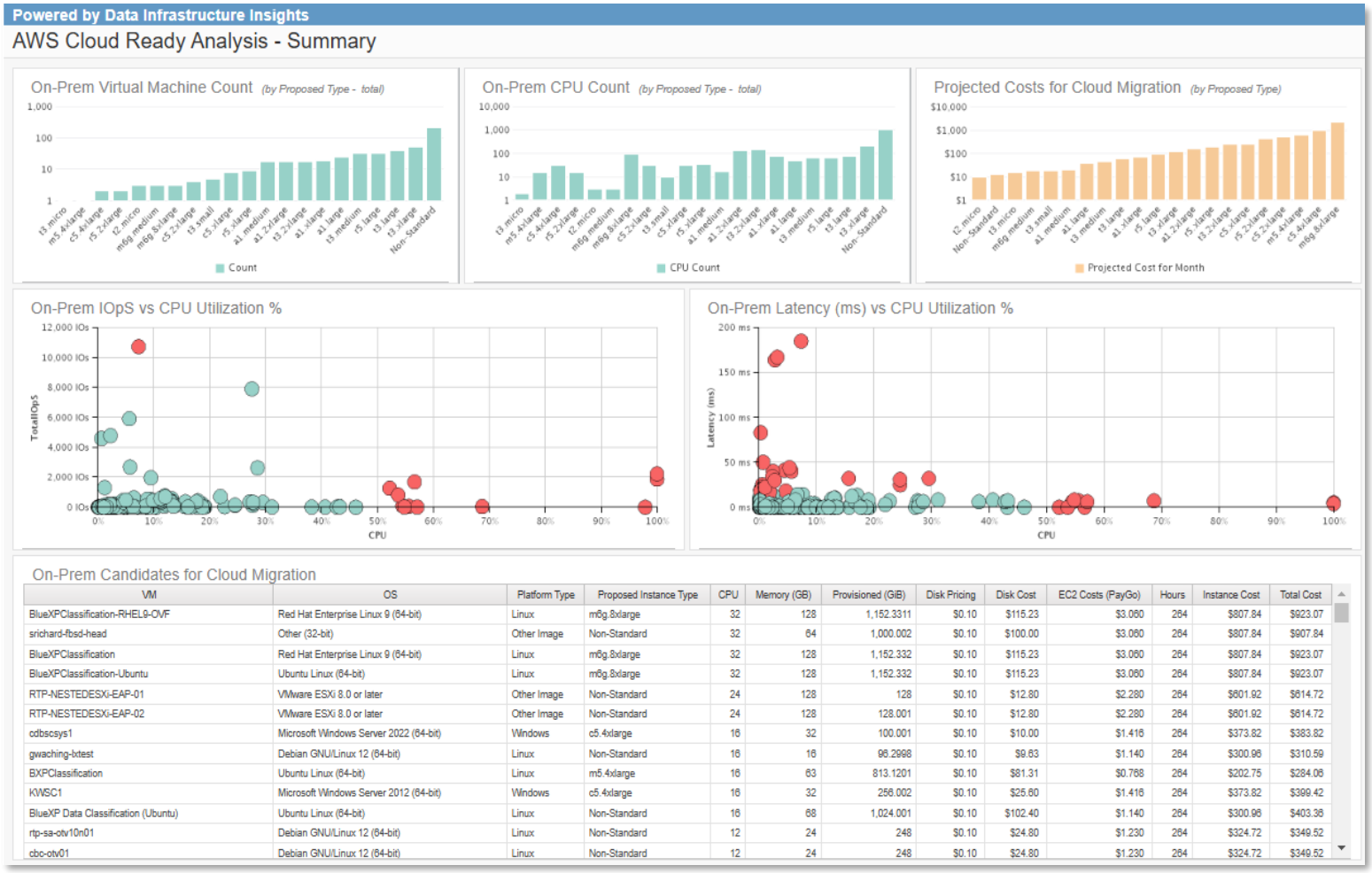
4.6 Cloud Ready Analysis



VM	OS	Platform Type	Proposed Instance Type	CPU	Memory (GB)	Provisioned (GiB)	Disk Pricing	Disk Cost	EC2 Costs (PayGo)	Hours	Instance Cost	Total Cost
BlueXPClassification-RHEL9-OVF	Red Hat Enterprise Linux 9 (64-bit)	Linux	m6g.8xlarge	32	128	1,152.3311	$0.10	$115.23	$3.060	264	$807.84	$923.07
srichard-fbsd-head	Other (32-bit)	Other Image	Non-Standard	32	64	1,000.002	$0.10	$100.00	$3.060	264	$807.84	$907.84
BlueXPClassification	Red Hat Enterprise Linux 9 (64-bit)	Linux	m6g.8xlarge	32	128	1,152.332	$0.10	$115.23	$3.060	264	$807.84	$923.07
BlueXPClassification-Ubuntu	Ubuntu Linux (64-bit)	Linux	m6g.8xlarge	32	128	1,152.332	$0.10	$115.23	$3.060	264	$807.84	$923.07
RTP-NESTEDESXi-EAP-01	VMware ESXi 8.0 or later	Other Image	Non-Standard	24	128	128	$0.10	$12.80	$2.280	264	$601.92	$614.72
RTP-NESTEDESXi-EAP-02	VMware ESXi 8.0 or later	Other Image	Non-Standard	24	128	128.001	$0.10	$12.80	$2.280	264	$601.92	$614.72
cdbscsys1	Microsoft Windows Server 2022 (64-bit)	Windows	c5.4xlarge	16	32	100.001	$0.10	$10.00	$1.416	264	$373.82	$383.82
gwaching-txtest	Debian GNU/Linux 12 (64-bit)	Linux	Non-Standard	16	16	96.2998	$0.10	$9.63	$1.140	264	$300.96	$310.59
BXPClassification	Ubuntu Linux (64-bit)	Linux	m5.4xlarge	16	63	813.1201	$0.10	$81.31	$0.768	264	$202.75	$284.06
KWSC1	Microsoft Windows Server 2012 (64-bit)	Windows	c5.4xlarge	16	32	256.002	$0.10	$25.60	$1.416	264	$373.82	$399.42
BlueXP Data Classification (Ubuntu)	Ubuntu Linux (64-bit)	Linux	Non-Standard	16	68	1,024.001	$0.10	$102.40	$1.140	264	$300.96	$403.36
rtp-sa-otv10n01	Debian GNU/Linux 12 (64-bit)	Linux	Non-Standard	12	24	248	$0.10	$24.80	$1.230	264	$324.72	$349.52
cbo-otv01	Debian GNU/Linux 12 (64-bit)	Linux	Non-Standard	12	24	248	$0.10	$24.80	$1.230	264	$324.72	$349.52

Description: This report shows potential resources that are cloud ready for AWS and AZURE hyperscalers. AWS example on left.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled. VMware discovered by DII.

Report XML for AWS: 4.6 AWS Cloud Ready Analysis

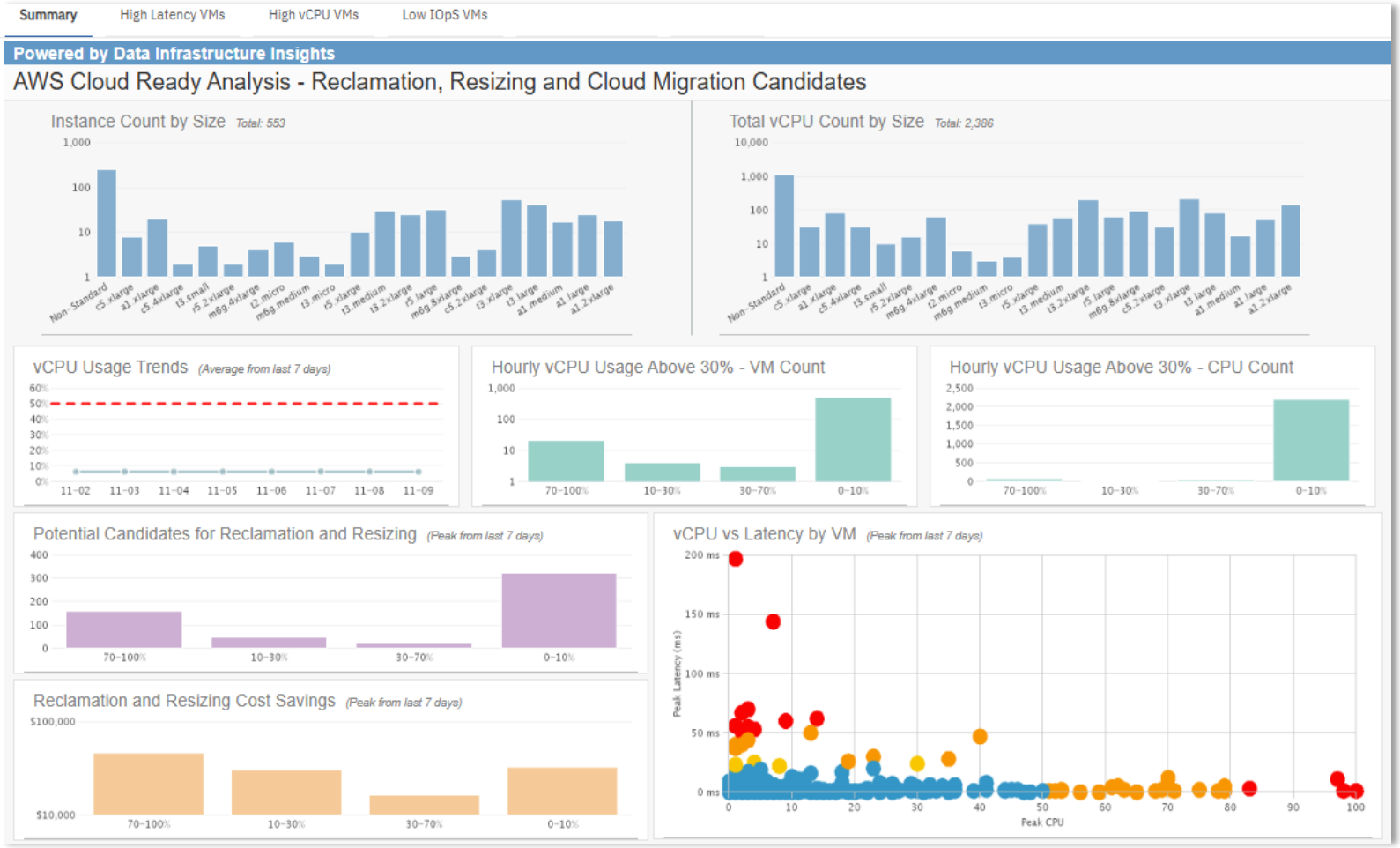
Report XML for AZURE: 4.10 AZURE Cloud Ready Analysis

4.6 Cloud Ready Analysis Definitions

Summary - Definitions

Config Type	Virtual Machine sizes as defined by the AWS Rate Cards.
Count	Total count of virtual machines
Total CPU for Config Type	Total count of CPUs associated with each Config Type
CPU %	CPU Utilization in % as reported by the Virtual Machine
Total IOpS	Total IOpS (both Read and Write) as reported by the Virtual Machine for the designated time period
Latency (ms)	Latency (or Read and Write response time) in milliseconds as reported by the Virtual Machine
VM	Name of the Virtual Machine or VM
OS	Operating System associated with the Virtual Machine
CPU	Number of CPUs associated with the Virtual Machine
Memory (GB)	Amount of RAM allocated to the Virtual Machine in GB
Provisioned (GiB)	Provisioned Capacity in Gibybytes as reported by the Virtual Machine
Total MBps	Total Throughput (both Read and Write) in MB/second associated with the Virtual Machine
Latency (ms)	Average Latency in milliseconds associated with the Virtual Machine (for ON-PREM instances only)
Costs (Pay as You Go)	Cost associated with the Config Type or VM Size as provided by the AWS Rate Card imported into OCI DWH
Hours	Number of operational hours to date
Total Cost	Hours * Costs (Pay as You Go)
Projected Cost for Month	Projected Monthly Costs of All Off-Prem Instances

4.7 Cloud Ready Analysis, Reclamation, Resizing and Cloud Migration Candidates



Description: This report shows potential resources that can be reclaimed, resized or are cloud ready for AWS/AZURE migration. Additional report pages include High Latency VM's, High vCPU VMs and Low IOpS VMs.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled. VMware discovered by DII.

Report XML for AWS: 4.7 AWS Cloud Ready Analysis - Reclamation - Resizing and Cloud Migration Candidates

Report XML for AZURE: 4.11 AZURE Cloud Ready Analysis - Reclamation - Resizing and Cloud Migration Candidates

4.7 Cloud Ready Analysis Definitions

Summary - Definitions

VM Count	Total count of virtual machines including On-Prem and Off-Prem
Config Type	Virtual Machine sizes as defined by the AWS Rate Cards. If a Config Type shows 'Non-Standard' this is either because the OS is unknown or the vCPU and vRAM combination cannot be found in the AWS rate card.
vCPU	Number of CPUs (processors) provisioned to a Virtual Machine
vCPU %	CPU Utilization in % as reported by the Virtual Machine
CPU Count	Total count of CPUs provisioned to Virtual Machines both On-Prem and Off-Prem
Peak CPU %	Peak CPU Utilization in % as reported by the Virtual Machine
Peak Latency (ms)	Peak Latency in milliseconds associated with the Virtual Machine (for ON-PREM instances only)
TimeAbove30CPU	SUM(IF(cpu% > 30, 1, 0)) / COUNT(Date) - This will count the number of times the CPU % is over 30%
Ranges (Usage Above 30%)	IF([TimeAbove30CPU] <=.1) THEN ('0-10%') ELSE(IF([TimeAbove30CPU] <=.3) THEN ('10-30%')ELSE(IF([TimeAbove30CPU] <=.7) THEN ('30-70%')ELSE ('70-100%')))
Ranges (Reclamation/Resizing)	IF(PeakCPU <= 10 THEN '0-10%', ELSE IF(PeakCPU <= 30 THEN '10-30%', ELSE IF(PeakCPU <= 70 THEN '30-70%' ELSE '70-100%'))) AS 'Ranges'
Monthly Cost	Cost associated with the Config Type or VM Size as provided by the AWS Rate Card imported into OCI DWH
Date	Fulldate field available in the data dimension table and associated with FACT tables in the DWH

Detail Pages (High Latency, High CPU and Low IOpS) - Definitions

VM	Name of the Virtual Machine or VM
CPU Count	Number of CPUs (processors) provisioned to a Virtual Machine
Memory (GB)	Amount of RAM memory in GB provisioned to Virtual Machines
Config Type	Virtual Machine sizes as defined by the AWS Rate Cards. If a Config Type shows 'Non-Standard' this is either because the OS is unknown or the vCPU and vRAM combination cannot be found in the AWS rate card.
Total IOpS	Total IOpS (both Read and Write) as reported by the Virtual Machine for the designated time period
Peak IOpS	Peak IOpS (maximum for the day or hour) as reported by the Virtual Machine for the designated time period
CPU%	CPU Utilization in % as reported by the Virtual Machine
Peak CPU %	Peak CPU Utilization in % as reported by the Virtual Machine
Latency (ms)	Average Latency in milliseconds associated with the Virtual Machine (for ON-PREM instances only)
Peak Latency (ms)	Peak Latency in milliseconds associated with the Virtual Machine (for ON-PREM instances only)
Type	Defines the location of the Virtual Machine. e.g. On-Prem or Off-Prem
Provisioned (GiB)	Provisioned Capacity in Gibybytes as reported by the Virtual Machine

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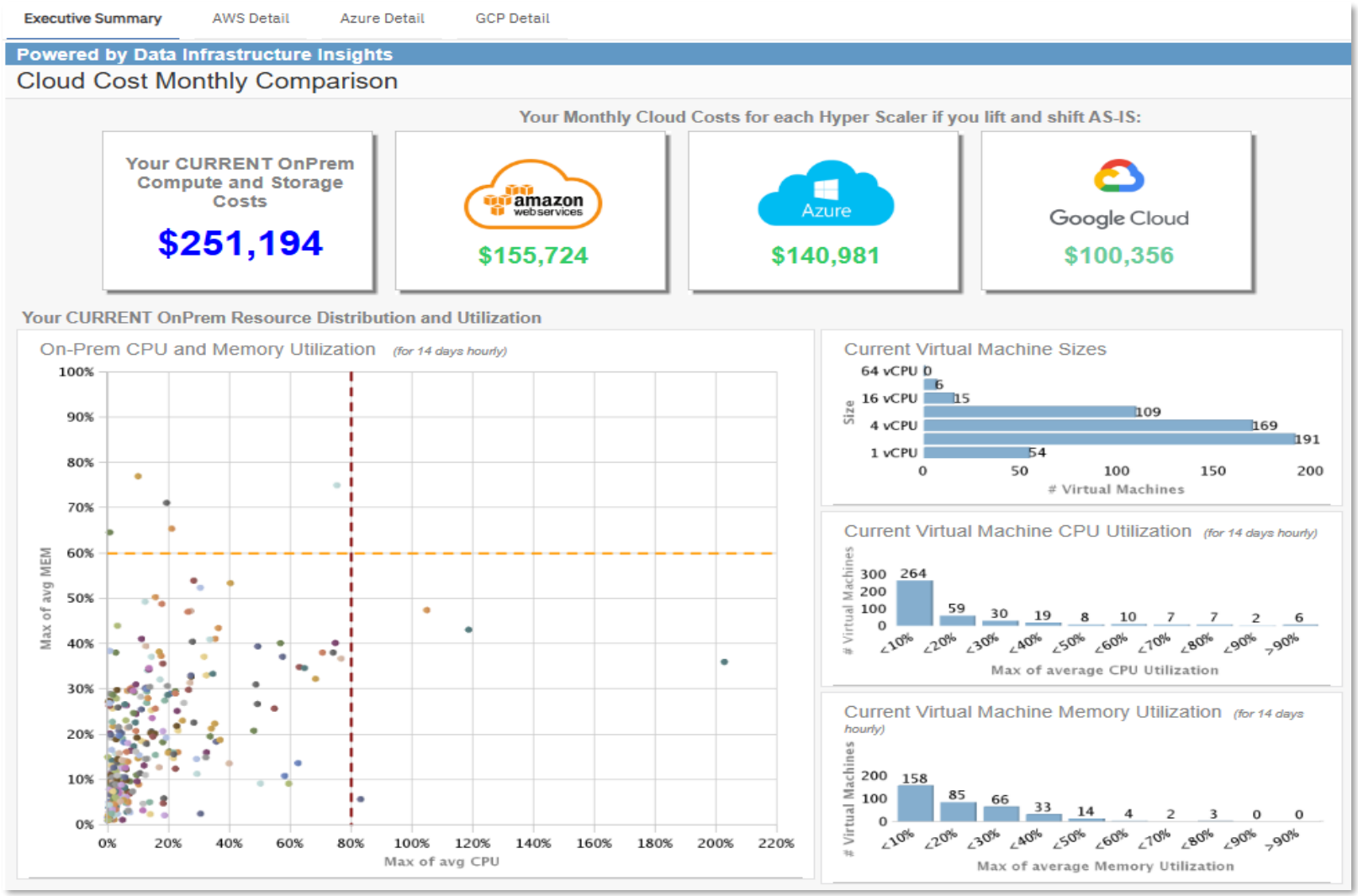
4.16 Cloud Cost Monthly Comparison



Description: This report shows the cost differences between all three hyperscalers. Detail lists of individual compute instances and the associated cost savings for migrating from onprem to cloud.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled. VMware discovered by DII.

Executive Summary | **AWS Detail** | Azure Detail | GCP Detail

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Cloud Cost Monthly Comparison - AWS Detail

Instance	Platform	Cores	Memory(GB)	Provisioned Capacity(GiB)	Used Capacity(GB)	AS-IS Configured	AS-IS Monthly Cost	Configured EBS	Avg IOPS	Configured EBS IOPS Cost	Configured EBS Cost	AS-IS S3 Cost	AS-IS Total Cost	OnPrem Cost	Price Diff +/-	Status
a41-dc	Windows	2	8	100.00	20.27	t3.large	$79.78	gp2	2	$0.16	$10.00	$2.00	$89.93	$153.20	$63.27	Cloud Candidate
aboell-vm	Windows	2	8	100.40	100.40	t3.large	$79.78	gp2	190	$12.35	$10.04	$2.01	$102.16	$153.35	$51.19	Cloud Candidate
aboell-vm2	Windows	2	8	108.08	108.08	t3.large	$79.78	gp2	877	$57.01	$10.81	$2.16	$147.59	$156.27	$8.68	Cloud Candidate
Active-Directory VSAQA Dont terminate	Other	2	4	30.00	0.00	a1.large	$36.72	gp2	5	$0.35	$3.00	$0.60	$40.07	$69.00	$28.93	Cloud Candidate
aiqum	Other	8	12	150.36	48.47	a1.2xlarge	$146.88	gp2	44	$2.85	$15.04	$3.01	$164.77	$229.94	$65.17	Cloud Candidate
AIQUM 9.11 (vApp)	Linux	4	12	152.00	103.75	a1.2xlarge	$146.88	gp2	28	$1.81	$15.20	$3.04	$163.89	$230.56	$66.67	Cloud Candidate
AIQUM 9.12 (Linux)	Other	6	16	100.01	54.87	a1.2xlarge	$146.88	gp2	2	$0.12	$10.00	$2.00	$157.17	$268.40	$111.23	Cloud Candidate
AIQUM 9.13 (vApp)	Linux	4	12	152.00	84.71	a1.2xlarge	$146.88	gp2	65	$4.23	$15.20	$3.04	$166.32	$230.56	$64.24	Cloud Candidate
AIQUM 9.14 (vApp)	Linux	4	12	152.00	83.67	a1.2xlarge	$146.88	gp2	71	$4.59	$15.20	$3.04	$166.68	$230.56	$63.88	Cloud Candidate
alexeym-lnx2	Other	2	8	16.00	6.38	a1.xlarge	$73.44	gp2	0	$0.01	$1.60	$0.32	$75.05	$121.28	$46.23	Cloud Candidate
alexz-jump	Linux	2	4	54.27	12.32	a1.large	$36.72	gp2	0	$0.00	$5.43	$1.09	$42.15	$78.22	$36.08	Cloud Candidate
amer-sa-liapenn-RHEL73	Linux	2	16	62.06	13.93	a1.2xlarge	$146.88	gp2	0	$0.00	$6.21	$1.24	$153.09	$253.98	$100.90	Cloud Candidate
amer-sa-liapenn-win10	Windows	2	16	48.86	0.00	t3.xlarge	$172.80	gp2	0	$0.00	$4.89	$0.98	$177.69	$248.97	$71.28	Cloud Candidate
amer-sa-liapenn-win2016	Windows	2	16	105.00	103.93	t3.xlarge	$172.80	gp2	7	$0.45	$10.50	$2.10	$183.75	$270.30	$86.56	Cloud Candidate
amer-sa-sfdesktop	Other	4	8	16.00	14.49	a1.xlarge	$73.44	gp2	0	$0.02	$1.60	$0.32	$75.06	$121.28	$46.22	Cloud Candidate
AN-JumpHost01	Windows	2	4	90.00	57.22	t3.medium	$43.20	gp2	18	$1.16	$9.00	$1.80	$53.37	$91.80	$38.43	Cloud Candidate
andrease_perf01	Windows	2	16	100.00	20.50	t3.xlarge	$172.80	gp2	2	$0.15	$10.00	$2.00	$182.95	$268.40	$85.45	Cloud Candidate
andrease_perf02	Windows	2	16	100.00	19.94	t3.xlarge	$172.80	gp2	3	$0.17	$10.00	$2.00	$182.97	$268.40	$85.43	Cloud Candidate
andrease-jumphost	Windows	4	32	250.00	32.90	t3.2xlarge	$345.60	gp2	4	$0.25	$25.00	$5.00	$370.85	$555.80	$184.96	Cloud Candidate
anindyas-spark	Linux	8	32	128.00	0.00	a1.4xlarge	$293.76	gp2	0	$0.00	$12.80	$2.56	$306.56	$509.44	$202.88	Cloud Candidate

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Cloud Cost Monthly Comparison - Azure Detail

Instance	Platform	Cores	Memory(GB)	Provisioned Capacity(GiB)	Used Capacity(GB)	AS-IS Configured	AS-IS Monthly Cost	Configured Disk	Configured Disk Cost	AS-IS Total Cost	OnPrem Cost	Price Diff +/-	Status
niels_win2022_barbuda_nvme	Windows	2	4.00	134.08	134.0811	A2_v2	$65.52	Standard_LRS_E15	$19.20	$84.72	$108.55	$23.83	Cloud Candidate
stjerna-mediator	Linux	4	16.00	36.14	36.1387	A4m_v2	$171.36	Standard_LRS_E6	$4.80	$176.16	$244.13	$67.97	Cloud Candidate
kw_scw1	Windows	8	32.00	140.00	74.3418	A8m_v2	$342.00	Standard_LRS_E15	$19.20	$361.46	$514.00	$152.54	Cloud Candidate
sap-lnx24-old-do-not-boot	Linux	2	24.00	106.33	72.9229	A4m_v2	$171.36	Standard_LRS_E10	$9.60	$180.96	$386.01	$205.05	Cloud Candidate
klaus_bench03	Linux	4	2.00	334.08	334.084	A4_v2	$137.52	Premium_LRS_E60	$946.08	$1,083.60	$155.75	($927.85)	Leave OnPrem
vsa-HAMediator1c-DO-NOT-DELETE	Other	2	4.00	24.00	0	A2_v2	$65.52	Standard_LRS_E4	$2.40	$67.92	$66.72	($1.20)	Leave OnPrem
rtp-sa-cleondris	Other	4	32.00	132.38	2.4229	A4m_v2	$171.36	Standard_LRS_E15	$19.20	$190.56	$511.10	$320.54	Cloud Candidate
johannew-jump	Windows	4	16.00	200.03	77.0586	A4m_v2	$171.36	Standard_LRS_E15	$19.20	$190.56	$306.41	$115.85	Cloud Candidate
kai_tinyvm	Linux	1	2.00	18.07	18.0713	A1_v2	$30.96	Standard_LRS_E6	$4.80	$35.76	$35.67	($0.09)	Leave OnPrem
stjerna-kvm1	Linux	8	24.00	2,122.15	2,122.1455	A8m_v2	$342.00	Premium_LRS_E50	$495.57	$837.63	$1,152.02	$314.39	Cloud Candidate
Phil's Demo Host	Windows	6	12.00	200.02	149.083	A8_v2	$288.00	Premium_LRS_E15	$38.02	$326.04	$248.81	($77.23)	Leave OnPrem
NAbox 4 (vApp)	Linux	4	8.00	411.52	137.0059	A4_v2	$137.52	Standard_LRS_E20	$38.40	$176.00	$271.58	$95.58	Cloud Candidate
Proxmox-Backup	Linux	4	24.00	56.08	56.0811	A4m_v2	$171.36	Standard_LRS_E6	$4.80	$176.16	$366.91	$190.75	Cloud Candidate
SCV1	Linux	4	12.00	100.08	28.291	A4m_v2	$171.36	Standard_LRS_E10	$9.60	$180.96	$210.83	$29.87	Cloud Candidate
racn1	Linux	4	8.00	108.09	108.0869	A4_v2	$137.52	Standard_LRS_E10	$9.60	$147.16	$156.27	$9.11	Cloud Candidate
baseloadGenerator_generalDS	Linux	1	4.00	48.00	16.7441	A2_v2	$65.52	Premium_LRS_E15	$38.02	$103.54	$75.84	($27.70)	Leave OnPrem
johan-win1	Windows	4	16.00	106.12	106.1152	A4m_v2	$171.36	Premium_LRS_E15	$38.02	$209.38	$270.72	$61.34	Cloud Candidate
hdumdey-k8s-2	Linux	2	8.00	36.80	33.1641	A2m_v2	$85.68	Standard_LRS_E6	$4.80	$90.48	$129.19	$38.71	Cloud Candidate
backuprestore	Windows	2	4.00	79.71	55.4951	A2_v2	$65.52	Standard_LRS_E10	$9.60	$75.12	$87.89	$12.77	Cloud Candidate
i-038f797316c09b0f7	Other	2	4.00	20.00	0	A2_v2	$65.52	Premium_LRS_E15	$38.02	$107.06	$66.20	($41.86)	Leave OnPrem

Report XML: 4.16 Cloud Cost Monthly Comparison

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4.16 Cloud Cost Monthly Comparison Definitions

Metric/Attribute	Description
Instance / VM Instance Name	
Platform	Operating system used by the instance e.g. Windows, Linux or Other
Cores	Number of virtual processors allocated to the instance or virtual machine
Memory(GiB)	Amount of RAM in Gibibytes allocated to the instance
Provisioned Capacity (GiB)	Amount of capacity in Gibibytes allocated to the instance
Used Capacity (GiB)	Amount of used capacity in Gibibytes reported by the instance
AS-IS Configured	The proposed hyperscaler configuration type for the virtual machine
AS-IS Monthly Cost	The hyperscaler hourly published cost associated with the instance for the entire month
Configured EBS	The EBS disk in Gibibytes that would be allocated to the instance in the cloud
Avg IOPS	Measures the average number of I/O service requests (read+write) on the instance during the selected time period (measured in I/O per sec)
Configured EBS IOPS Cost	The cost of IOPS as published by the hyperscaler
Configured EBS Cost	The cost of EBS disk(s) as published by the hyperscaler
AS-IS S3 Cost	The cost of object storage (S3) if used after migrating the instance to the cloud
AS-IS Total Cost	Total cost of the instance if migrating to the cloud
OnPrem Cost	The current retail cost of the virtual machine from VMware published prices
Price Diff +/-	This is the OnPrem Cost – AS-IS Total Cost
Status	WHEN [Price Diff +/-] < 0 THEN 'Leave OnPrem' ELSE 'Cloud Candidate'
Max of Avg CPU %	The max of average percentage of a physical CPU's processing power that is currently being used by that virtual instance, essentially measuring how much of the allocated CPU resources are actively being consumed
Max of Avg MEM %	The max of average percentage of the allocated RAM that is currently being used by the virtual machine, essentially indicating how much of its assigned memory is actively in use, often measured as a percentage of the total allocated memory to the virtual instance
Total OnPrem Cost	Total of vCPUcost + vRAMcost + storageCostperGiB
Total AWS Cost	AS-IS Monthly Cost + Configured EBS Cost + Configured EBS IOPS Cost + Data Transfer Cost
Total AZURE Cost	AS-IS Monthly Cost + Configured EBS Cost + Data Transfer Cost
Total GCP Cost	AS-IS Monthly Cost + Configured Disk Cost + Configured EBS IOPS Cost + Data Transfer Cost

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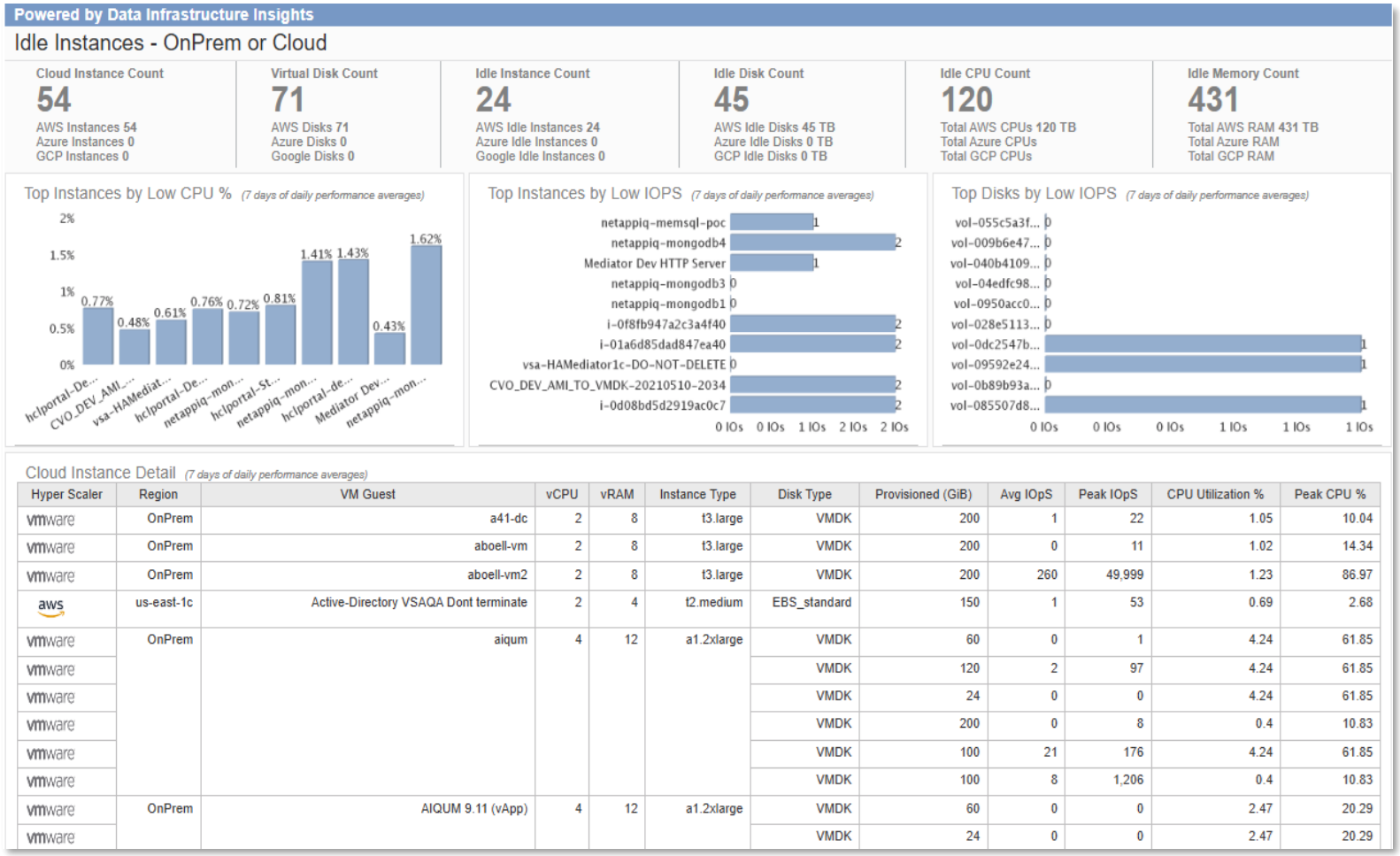
4.17 Idle Instances – OnPrem or Cloud



Hyper Scaler	Region	VM Guest	vCPU	vRAM	Instance Type	Disk Type	Provisioned (GiB)	Avg IOpS	Peak IOpS	CPU Utilization %	Peak CPU %
vmware	OnPrem	a41-dc	2	8	t3.large	VMDK	200	1	22	1.05	10.04
vmware	OnPrem	aboell-vm	2	8	t3.large	VMDK	200	0	11	1.02	14.34
vmware	OnPrem	aboell-vm2	2	8	t3.large	VMDK	200	260	49,999	1.23	86.97
aws	us-east-1c	Active-Directory VSAQA Dont terminate	2	4	t2.medium	EBS_standard	150	1	53	0.69	2.68
vmware	OnPrem	aiqum	4	12	a1.2xlarge	VMDK	60	0	1	4.24	61.85
vmware						VMDK	120	2	97	4.24	61.85
vmware						VMDK	24	0	0	4.24	61.85
vmware						VMDK	200	0	8	0.4	10.83
vmware						VMDK	100	21	176	4.24	61.85
vmware						VMDK	100	8	1,206	0.4	10.83
vmware	OnPrem	AIQUM 9.11 (vApp)	4	12	a1.2xlarge	VMDK	60	0	0	2.47	20.29
vmware						VMDK	24	0	0	2.47	20.29

Description: This report shows compute instances both On and Off Prem that are idle or significantly under-utilized. Currently the report defaults to Cloud (offprem).

Prerequisites: Data Infrastructure Insights (DII) reporting enabled. VMware discovered by DII.

Report XML: 4.17 Idle Instances - OnPrem or Cloud

4.17 Idle Instances – OnPrem or Cloud Definitions

Metric/Attribute	Description
Hyper Scaler	Name of the hyperscaler e.g. AWS, AZURE or Google Cloud
Region	The hyperscaler region associated with the instance discovered by DII
VM Guest / VM / Virtual Machine	Name of the VMware virtual machine discovered and monitored by DII
Instance	Name of the instance (cloud based virtual machine)
vCPU	Number of processors allocated to the instance
vRAM	Amount of Memory in Gibibytes allocated to the instance
Instance Type	The configuration type associated with the virtual instance e.g. for AWS, a1.medium, a1.large, a1.xlarge etc.
Disk Type	The disk type e.g. EBS_gp2, EBS_gp3 etc..
Provisioned (GiB)	Amount of capacity in Gibibytes allocated to the instance
Avg IOpS	Measures the average number of I/O service requests (read+write) on the instance during the selected time period (measured in I/O per sec)
Peak IOpS	Maximum I/O service requests for the collection period
CPU Utilization %	The percentage of a physical CPU's processing power that is currently being used by that virtual machine, essentially measuring how much of the allocated CPU resources are actively being consumed by the VM
Peak CPU %	Maximum CPU processing power on the instance for the collection period
Virtual Disk Count	Total number of virtual disks discovered by DII
Idle Instance Count	Total number of instances with Max of Average CPU Utilization % < 5
Idle Disk Count	Total number of disks with Peak IOPS < 20
Idle CPU Count	Total number of vCPUs based on Max of Average CPU Utilization % < 5
Idle Memory Count	Total number of vCPUs based on Max of Average CPU Utilization % < 5

4.18 Virtual Instances Powered Down

Powered by Data Infrastructure Insights

Virtual Instances Powered Down

Instance Detail *(Current Data)*

Hyper Scaler	Region	Virtual Machine	OS	vCPUs	vRAM (GB)	Guest State	State Change	Days Since Powered Down	Provisioned Capacity (GiB)	Used Capacity (GiB)	Used %
vmware	OnPrem	vcbackup	CentOS 7 (64-bit)	2	4	notRunning	Jan 12, 2023	669	164.86	7.23	4%
vmware	OnPrem	rtp-sa-komprise-proxy-02	Microsoft Windows Server 2016 (64-bit)	4	8	unknown	Jan 12, 2023	669	40.16	40.16	100%
vmware	OnPrem	rtp-sa-rubrik-02	Ubuntu Linux (64-bit)	4	24	unknown	Jan 12, 2023	669	1,155.52	1,071.35	93%
vmware	OnPrem	WebServerTM_MVN	Ubuntu Linux (64-bit)	4	12	unknown	Jan 21, 2023	660	200	31.8	16%
vmware	OnPrem	k8srp1-node2	CentOS 7 (64-bit)	2	4	notRunning	Jan 26, 2023	655	179.08	80.1	45%
vmware	OnPrem	k8srp1-node1	CentOS 7 (64-bit)	2	4	notRunning	Jan 26, 2023	655	187.91	85.79	46%
vmware	OnPrem	k8srp1-node3	CentOS 7 (64-bit)	2	4	notRunning	Jan 26, 2023	655	187.33	86.07	46%
vmware	OnPrem	Linux test	Red Hat Enterprise Linux 9 (64-bit)	4	12	unknown	Apr 25, 2023	566	20	0	0%
vmware	OnPrem	k8srp1-master1	CentOS 7 (64-bit)	4	4	notRunning	Jul 6, 2023	494	204.67	121.76	59%
vmware	OnPrem	sfdebian	Debian GNU/Linux 12 (64-bit)	4	16	notRunning	Sep 23, 2023	415	216.27	4.6	2%
vmware	OnPrem	johannew-kkp04	Ubuntu Linux (64-bit)	4	16	notRunning	Sep 27, 2023	411	116.27	11.98	10%
vmware	OnPrem	johannew_kkp06	Ubuntu Linux (64-bit)	4	16	notRunning	Sep 27, 2023	411	116.28	11.55	10%
vmware	OnPrem	johannew-kkp01	Ubuntu Linux (64-bit)	4	16	notRunning	Sep 27, 2023	411	41.28	11.88	29%
vmware	OnPrem	johannew-kkp02	Ubuntu Linux (64-bit)	4	16	notRunning	Sep 27, 2023	411	41.28	11.83	29%
vmware	OnPrem	johannew_kkp05	Ubuntu Linux (64-bit)	4	16	notRunning	Sep 27, 2023	411	116.28	11.86	10%
vmware	OnPrem	johannew-kkp03	Ubuntu Linux (64-bit)	4	16	notRunning	Sep 27, 2023	411	41.28	11.55	28%
vmware	OnPrem	johannew_kkp_ucw02	Ubuntu Linux (64-bit)	4	16	notRunning	Sep 29, 2023	409	116.27	39.56	34%
vmware	OnPrem	johannew_kkp_ucw03	Ubuntu Linux (64-bit)	4	16	notRunning	Sep 29, 2023	409	116.28	37.69	32%
vmware	OnPrem	johannew_kkp_ucw01	Ubuntu Linux (64-bit)	4	16	notRunning	Sep 29, 2023	409	116.28	40.35	35%
vmware	OnPrem	HCIBench_2.8.1	Other 3.x or later Linux (64-bit)	8	8	notRunning	Oct 13, 2023	395	224.35	216.01	96%
vmware	OnPrem	Devsvr	Microsoft Windows Server 2016 or later (64-bit)	4	12	unknown	Oct 28, 2023	380	101.36	60.18	59%
vmware	OnPrem	kubevirt-single1	Ubuntu Linux (64-bit)	4	16	notRunning	Jan 3, 2024	313	116.27	45.15	39%
vmware	OnPrem	kubevirt-single2	Ubuntu Linux (64-bit)	4	16	notRunning	Jan 3, 2024	313	116.27	16.1	14%
vmware	OnPrem	kw_mdsq1	Microsoft Windows Server 2019 (64-bit)	2	16	unknown	Jan 22, 2024	294	90	40.23	45%
vmware	OnPrem	kw_mdsq2	Microsoft Windows Server 2019 (64-bit)	2	16	unknown	Jan 22, 2024	294	90	37.33	41%
vmware	OnPrem	awx.swelab.local - Ansible AWX	Ubuntu Linux (64-bit)	2	16	notRunning	Feb 20, 2024	265	80.87	64.32	80%
vmware	OnPrem	Arrow-OTS-01	FreeBSD Pre-11 versions (64-bit)	4	16	unknown	Feb 21, 2024	264	2,315.64	2,200.74	95%
vmware	OnPrem	Arrow-OTS-02	FreeBSD Pre-11 versions (64-bit)	4	16	unknown	Feb 26, 2024	259	2,315.64	2,195.79	95%
vmware	OnPrem	srichard-fbsd-head	Other (32-bit)	32	64	unknown	Feb 28, 2024	257	1,000	499.5	50%
vmware	OnPrem	git.swelab.local	Ubuntu Linux (64-bit)	2	8	notRunning	Mar 28, 2024	228	72.67	7.66	11%

Description: This report shows OnPrem or Cloud compute instances that are powered down.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled. VMware or Cloud Hyperscalers discovered by DII.

Report XML: 4.18 Virtual Instances Powered Down

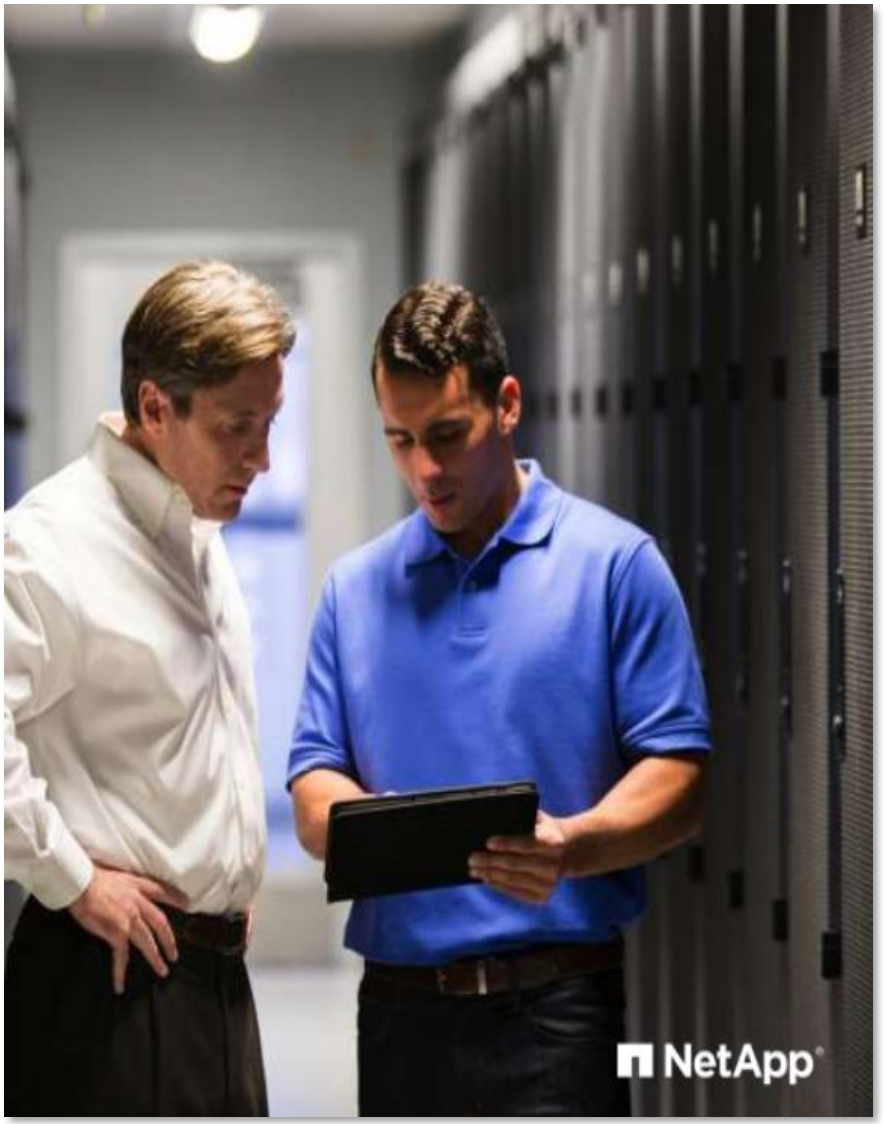
4.18 Virtual Instances Powered Down Definitions

Metric/Attribute	Description
Hyper Scaler	Name of the hyperscaler e.g. AWS, AZURE or Google Cloud
Region	The hyperscaler region associated with the instance discovered by DII
Virtual Machine	Name of the VMware virtual machine discovered and monitored by DII
OS	Operating system used by the instance e.g. Windows, Linux or Other
vCPUs	Number of processors allocated to the instance
vRAM (GiB)	Amount of Memory in Gibibytes allocated to the instance
Guest State	The combined state of the virtual hardware of the virtual machine and of the guest OS
State Change	Time when the power state has changed to the current value
Days Since Powered Down	This is the state change modified to show the number of days powered down. DATEDIFF(NOW(),hv_virtual_machine.powerStateChangeTime)
Provisioned Capacity (GiB)	Amount of capacity in Gibibytes allocated to the instance
Used Capacity (GiB)	Amount of used capacity in Gibibytes allocated to the instance
Used %	Used Capacity (GiB) / Provisioned Capacity (GiB)

Executive Overview

The objective of Executive reporting will encompass Compute And Storage Infrastructure Risks, Alert load, and focus on savings. Here are some of the objectives met by this section:

- ❑ Risk Report – Storage Node and Compute – Executive Level
- ❑ Executive Capacity Report
- ❑ Executive Capacity Report with KPIs
- ❑ Compute Capacity and Performance Savings
- ❑ Storage Capacity and Performance Savings
- ❑ Storage Capacity Trends – Executive Level
- ❑ Compute Infrastructure Performance - Executive Level
- ❑ VM Configuration Risk Report
- ❑ NetApp Storage Node Alert Counts

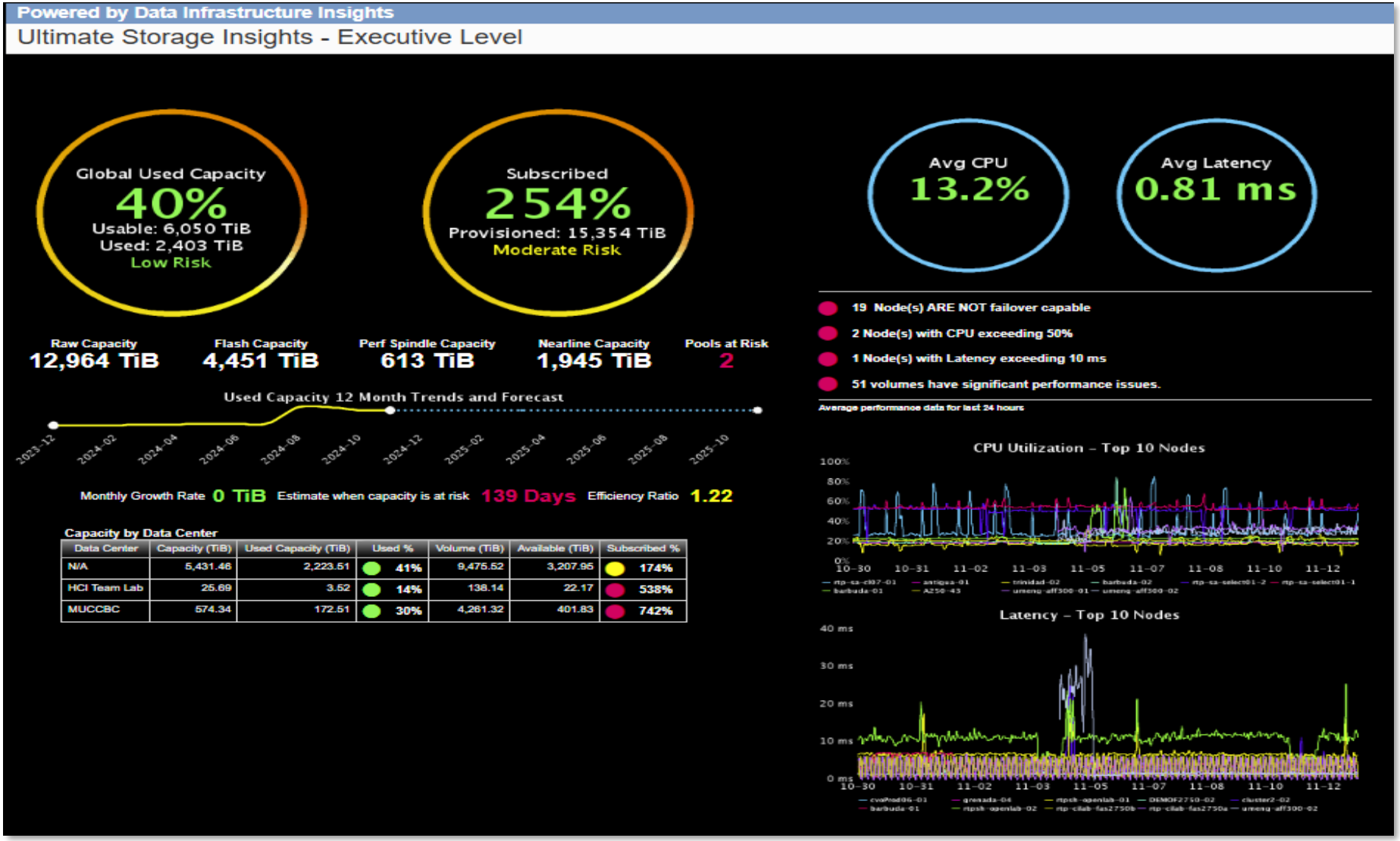


NetApp

5.0a Ultimate Storage Insights – Executive Level

Description: This report shows storage risk from a capacity and performance perspective.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.



Capacity by Data Center

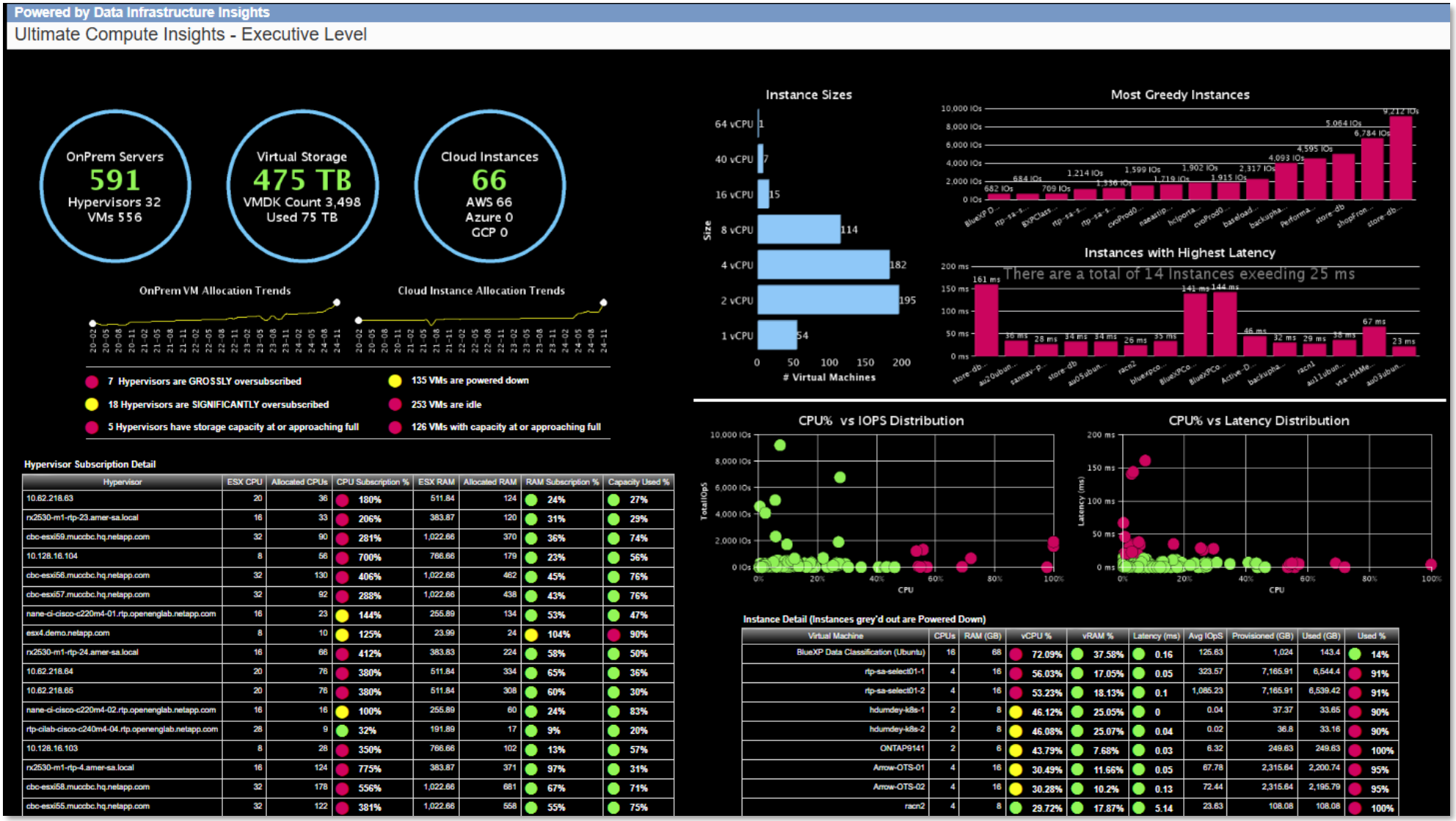
Data Center	Capacity (TiB)	Used Capacity (TiB)	Used %	Volume (TiB)	Available (TiB)	Subscribed %
N/A	5,431.48	2,223.51	41%	9,475.52	3,207.95	174%
HCI Team Lab	25.69	3.52	14%	138.14	22.17	538%
MUCCBC	574.34	172.51	30%	4,261.32	401.83	742%

Report XML: 5.0a Ultimate Storage Insights

5.0b Ultimate Compute Insights – Executive Level

Description: This report shows compute risk from a capacity and performance perspective.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.



Hypervisor	ESX CPU	Allocated CPUs	CPU Subscription %	ESX RAM	Allocated RAM	RAM Subscription %	Capacity Used %
10.62.218.63	20	36	180%	511.84	124	24%	27%
rx2530-m1-rtp-23.amer-sa.local	16	33	206%	383.87	120	31%	29%
cbc-esxi59.muccbc.hq.netapp.com	32	90	281%	1,022.66	370	36%	74%
10.128.16.104	8	56	700%	766.66	179	23%	56%
cbc-esxi58.muccbc.hq.netapp.com	32	130	406%	1,022.66	462	45%	76%
cbc-esxi57.muccbc.hq.netapp.com	32	92	288%	1,022.66	438	43%	76%
nane-ci-cisco-c220m4-01.rtp.openenglab.netapp.com	16	23	144%	255.89	134	53%	47%
esx4.demo.netapp.com	8	10	125%	23.99	24	104%	90%
rx2530-m1-rtp-24.amer-sa.local	16	66	412%	383.83	224	58%	50%
10.62.218.64	20	76	380%	511.84	334	65%	36%
10.62.218.65	20	76	380%	511.84	308	60%	30%
nane-ci-cisco-c220m4-02.rtp.openenglab.netapp.com	16	16	100%	255.89	60	24%	83%
rtp-cilab-cisco-c240m4-04.rtp.openenglab.netapp.com	28	9	32%	191.89	17	9%	20%
10.128.16.103	8	28	350%	766.66	102	13%	57%
rx2530-m1-rtp-4.amer-sa.local	16	124	775%	383.87	371	97%	31%
cbc-esxi58.muccbc.hq.netapp.com	32	178	556%	1,022.66	681	67%	71%
cbc-esxi55.muccbc.hq.netapp.com	32	122	381%	1,022.66	558	55%	75%

Virtual Machine	CPUs	RAM (GB)	vCPU %	vRAM %	Latency (ms)	Avg IOpS	Provisioned (GB)	Used (GB)	Used %
BlueXP Data Classification (Ubuntu)	16	68	72.09%	37.58%	0.16	125.63	1,024	143.4	14%
rtp-sa-select01-1	4	16	56.03%	17.05%	0.05	323.57	7,165.91	6,544.4	91%
rtp-sa-select01-2	4	16	53.23%	18.13%	0.1	1,085.23	7,165.91	6,539.42	91%
hdumdey-k8s-1	2	8	46.12%	25.05%	0	0.04	37.37	33.65	90%
hdumdey-k8s-2	2	8	46.08%	25.07%	0.04	0.02	36.8	33.16	90%
ONTAP9141	2	8	43.79%	7.68%	0.03	6.32	249.63	249.63	100%
Arrow-OTS-01	4	16	30.49%	11.66%	0.05	67.78	2,315.64	2,200.74	95%
Arrow-OTS-02	4	16	30.28%	10.2%	0.13	72.44	2,315.64	2,195.79	95%
racn2	4	8	29.72%	17.87%	5.14	23.63	108.08	108.08	100%

Report XML: 5.0b Ultimate Compute Insights

5.0 Ultimate Storage and Compute Insights Definitions

Metric/Attribute	Description
Storage Insights	
Data Center	DII configured annotation. Defines the location of the device
Raw Capacity	Pre-RAID Raw Capacity in TiB of all disks as reported by the storage device monitored by DII and contained in the Storage and Storage Pool Capacity Fact table. Represented as: capacity * rawToUsableRatio
Flash Capacity	The sum of all disk capacity discovered by DII where type is SSD and speed is null
Perf Spindle Capacity	The sum of all disk capacity discovered by DII where speed is > 8000
Nearline Capacity	The sum of all disk capacity discovered by DII where speed is = 7200
Pools at Risk	The number of pools or aggregates that are < 365 days until capacity full. Does not include root or aggr0.
Capacity (TiB)	Usable capacity allocated for a storage-pool as reported by the storage-array in Tebibytes (Base 2 units)
Used Capacity (TiB)	Used capacity in Tebibytes as reported by the storage pool or aggregate. If Thin Provisioned, then Used = Written. If Thick Provisioned then Used = Allocated or 100%
Used %	Used Capacity (TiB) / Capacity (TiB) ● Used % >= .9 ● Used % Between .7 and .9
Volume (TiB)	The greater of Internal Volume (Flexvol) and Block Volume capacity in Tebibytes as reported by the storage pool or aggregate
Internal Volume Allocated (TiB)	Total allocated capacity in Tebibytes from the internal volume (Flexvol)
Available (TiB)	Capacity (TiB) - Used Capacity (TiB)
Subscribed %	Volume (TiB) / Capacity (TiB) ● Subscribed % >= 3 ● Subscribed % Between 1.5 and 3
Provisioned TiB	Block Volume Capacity + Internal Volume Allocated in Tebibytes
Subscription Status	WHEN [Subscribed %] > 3 THEN 'High Risk' WHEN [Subscribed %] BETWEEN 1.5 AND 3 THEN 'Moderate Risk' ELSE 'Low Risk'
Monthly Growth Rate	Volume (TiB) / Capacity (TiB)
Pool Efficiency Ratio	Used Capacity (TiB) / (UsedCapacityTiB – PoolCompactedTiB)
Forecast Capacity	Projected Used Capacity in Tebibytes for the future 12 month period
Node CPU Utilization %	Node CPU Utilization shows the percentage of time that one or more CPUs were busy. In DII, this is based on the higher of CPU, WAFL_EX and Kahuna Processor Domain metrics. Details are as follows: • System – avg_processor_busy, cpu_elapsed_time1 • WAFL – total_cp_msecs, cp_phase_times.P2_FLUSH • Processor – domain_busy, processor_elapsed_time

	Overall node utilization then is displayed as the higher of the 3 (system, WAFL or processor domains) which all indicate a controller's ability (utilization) to process read/write requests
Latency	The time it takes from the moment a request for information arrives at the Storage Node to the time when the instance begins to send the information back in response. This is the actual latency of the device in milliseconds
Compute Insights	
Hypervisors Subscription Indicators	● If hypervisors are over subscribed by 500% or more ● If hypervisors are over subscribed between 150 and 300%
Idle VMs	● If any virtual machines are idle e.g. zero IOPS for 90 days
Virtual Storage Provisioned	Amount of capacity in Gibibytes allocated to the instance
Virtual Storage Used	Amount of capacity used in Gibibytes allocated to the instance
Most Greedy Instances	Top 15 virtual instances with the highest amount of I/Os
Hypervisor	Name of the hypervisor discovered and monitored by DII
ESX CPU	The CPU count associated with the hypervisor
Allocated CPUs	Total number of vCPUs allocated to virtual machines
CPU Subscription %	Allocated CPUs / ESX CPU ● CPU Subscription % > 150 ● CPU Subscription % Between 100 and 150
ESX RAM	The amount of RAM in Gibibytes associated with the hypervisor
Allocated RAM	Total amount of vRAM allocated to virtual machines
RAM Subscription %	Allocated RAM / ESX RAM ● RAM Subscription % > 150 ● RAM Subscription % Between 100 and 150
Virtual Machine	Name of the virtual machine associated with the hypervisor
CPUs	Number of vCPUs allocated to individual virtual machines
RAM (GiB)	Amount of vRAM in Gibibytes allocated to individual virtual machines
Datastore Provisioned (GiB)	Amount of capacity in Gibibytes allocated to the datastore
Datastore Used (GiB)	The amount of data-store capacity being used (vm_capacity_fact.ActualMB/1024)
ESX Capacity Used %	Datastore Used (GiB) / Datastore Provisioned (GiB) ● ESX Capacity Used % > .85
vCPU %	The average percentage of a physical CPU's processing power that is currently being used by that virtual instance, essentially measuring how much of the allocated CPU resources are actively being consumed ● vCPU % > 50 ● vCPU % Between 30 and 50
vRAM %	The average percentage of the allocated RAM that is currently being used by the virtual machine ● vRAM % > 70 ● vRAM % Between 50 and 70
Latency (ms)	The time it takes from the moment a request for information arrives at the instance to the time when the instance begins to send the information back in response. This is the actual latency of the device in milliseconds

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	• Latency (ms) > 15 • Latency (ms) Between 10 and 15
Avg IOPS	Measures the total number of I/O service requests (read+write) on the volume during the selected time period (measured in I/O per sec)
Provisioned (GiB)	Amount of capacity in Gibibytes allocated to the virtual instance
Used (GiB)	Amount of capacity used in Gibibytes by the virtual instance
Used %	Used (GiB) / Provisioned (GiB) • Used % > .90 • Used % Between .70 and .90

5.0c Compute Optimization – Executive Level

Description: This report shows savings from compute optimization.

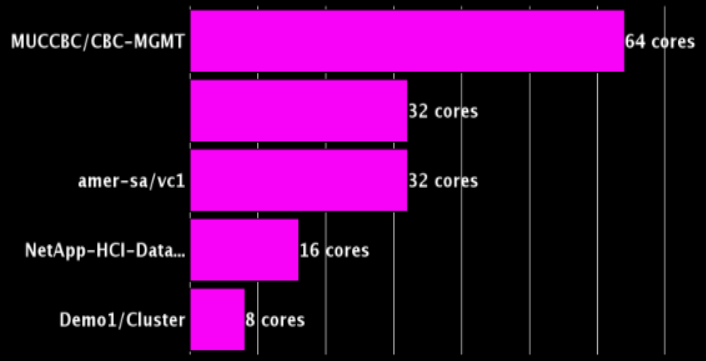
Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Powered by Data Infrastructure Insights

Compute Optimization - Executive Level

Save 152 cores by decommissioning 9 hypervisors
Decommission of these hypervisors will reduce your consumption of cores by 25%

Top N clusters by core savings opportunities (cores)

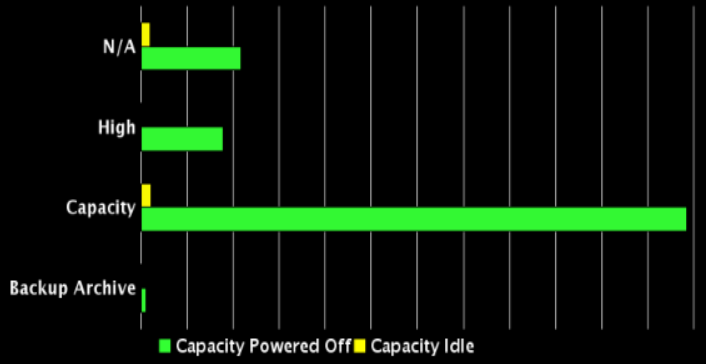


Memory saved (TiB)	NAS Capacity saved (TiB)	SAN Capacity saved (TiB)
4.77	862.85	38.77
31% savings	27% savings	37% savings

Cluster	Hypervisor	VM Count	CPU Count	RAM GiB	Total NFS Allocated GiB	iSCSI Capacity GiB
NetApp-HCI-Datacenter-01/NetApp-HCI-Cluster-01	10.128.16.102	11	8	766.66	4,307.00	
NetApp-HCI-Datacenter-01/NetApp-HCI-Cluster-01	10.128.16.105	3	8	766.66	4,307.00	
MUCCBC/CBC-MGMT	cbc-esxi55.muccbc.hq.netapp.com	43	32	1,022.66	319,409.94	8,219.50
MUCCBC/CBC-MGMT	cbc-esxi59.muccbc.hq.netapp.com	30	32	1,022.66	299,203.13	8,219.50
Demo1/Cluster	esx3.demo.netapp.com	5	8	23.99	1,029.00	10,277.50
	nane-ci-cisco-c220m4-01.rtp.openenglab.netapp.com	10	16	255.89	22,528.00	4,096.00
	nane-ci-cisco-c220m4-02.rtp.openenglab.netapp.com	5	16	255.89	23,040.00	4,096.00
amer-sa/vc1	rx2530-m1-rtp-23.amer-sa.local	7	16	383.87	116,088.59	4,787.00

Save 163.31 TiB by reclaiming 221 virtual machines
Reclaiming these VMs wil reduce your allocated capacity by 52%

Underutilized capacity by storage tier (TiB)



vCPU saved	Memory saved (TiB)
975	3.43
35% savings	37% savings

VM	vCPU	vRAM GiB	Tier	Capacity Idle	Capacity Powered Off
rtp-sa-s1g3	8	19	Capacity	0 TiB	12.1 TiB
rtp-sa-s2g2	8	19	Capacity	0 TiB	12.1 TiB
rtp-sa-s3g1	8	19	Capacity	0 TiB	12.1 TiB
rtp-sa-s3g3	8	19	Capacity	0 TiB	12.1 TiB
rtp-sa-s1g2	8	19	Capacity	0 TiB	12.1 TiB
rtp-sa-s2g1	8	19	Capacity	0 TiB	12.1 TiB
rtp-sa-s2g3	8	19	Capacity	0 TiB	12.1 TiB
rtp-sa-s3g2	8	19	Capacity	0 TiB	12.1 TiB

Report XML: 5.0c Compute Optimization - Executive Level

5.0c Compute Optimization – Executive Level Definitions

Metric/Attribute	Description
Storage Insights	
Tier	DII configured annotation. Defines tiers of storage based on disk type, disk speed, etc.
Cluster	Name of the ESX Cluster discovered and monitored by DII
Hypervisor	Name of the ESX host (hypervisor) associated with the Cluster
VM	Name of the virtual machine associated with the hypervisor
VM Count	Total number of virtual machines associated with each hypervisor
CPU Count	Total number of physical CPUs associated with each hypervisor
RAM GiB	Total amount of RAM in Gibibytes associated with each hypervisor
Total NFS Allocated GiB	Sum of NFS allocated capacity in Gibibytes
iSCSI Capacity GiB	Sum of iSCSI capacity in Gibibytes
vCPU	Number of vCPUs allocated to virtual instances
vRAM GiB	Amount of Memory in Gibibytes allocated to virtual instances
Capacity Idle	Amount of Capacity in Tebibytes that has zero Throughput (MBps) for 90 days
Capacity Powered Off	Number of virtual machines where the guestState = poweredOff
CPU %	The average utilization percentage of physical CPUs associated with the ESX server or hypervisor
Total IOPS	Measures the total number of I/O service requests (read+write) on the volume during the selected time period (measured in I/O per sec)
Hypervisor Decommission Criteria	ESX servers or hypervisors where Total IOPS < 100 AND CPU% < 10
Memory Saved TiB	Sum of Memory in Gibibytes when virtual machine guest state = poweredOff
NAS Capacity Saved TiB	Amount of NAS capacity saved in Tebibytes when all hypervisors that meet the criteria have been decommissioned
SAN Capacity Saved TiB	Amount of SAN capacity saved in Tebibytes when all hypervisors that meet the criteria have been decommissioned
vCPU Saved	Total vCPUs that can be reclaimed when the instance is idle or powered off
vRAM Saved	Total Memory in Gibibytes that can be reclaimed when the instance is idle or powered off

5.1a Risk Report – Storage Risk

Powered by Data Infrastructure Insights

Node Storage Risk (Capacity & Performance)

Storage Risk *(30 Day Trends)*

Node	Capacity Risk (Capacity > 75% used)	Capacity Impact (Prod & DR)	Performance Risk (High Response Times)	Performance Impact (Prod & DR)
ocisedev-02		Insufficient Capacity. There are 18 volume(s) greater than 75% used		Performance is not at risk
umeng-aff300-02		Insufficient Capacity. There are 21 volume(s) greater than 75% used		Significant performance issues with 6 volume(s). There are also Moderate performance issues with 1 volume(s).
rtp-cilab-fas2750a		Insufficient Capacity. There are 1 volume(s) greater than 75% used		Performance is not at risk
rtp-sa-cl05-01		Insufficient Capacity. There are 11 volume(s) greater than 75% used		Performance is not at risk
cluster1-02		Insufficient Capacity. There are 2 volume(s) greater than 75% used		Performance is not at risk
Fsxid0e2fc280c041f12c9-01		Insufficient Capacity. There are 2 volume(s) greater than 75% used		Performance is not at risk
umeng-aff300-01		Insufficient Capacity. There are 12 volume(s) greater than 75% used		Significant performance issues with 3 volume(s).
rtp-sa-select02-01		Insufficient Capacity. There are 3 volume(s) greater than 75% used		Performance is not at risk
rtp-sa-select-sgl1-01		Insufficient Capacity. There are 1 volume(s) greater than 75% used		Performance is not at risk
barbuda-01		Insufficient Capacity. There are 4 volume(s) greater than 75% used		Significant performance issues with 21 volume(s). There are also Moderate performance issues with 10 volume(s).
rtp-sa-cl07-01		Insufficient Capacity. There are 21 volume(s) greater than 75% used		Performance is not at risk
rtpsh-openlab-02		Insufficient Capacity. There are 1 volume(s) greater than 75% used		Performance is not at risk
antigua-02		Insufficient Capacity. There are 7 volume(s) greater than 75% used		Perfon
grenada-04		Insufficient Capacity. There are 28 volume(s) greater than 75% used. There are 10 between 65 and 75% used.		Perfon
aff300-sa-rtp-1-02		Insufficient Capacity. There are 2 volume(s) greater than 75% used		Perfon
epic-select-02		Insufficient Capacity. There are 2 volume(s) greater than 75% used		Perfon
cluster1-01		Insufficient Capacity. There are 1 volume(s) greater than 75% used. There are 1 between 65 and 75% used.		Perfon
rtp-sa-cl01-08		Insufficient Capacity. There are 2 volume(s) greater than 75% used		Perfon
barbuda-02		Insufficient Capacity. There are 5 volume(s) greater than 75% used		Perfon
rtp-sa-cl06-01		Insufficient Capacity. There are 14 volume(s) greater than 75% used. There are 1 between 65 and 75% used.		Perfon
rtp-sa-cl01-05		Insufficient Capacity. There are 8 volume(s) greater than 75% used		Perfon
gemini-04		Insufficient Capacity. There are 9 volume(s) greater than 75% used		Perfon
rtp-sa-cl05-02		Insufficient Capacity. There are 18 volume(s) greater than 75% used		Perfon

Thresholds

Capacity and Performance

Threshold	Default Value
Storage Used Capacity % High Limit	0.75
Storage Used Capacity % Between	0.65 and 0.76
Storage High Latency (ms) Limit	10
Storage Latency (ms) Between	5 and 11
Cost to Address %	0.25
Storage Orphaned by Performance (IOPS)	1,000
Compute Used Capacity % High Limit	0.75
Compute Used Capacity % Between	0.65 and 0.76
Compute High Latency (ms) Limit	25
Compute Latency (ms) Between	10 and 26
Compute Cost Risk Elevated / Moderate / None	50,000 / 5,000 / 5,001 and 50,001
Compute Orphaned by Performance (IOPS)	300

Description: This report shows storage risk from a capacity and performance perspective. Thresholds insert is located on the bottom right of this page.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled. Application, tier and tier cost annotations deployed.

Report XML: 5.1 Risk Report - Storage Node and Compute

5.1b Risk Report – Compute Risk

Powered by Data Infrastructure Insights

Compute Risk (Capacity & Performance)

Compute Capacity Risk *(30 Day Trends)*

Cluster	Capacity Risk *(Capacity > 75% used)*	Capacity Impact (Prod & DR)	Performance Risk *(High Response Times)*	Performance Impact (Prod & DR)
DC-RTP-SA/rtp-sa-cluster		Insufficient Capacity. There are 16 server(s) greater than 75% used. There are 6 between 65 and 75% used.		Performance is not at risk
210811600188/us-east-1d		Capacity not at risk		Moderate performance issues with 16 server(s).
210811600188/us-east-1c		Capacity not at risk		Performance is not at risk
210811600188/us-east-1a		Capacity not at risk		Performance is not at risk
amer-sa/vc1		Insufficient Capacity. There are 9 server(s) greater than 75% used. There are 2 between 65 and 75% used.		Moderate performance issues with 1 server(s).
MUCCBC/CBC-MGMT		Insufficient Capacity. There are 53 server(s) greater than 75% used. There are 11 between 65 and 75% used.		Moderate performance issues with 1 server(s).
		Insufficient Capacity. There are 19 server(s) greater than 75% used. There are 1 between 65 and 75% used.		Significant performance issues with 30 server(s). There are also Moderate performance issues with 9 server(s).
NetApp-HCI-Datacenter-01/NetApp-HCI-Cluster-01		Insufficient Capacity. There are 35 server(s) greater than 75% used. There are 1 between 65 and 75% used.		Significant performance issues with 20 server(s). There are also Moderate performance issues with 37 server(s).
Demo1/Cluster		Insufficient Capacity. There are 8 server(s) greater than 75% used		Performance is not at risk

Customer Cost *(12 Month Trends)*

Cluster	Configured Cost	Compute Cost Risk	Compute Impact	12 Month Avg Cost Increase
MUCCBC/CBC-MGMT	$32,775		Negligable Cost Growth	$2,147
210811600188/us-east-1c	$5,026		Negligable Cost Growth	$756
210811600188/us-east-1d	$2,057		Negligable Cost Growth	$99
210811600188/us-east-1a	$565		Negligable Cost Growth	$102
amer-sa/vc1	$21,236		Negligable Cost Growth	$111
Demo1/Cluster	$1,387		Negligable Cost Growth	$302
NetApp-HCI-Datacenter-01/NetApp-HCI-Cluster-01	$11,156		Negligable Cost Growth	$664
DC-RTP-SA/rtp-sa-cluster	$18,568		Negligable Cost Growth	$3,096

Cost Optimization *(180 Day Trends)*

Cluster	Orphaned CPUs	Orphaned Memory GB	Orphaned GiB	Potential Monthly Savings
amer-sa/vc1	341	1,065.375	120,455.67	$28,730
210811600188/us-east-1c	104	388	3,125	$7,990
MUCCBC/CBC-MGMT	455	1,913.5	44,146.92	
Demo1/Cluster	21	54.375	602.01	

Compute Rate Card

Cost by Configuration

Configuration	Windows	Linux	RHEL
Cost per vCPU	0.02	0.01	0.03
Cost per GB of RAM	0.01	0.01	0.02
Cost per GB of Storage (monthly)	0.05	0.05	0.05
Cost per IOPS	0.10	0.10	0.10
Base License Cost	19	14	27
Administration Costs	1.28	0.68	1.54
Data Center Misc. Costs	2.25	2.25	2.25

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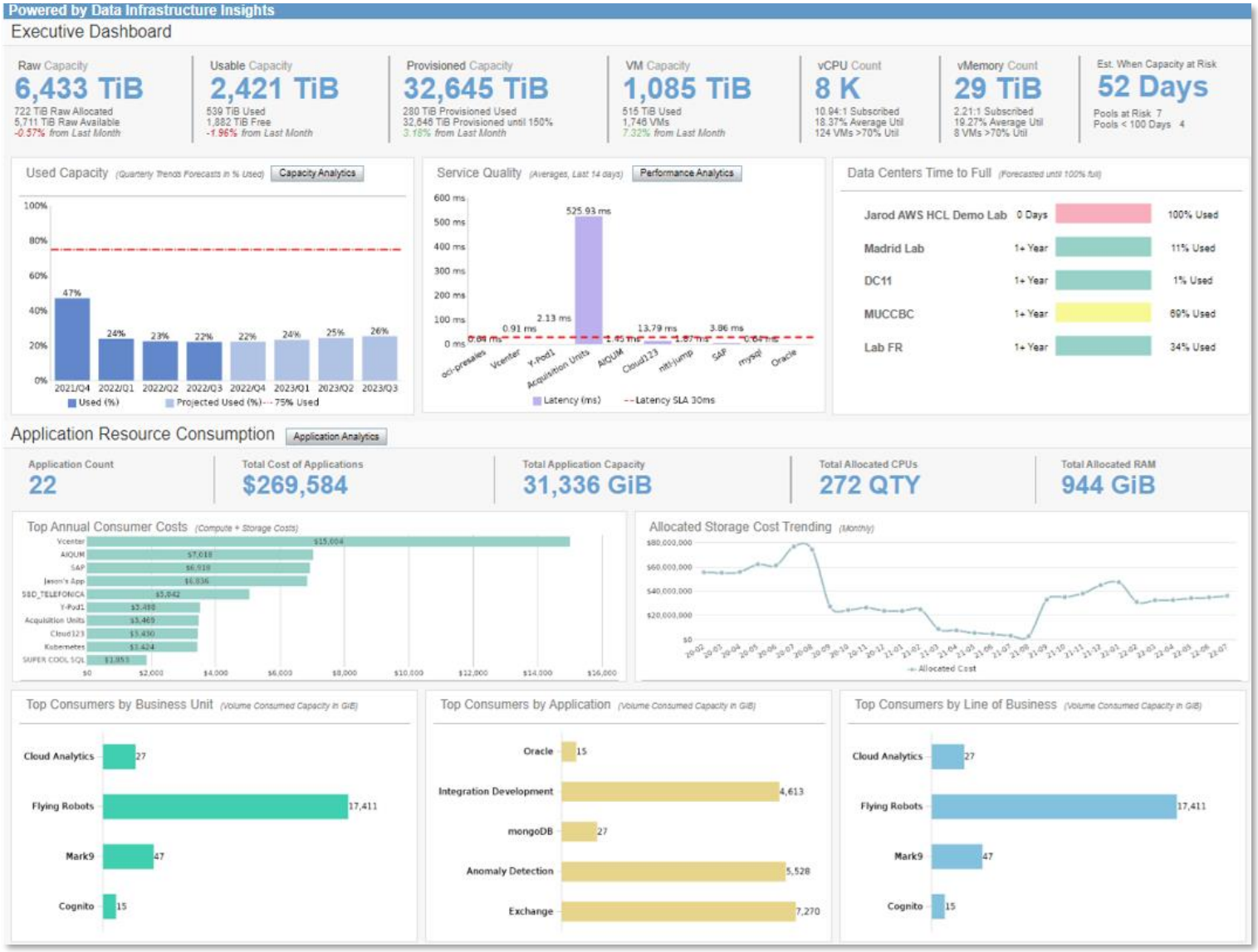
5.1 Risk Report – by Node and ESX Cluster – Executive Level Definitions

Metric/Attribute	Description
Storage	
Node	Name of the storage node discovered and monitored by DII
Data Center	Name of the Data Center assigned to the storage device
Storage Capacity Risk	Volume Used Capacity % > 75 Volume Used Capacity % Between 65 and 75 Volume Used Capacity % < 65 *If capacity is RED or YELLOW, then the number of volumes will be shown that meet each criteria*
Storage Performance Risk	Volume Latency > 10 (ms) Volume Latency between 5 and 10 (ms) Volume Latency less than 5 (ms) *If capacity is RED or YELLOW, then the number of volumes will be shown that meet each criteria*
Current Allocated GiB	Current allocated capacity in Gibibytes as reported by the internal volume (Flexvol)
Current Used GiB	Current used capacity in Gibibytes as reported by the internal volume (Flexvol)
Begin Used GiB	Used capacity in Gibibytes associated with the volume beginning 190 days (or less) from the current date
Growth Rate	Using a compound average growth rate function: power(Current Used GiB / Beginning Used GiB, 1/TIMESTAMPDIFF(MONTH,begin.date,end.date))-1
Months Until Full	Current Allocated GiB - Current Used GiB / Growth Rate
Monthly Costs	Derived from the report storage rate card. (CapEx_SubTotal + OpeEx_SubTotal) / sAcctMonths
Cost to Address	The total cost to replace storage capacity at risk. CostperGiB is derived from the report storage rate card IF(Months until Full <> '>24 Months') THEN (((Current Allocated GiB) * #prompt('sStorageCostToAddress','float','.25')#) * [CostperGiB]) ELSE (0)
Customer Orphaned (GiB)	Orphaned capacity in Gibibytes by volume performance where totalIOPSmax = 0 for 180 days
Potential Monthly Savings	Sum of Monthly Costs associated with Orphaned capacity
Compute	
Cluster	Name of the ESX cluster discovered and monitored by DII
Compute Capacity Risk	Server Used Capacity % > 75 Server Used Capacity % Between 65 and 75 Server Used Capacity % < 65 *If capacity is RED or YELLOW, then the number of Virtual Machines will be shown that meet each criteria*
Compute Performance Risk	Server Latency > 10 (ms) Server Latency between 5 and 10 (ms) Server Latency less than 5 (ms) *If capacity is RED or YELLOW, then the number of Virtual Machines will be shown that meet each criteria*
Configured Cost	From the compute rate card: [vCPUcost]+[vRAMcost]+[storageCost]+[Cost Per IOPS]
Growth Rate for Customer	
Compute Cost Risk / Compute Impact	[Growth Rate for Customer] < 5001 THEN 'Negligible Cost Growth' [Growth Rate for Customer] BETWEEN 5000 and 50001 THEN 'Moderate Cost Growth' [Growth Rate for Customer] > 50000 THEN 'Elevated Cost Growth'
12 Month Avg Cost Increase	Sum of ((End Cost - Begin Cost)/12 for [Cluster])
Orphaned CPUs	Sum of Orphaned CPU count. Virtual machines orphaned by performance where IOPS = 0 for 180 days
Orphaned Memory GiB	Sum of Orphaned RAM count.

Orphaned GiB	Sum of virtual machine orphaned provisioned capacity in Gibibytes
Potential Monthly Savings	From the compute rate card: [vCPUcost]+[vRAMcost]+[storageCost]

5.2 Executive Capacity Report with KPIs - Storage

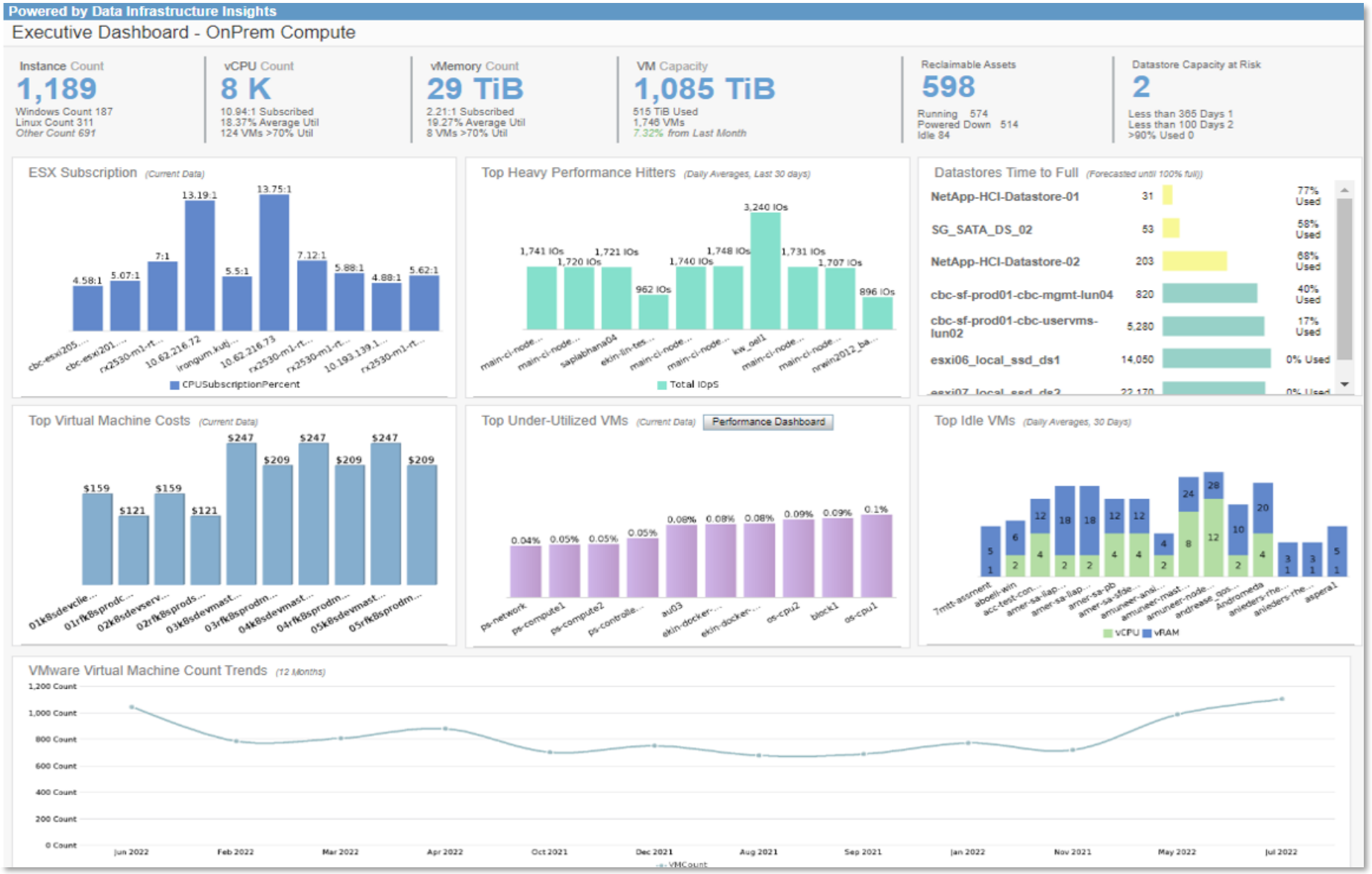


Description: This report shows storage and compute KPIs and SLA thresholds for Service Quality and Capacity Management. Areas of focus include Capacity at Risk, Data Center Capacity Time to Full, Application costs and top business consumers of storage resources. Capacity Analytics, Performance Analytics and Application Analytics allow drill through to WebUI dashboards for near realtime business intelligence.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.
Business Unit, Line of Business, Application, tier and tier cost annotations deployed.

Report XML: 5.2 Executive Capacity Report with KPIs

5.2 Executive Capacity Report with KPIs – OnPrem Compute



Report XML: [5.2 Executive Capacity Report with KPIs]

5.2 Executive Capacity Report Definitions

Metric/Attribute	Description
Storage	
Data Center	DII configured annotation. Defines the location of the device
Application	DII configured annotation. Defines the application associated with the virtual machine or backend storage capacity
Business Unit	DII configured annotation. Defines the Business Unit associated with the virtual machine or backend storage capacity
Line of Business	DII configured annotation. Defines the Line of Business associated with the virtual machine or backend storage capacity
Raw Capacity	Pre-RAID Raw Capacity in TiB of all disks as reported by the storage device monitored by DII and contained in the Storage and Storage Pool Capacity Fact table. Represented as: capacity * rawToUsableRatio
Usable Capacity	Usable capacity allocated for a storage-pool as reported by the storage-array in Tebibytes (Base 2 units)
Used Capacity Threshold	Used capacity and projected capacity trending chart 75% full threshold
Service Quality Threshold	Latency SLA threshold of 30 milliseconds
Minimum Days to Full	The minimum of dwh_capacity.sp_time_to_fill.daysToStoragePoolFull. This metric is used to monitor the capacity consumption rate of storage pools and aggregates
Pools at Risk	The number of pools or aggregates that show days to full less than 365
Pools < 100 Days	The number of pools or aggregates that show days to full less than 100
Used %	Used Capacity / Usable Capacity
Projected Used %	Projected Used Capacity / Projected Usable Capacity.
Quarter	The quarterly representation of the Full Date metric from the date_dimension table
Latency	The time it takes from the moment a request for information arrives at the storage device to the time when the storage device begin to send the information back in response
Days	DATEDIFF(IF(SUM(Projected Usable (TiB)) <= SUM(Projected Used (TiB)), FullDate,'9999-01-01'), NOW())
Days to Full	IF(MIN(Days) > 365, 365, MIN(Days))
Time to Full	IF(MIN(Days) > 365,` 1+ Year', IF(MIN(Days) > 31, CONCAT(FLOOR(MIN(Days) / 30), ' Months'), CONCAT(MIN(Days), ' Days')))
ConfigType and Cost	Platform WHEN virtual_machine.processors<=2 AND virtual_machine.memory/1024) <=8 THEN 'Small' WHEN virtual_machine.processors<=4 AND virtual_machine.memory/1024)<=16 THEN 'Medium' WHEN virtual_machine.processors<=8 AND virtual_machine.memory/1024)<=32 THEN 'Large' WHENvirtual_machine.processors>8 OR virtual_machine.memory/1024)>=32 THEN 'xLarge' Cost WHEN ConfigType ='Small' THEN 1681.92 WHEN ConfigType ='Medium' THEN 3363.84 WHEN ConfigType ='Large' THEN 6727.68 WHEN ConfigType ='xLarge' THEN 13455.36
Total Annual Cost	The total of the ConfigType Cost + Provisioned Capacity GiB * 840.00

Total Cost of Applications	Sum of Total Annual Cost
Total Application Capacity	Sum of virtual machine Provisioned capacity in Gibibytes for the entire report
Compute	
ESX Host	Name of the ESX Host or hypervisor discovered and monitored by DII
VM	Name of the virtual machine associated with the hypervisor
Datastore	Name of the datastore associated with the hypervisor
CPUSubscriptionPercent	The sum of all virtual machine allocated vCPUs / ESX Host CPU Count
Total IOpS	Measures the total number of I/O service requests (read+write) on the virtual machine during the selected time period (measured in I/O per sec)
Days to Full	Simple capacity growth calculation for datastores over a 30 day period
Used %	Current Datastore Used Capacity in Tebibytes / Current Datastore Allocated Capacity in TiB
Billable Hours	The number of billable hours for the current month. E.g. (DAY(LAST_DAY(NOW()))*24)
Instance Hourly Pricing	Instance cost per hour based on the published hyperscaler rate card. Example: WHEN [Instance Type]='a1.medium' THEN 0.0255 WHEN [Instance Type]='a1.large' THEN 0.051 WHEN [Instance Type]='a1.xlarge' THEN 0.102 WHEN [Instance Type]='a1.2xlarge' THEN 0.204 WHEN [Instance Type]='a1.4xlarge' THEN 0.408 WHEN [Instance Type]='a1.metal' THEN 0.408
Instance Cost	Billable Hours * Instance Hourly Pricing
Disk Pricing	Disk cost per month based on the published VMware or hyperscaler rate card. Example: WHEN [Type] contains 'VMDK' THEN .1 WHEN [Type] contains 'gp' THEN .1 WHEN [Type] contains 'io' THEN .125 WHEN [Type] contains 'st1' THEN .045 WHEN [Type] contains 'sc1' THEN .025 WHEN [Type] contains 'standard' THEN .05 WHEN [Type] contains 'snap' THEN .05 WHEN [Type] contains 'Standard_LRS' THEN .045 WHEN [Type] contains 'Premium_LRS' THEN .12
Disk Cost	Disk Pricing * VM Provisioned Capacity GiB
Total Monthly Costs	Instance Cost + Disk Cost
Avg CPU Utilization	Average vCPU Utilization as reported by virtual machine instances for the user selected time period
vCPU	Number of virtual processors associated with the virtual instance
vRAM	Amount of Memory in Gibibytes associated with the virtual instance
VM Capacity	Virtual machine provisioned capacity in Gibibytes
Reclaimable Assets	All virtual machine assets that are either powered down or idle
Datastore Capacity at Risk	Datastore capacity in Tebibytes that is nearing full allocation

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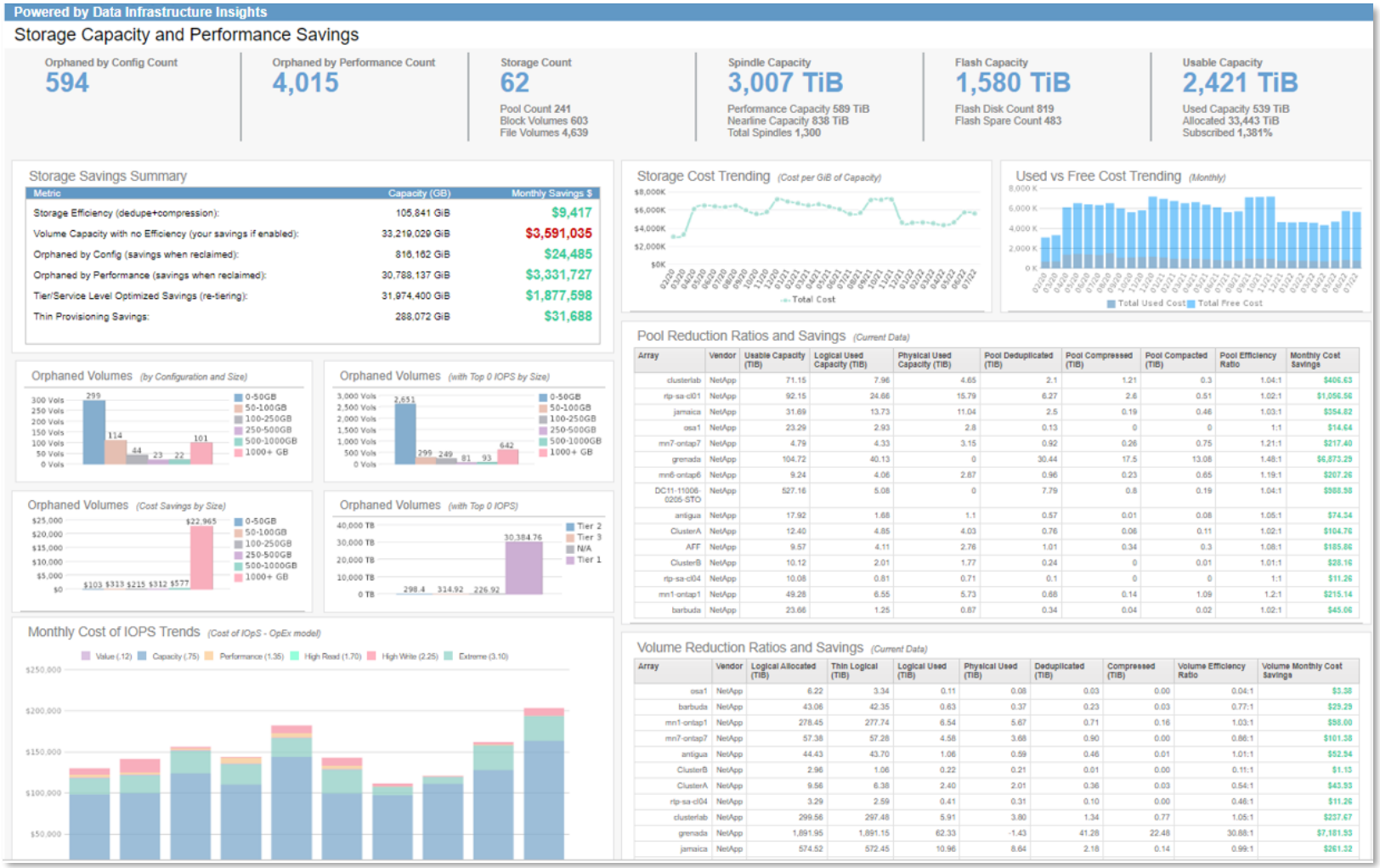
5.3 Storage Capacity and Performance Savings



Description: This report shows capacity and performance savings from utilizing storage efficiency technologies and reclaiming orphaned assets.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 5.3 Storage Capacity and Performance Savings

5.3 Storage Capacity and Performance Savings Definitions

Metric/Attribute	Description
Array	Name of the storage device discovered and monitored by DII
Vendor	Manufacturer of the storage device
Tier	DII configured annotation. Defines tiers of storage based on disk type, disk speed, etc.
Service Level	DII configured annotation. Defines Service Levels based on IO Density (IOPS/TiB)
Pool Reduction Ratios and Savings	
Raw Capacity (TiB)	Pre-RAID Raw Capacity in Tebibytes of all disks as reported by the storage device monitored by DII and contained in the Storage and Storage Pool Capacity Fact table. Represented as: capacity * rawToUsableRatio
Used Raw Capacity (TiB)	Used Raw Capacity in Tebibytes as reported by the storage pool or aggregate
Usable Capacity (TiB)	Usable capacity allocated for a storage-pool as reported by the storage-array in Tebibytes (Base 2 units)
Logical Used Capacity (TiB)	Used capacity in Tebibytes as reported by the internal volume (internal_volume_capacity_fact)
Physical Used Capacity (TiB)	Consumed Capacity in Tebibytes reported by the internal volume
Pool Deduplicated (TiB)	Derived from the storage_and_storage_pool_capacity_ fact (1 – (dedupeRatio / dedupeRatio) * (Used Capacity TiB))
Pool Compressed (TiB)	(1 – (compressionRatio / compressionRatio) * (Used Capacity TiB))
Pool Compacted (TiB)	(1 – (compactionRatio / compactionRatio) * (Used Capacity TiB))
Pool Efficiency Ratio	Used Capacity TiB / (Used Capacity TiB - Pool Compacted TiB)
Monthly Cost Savings	((Pool Deduplicated (TiB*1024) + Pool Compressed (TiB*1024) + Pool Compacted (TiB)])*1024) * AvgCostperGiB Note: Average Cost per Gibibyte is currently .03
Volume Reduction Ratios and Savings	
Logical Allocated (TiB)	Allocated capacity in Gibibytes associated with the internal volume
Thin Logical (TiB)	When thinprovisioned =1 then Allocated capacity in Gibibytes associated with the internal volume
Logical Used (TiB)	Used capacity in Gibibytes associated with the internal volume
Physical Used (TiB)	Consumed capacity in Gibibytes associated with the internal volume
Deduplicated (TiB)	Derived from the internal_volume_capacity_fact (1 – (dedupeRatio / dedupeRatio) * (Logical Used TiB))
Compressed (TiB)	(1 – (compressionRatio / compressionRatio) * (Logical Used TiB))
Volume Efficiency Ratio	Logical Used TiB / (Physical Used TiB - Deduplicated TiB + Compressed TiB)
Volume Monthly Cost Savings	((Deduplicated (TiB) + Compressed (TiB)) * 1024) * AvgCostperGiB Note: Average Cost per Gibibyte is currently .03
All Other Definitions	
Orphaned by Config Count	Total number of volumes that are flagged as orphaned. This is derived from volume_capacity_fact.isOrphaned = 1 flag
Orphaned by Performance Count	Total number of volumes that have zero peak IOPS for 180 days
Spindle Capacity	Total amount of disk capacity in Tebibytes where the disk speed > 8000
Flash Capacity	Total amount of disk capacity in Tebibytes where the disk speed is null

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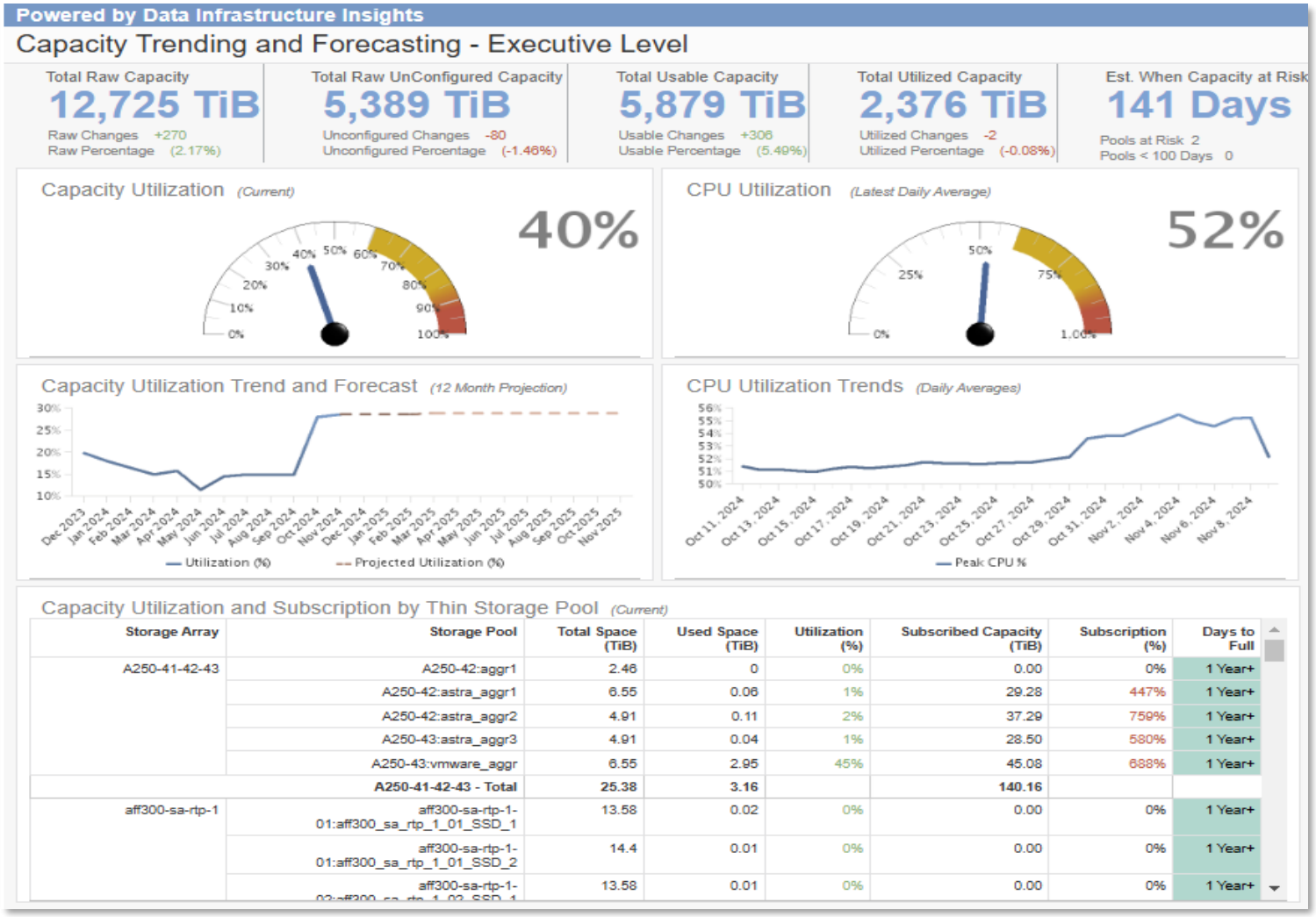
Usable Capacity	Usable capacity allocated for a storage-pool as reported by the storage-array in Tebibytes (Base 2 units)
Total Cost	Tier Cost * Raw Capacity (GiB)
Total Used Cost	Tier Cost * Used Raw Capacity (GiB)
Total Free Cost	Total Cost - Total Used Cost
Date	Full Date field available in the DWH Date Dimension table
Capacity Range	WHEN orphanedCapacityGiB BETWEEN 0 AND 50 THEN '0-50GiB' WHEN orphanedCapacityGiB BETWEEN 50 AND 100 THEN '50-100GiB' WHEN orphanedCapacityGiB BETWEEN 100 AND 250 THEN '100-250GiB' WHEN orphanedCapacityGiB BETWEEN 250 AND 500 THEN '250-500GiB' WHEN orphanedCapacityGiB BETWEEN 500 AND 1000 THEN '500-1000GiB' ELSE '1000+ GiB'
Potential Cost Savings	Orphaned by Config (GiB) * .03
Total IOpS	Measures the total number of I/O service requests (read+write) on the volume during the selected time period (measured in I/O per sec).
Cost per IOpS	Defines the cost of IOPS as derived from the Service Level annotation: WHEN [Service Level]='Value' THEN .12*[Total IOpS] WHEN [Service Level]='Capacity' THEN .75 *[Total IOpS] WHEN [Service Level]='Performance' THEN 1.35*[Total IOpS] WHEN [Service Level]='High Read' THEN 1.70*[Total IOpS] WHEN [Service Level]='High Write' THEN 2.25*[Total IOpS] WHEN [Service Level]='Extreme' THEN 3.1*[Total IOpS]
Orphaned Capacity (TiB)	Amount of capacity in Tebibytes where the volumes are flagged as orphaned. This is derived from volume_capacity_fact.isOrphaned = 1 flag

5.4 Capacity Trending and Forecasting – Executive Level



Storage Array	Storage Pool	Total Space (TiB)	Used Space (TiB)	Utilization (%)	Subscribed Capacity (TiB)	Subscription (%)	Days to Full
A250-41-42-43	A250-42:aggr1	2.46	0	0%	0.00	0%	1 Year+
	A250-42:astra_aggr1	6.55	0.06	1%	29.28	447%	1 Year+
	A250-42:astra_aggr2	4.91	0.11	2%	37.29	759%	1 Year+
	A250-43:astra_aggr3	4.91	0.04	1%	28.50	580%	1 Year+
	A250-43:vmware_aggr	6.55	2.95	45%	45.08	688%	1 Year+
	A250-41-42-43 - Total	**25.38**	**3.16**		**140.16**		
aff300-sa-rtp-1	aff300-sa-rtp-1-01:aff300_sa_rtp_1_01_SSD_1	13.58	0.02	0%	0.00	0%	1 Year+
	aff300-sa-rtp-1-01:aff300_sa_rtp_1_01_SSD_2	14.4	0.01	0%	0.00	0%	1 Year+
	aff300-sa-rtp-1-02:aff300_sa_rtp_1_02_SSD_1	13.58	0.01	0%	0.00	0%	1 Year+

Description: This report shows an executive level view of storage resource utilization and when specific resources may run out of capacity.

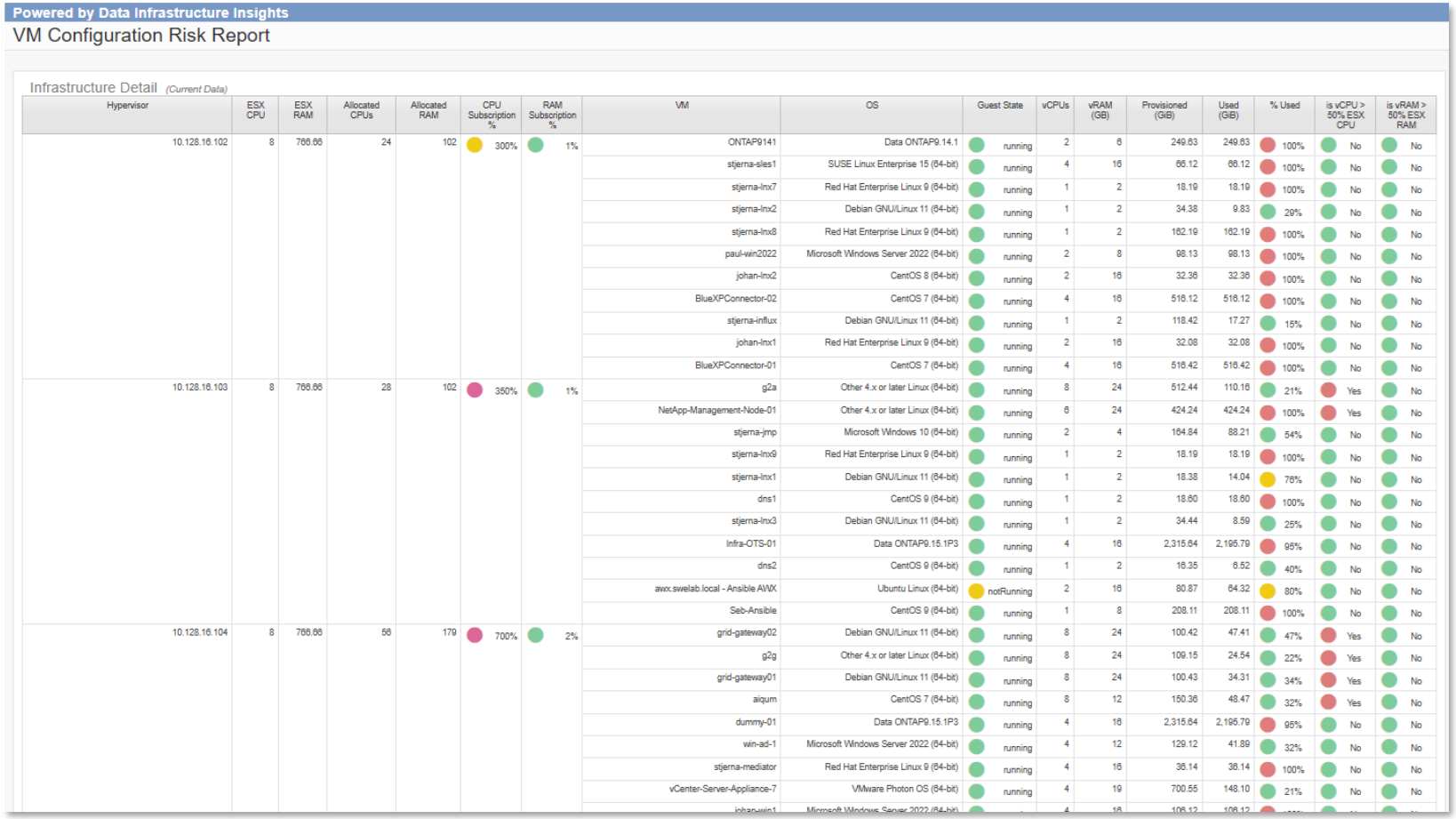
Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 5.4 Storage Capacity Trending and Forecasting - Executive Level

5.4 Capacity Trending and Forecasting Definitions

Metric/Attribute	Description
Storage Array	Name of the storage device discovered and monitored by DII
Storage Pool	Name of the storage pool or aggregate associated with the storage device
Total Space (TiB)	Usable capacity allocated for a storage-pool as reported by the storage-array in Tebibytes (Base 2 units)
Used Space (TiB)	Used capacity in Tebibytes as reported by the storage pool or aggregate. If Thin Provisioned, then Used = Written. If Thick Provisioned then Used = 100% of Allocated
Utilization (%)	Used Space (TiB) / Total Space (TiB)
Projected Utilization (%)	Usable Capacity in Tebibytes for the future 12 month period. This field is the basis for the intercept as a result of linear regression and projected used capacity. The field is contained in the Storage and Storage Pools Capacity FUTURE Fact table
Subscribed Capacity (TiB)	The greater of Block Volume or Internal Volume Allocated capacity in Tebibytes
Subscription (%)	Subscribed Capacity (TiB) / Total Space (TiB)
Days to Full	Derived from the sp_time_to_fill.daysToStoragePoolFull metric for aggregates that are less than 365 to full
Peak CPU	Maximum of Node CPU Utilization for the collection period This metric shows the percentage of time that one or more CPUs were busy. In DII, this is based on the higher of CPU, WAFL_EX and Kahuna Processor Domain metrics. Details are as follows: • System – avg_processor_busy, cpu_elapsed_time1 • WAFL – total_cp_msecs, cp_phase_times.P2_FLUSH • Processor – domain_busy, processor_elapsed_time
Capacity Utilization (%)	Same as Utilization (%)
Total Raw Capacity	Pre-RAID Raw Capacity in TiB of all disks as reported by the storage device monitored by DII and contained in the Storage and Storage Pool Capacity Fact table. Represented as: capacity * rawToUsableRatio
Total Raw UnConfigurated Capacity	Unconfigured raw capacity of the storage (includes failed, spare and unused disks) in TiB
Total Usable Capacity	Same as Total Space (TiB)
Total Utilized Capacity	Same as Used Space (TiB)
Est. When Capacity at Risk	The minimum of days to full for all aggregates
Pools at Risk	Total number of pools less than 365 days to full
Pools < 100 Days	Total number of pools less than 100 days to full

5.6 VM Configuration Risk Report



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VM Configuration Risk Report

Infrastructure Detail *(Current Data)*

Hypervisor	ESX CPU	ESX RAM	Allocated CPUs	Allocated RAM	CPU Subscription %	RAM Subscription %	VM	OS	Guest State	vCPUs	vRAM (GB)	Provisioned (GiB)	Used (GiB)	% Used	is vCPU > 50% ESX CPU	is vRAM > 50% ESX RAM
10.128.16.102	8	766.66	24	102	300%	1%	ONTAP9141	Data ONTAP9.14.1	running	2	6	249.63	249.63	100%	No	No
							stjerna-sles1	SUSE Linux Enterprise 15 (64-bit)	running	4	16	66.12	66.12	100%	No	No
							stjerna-lnx7	Red Hat Enterprise Linux 9 (64-bit)	running	1	2	18.19	18.19	100%	No	No
							stjerna-lnx2	Debian GNU/Linux 11 (64-bit)	running	1	2	34.38	9.83	29%	No	No
							stjerna-lnx8	Red Hat Enterprise Linux 9 (64-bit)	running	1	2	162.19	162.19	100%	No	No
							paul-win2022	Microsoft Windows Server 2022 (64-bit)	running	2	8	98.13	98.13	100%	No	No
							johan-lnx2	CentOS 8 (64-bit)	running	2	16	32.36	32.36	100%	No	No
							BlueXPConnector-02	CentOS 7 (64-bit)	running	4	16	516.12	516.12	100%	No	No
							stjerna-influx	Debian GNU/Linux 11 (64-bit)	running	1	2	118.42	17.27	15%	No	No
							johan-lnx1	Red Hat Enterprise Linux 9 (64-bit)	running	2	16	32.08	32.08	100%	No	No
							BlueXPConnector-01	CentOS 7 (64-bit)	running	4	16	516.42	516.42	100%	No	No
10.128.16.103	8	766.66	28	102	350%	1%	g2a	Other 4.x or later Linux (64-bit)	running	8	24	512.44	110.16	21%	Yes	No
							NetApp-Management-Node-01	Other 4.x or later Linux (64-bit)	running	6	24	424.24	424.24	100%	Yes	No
							stjerna-jmp	Microsoft Windows 10 (64-bit)	running	2	4	164.84	88.21	54%	No	No
							stjerna-lnx9	Red Hat Enterprise Linux 9 (64-bit)	running	1	2	18.19	18.19	100%	No	No
							stjerna-lnx1	Debian GNU/Linux 11 (64-bit)	running	1	2	18.38	14.04	76%	No	No
							dns1	CentOS 9 (64-bit)	running	1	2	18.60	18.60	100%	No	No
							stjerna-lnx3	Debian GNU/Linux 11 (64-bit)	running	1	2	34.44	8.59	25%	No	No
							Infra-OTS-01	Data ONTAP9.15.1P3	running	4	16	2,315.64	2,195.79	95%	No	No
							dns2	CentOS 9 (64-bit)	running	1	2	18.35	6.52	40%	No	No
							awx.swelab.local - Ansible AWX	Ubuntu Linux (64-bit)	notRunning	2	16	80.87	64.32	80%	No	No
							Seb-Ansible	CentOS 9 (64-bit)	running	1	8	208.11	208.11	100%	No	No
10.128.16.104	8	766.66	56	179	700%	2%	grid-gateway02	Debian GNU/Linux 11 (64-bit)	running	8	24	100.42	47.41	47%	Yes	No
							g2g	Other 4.x or later Linux (64-bit)	running	8	24	109.15	24.54	22%	Yes	No
							grid-gateway01	Debian GNU/Linux 11 (64-bit)	running	8	24	100.43	34.31	34%	Yes	No
							aiqum	CentOS 7 (64-bit)	running	8	12	150.36	48.47	32%	Yes	No
							dummy-01	Data ONTAP9.15.1P3	running	4	16	2,315.64	2,195.79	95%	No	No
							win-ad-1	Microsoft Windows Server 2022 (64-bit)	running	4	12	129.12	41.89	32%	No	No
							stjerna-mediator	Red Hat Enterprise Linux 9 (64-bit)	running	4	16	36.14	36.14	100%	No	No
							vCenter-Server-Appliance-7	VMware Photon OS (64-bit)	running	4	19	700.55	148.10	21%	No	No
							johan-win1	Microsoft Windows Server 2022 (64-bit)		4	16	106.12	106.12			

Description: This report shows confguration risk of the virtual compute estate. Emphasis is placed on CPU and Memory subscriptions as well as consumption.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 5.6 VM Configuration Risk Report

5.6 VM Configuration Risk Report Definitions

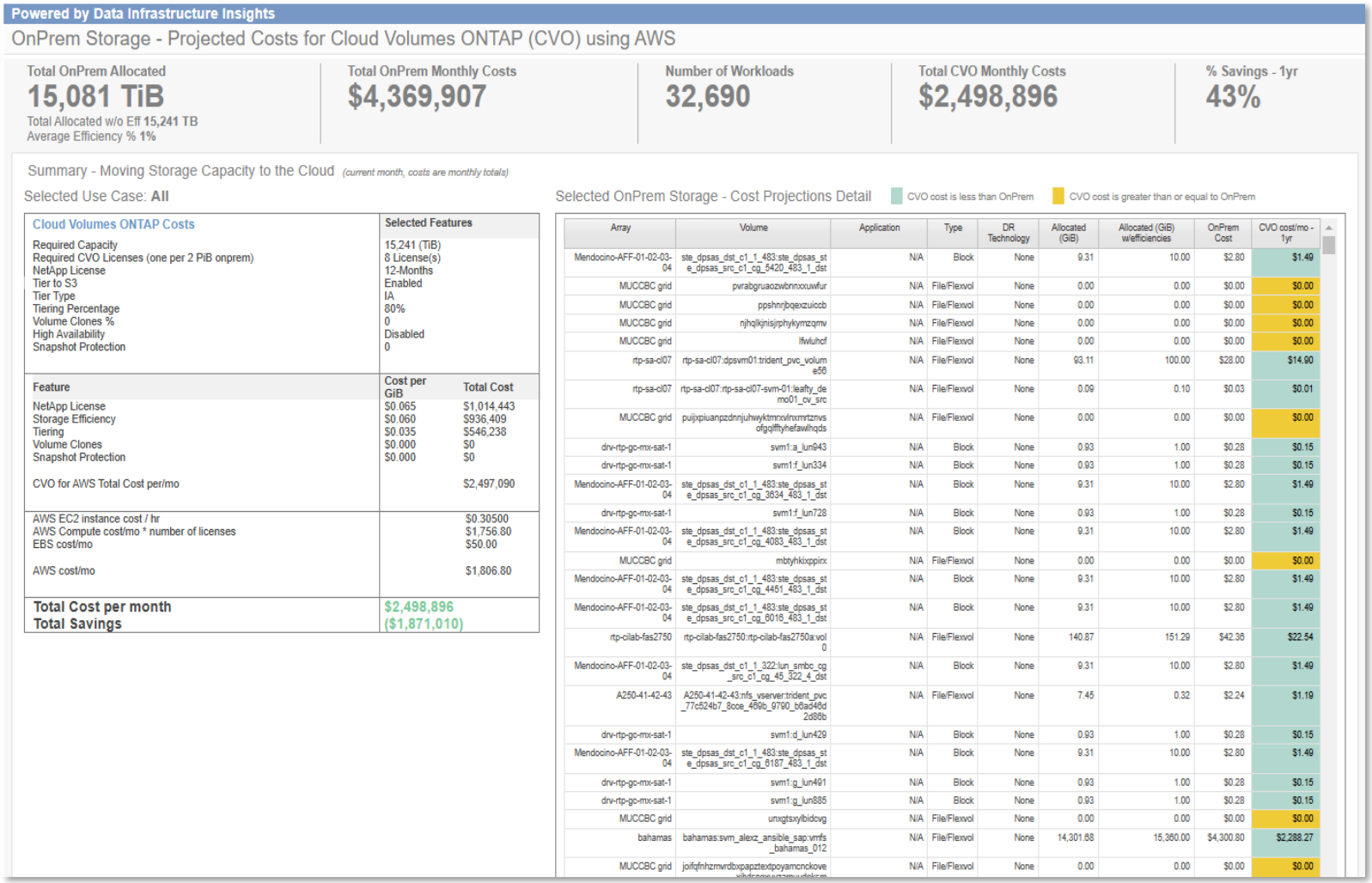
Metric/Attribute	Description
Hypervisor	Name of the hypervisor (ESX server) that is discovered and monitored by DII
ESX CPU	Amount of physical CPU that is available on the ESX server for VM Guest allocation
ESX RAM	Amount of physical RAM that is available on the ESX server for VM Guest allocation
Allocated CPUs	Amount of physical CPU that has been allocated to VM Guests
Allocated RAM	Amount of physical RAM that has been allocated to VM Guests
CPU Subscription %	Percent of ESX CPU that has been allocated to VMs CPU subscribed < 150% CPU subscribed between 150 and 300 % CPU subscribed greater than 300 %
RAM Subscription %	Percent of RAM that has been allocated to VMs RAM subscribed < 150% RAM subscribed between 150 and 300 % RAM subscribed greater than 300 %
VM	Name of the virtual machine associated with the hypervisor discovered by DII
OS	Type of OS deployed on the virtual machine
Guest State	Whether the VM is powered on or off
vCPUs	Number of virtual CPUs that are allocated to the VM Guest
vRAM (GiB)	Amount of RAM in Gigabytes allocated to the VM Guest
Provisioned (GiB)	Amount of capacity provisioned to the VM Guest
Used (GiB)	Amount of capacity used by the VM Guest. Used capacity will equal 100% if it is THICK provisioned
% Used	Percent of capacity used (Used / Provisioned) by the VM Guest
Is vCPU > 50% ESX CPU	Shows whether the vCPU allocated is greater than 50% of available ESX physical CPU
Is vRAM > 50% ESX RAM	Shows whether the vRAM allocated is greater than 50% of available ESX physical RAM

Financial Overview

These are some of the day-to-day and monthly financial management tasks that can be addressed by leveraging the reports in this catalog. Here are some of the objectives met by this section:

- ❑ Application Resource Consumption
- ❑ Asset Utilization by Application and Business Unit
- ❑ Qtree Capacity with Applications and Business Units
- ❑ Open Systems Storage – Top 10 Applications
- ❑ Application Allocation and Cost Consumption
- ❑ Epic Health Application Summary
- ❑ Epic Capacity and Costs
- ❑ Application Capacity and Performance
- ❑ Kubernetes Capacity Forecast by Cluster or Namespace
- ❑ Kubernetes Chargeback – AWS Rate Card

6.0 OnPrem Storage – Projected Costs for CVO using AWS



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OnPrem Storage - Projected Costs for Cloud Volumes ONTAP (CVO) using AWS

Total OnPrem Allocated	Total OnPrem Monthly Costs	Number of Workloads	Total CVO Monthly Costs	% Savings - 1yr
15,081 TiB	$4,369,907	32,690	$2,498,896	43%
Total Allocated w/o Eff 15,241 TB Average Efficiency % 1%				

Summary - Moving Storage Capacity to the Cloud *(current month, costs are monthly totals)*

Selected Use Case: **All**

Cloud Volumes ONTAP Costs	Selected Features
Required Capacity	15,241 (TiB)
Required CVO Licenses (one per 2 PiB onprem)	8 License(s)
NetApp License	12-Months
Tier to S3	Enabled
Tier Type	IA
Tiering Percentage	80%
Volume Clones %	0
High Availability	Disabled
Snapshot Protection	0

Feature	Cost per GiB	Total Cost
NetApp License	$0.065	$1,014,443
Storage Efficiency	$0.060	$936,409
Tiering	$0.035	$546,238
Volume Clones	$0.000	$0
Snapshot Protection	$0.000	$0
CVO for AWS Total Cost per/mo		$2,497,090
AWS EC2 instance cost / hr		$0.30500
AWS Compute cost/mo * number of licenses		$1,756.80
EBS cost/mo		$50.00
AWS cost/mo		$1,806.80
Total Cost per month		$2,498,896
Total Savings		($1,871,010)

Selected OnPrem Storage - Cost Projections Detail — CVO cost is less than OnPrem — CVO cost is greater than or equal to OnPrem

Array	Volume	Application	Type	DR Technology	Allocated (GiB)	Allocated (GiB) w/efficiencies	OnPrem Cost	CVO cost/mo - 1yr
Mendocino-AFF-01-02-03-04	ste_dpsas_dst_c1_1_483:ste_dpsas_ste_dpsas_src_c1_cg_5420_483_1_dst	N/A	Block	None	9.31	10.00	$2.80	$1.49
MUCCBC grid	pvralbgruaozwbnnxxuwfur	N/A	File/Flexvol	None	0.00	0.00	$0.00	$0.00
MUCCBC grid	ppshnrjbqexzuiccb	N/A	File/Flexvol	None	0.00	0.00	$0.00	$0.00
MUCCBC grid	njhqlkjnisjrphykymzqmv	N/A	File/Flexvol	None	0.00	0.00	$0.00	$0.00
MUCCBC grid	lfwluhcf	N/A	File/Flexvol	None	0.00	0.00	$0.00	$0.00
rtp-sa-cl07	rtp-sa-cl07:dpsvm01:trident_pvc_volume56	N/A	File/Flexvol	None	93.11	100.00	$28.00	$14.90
rtp-sa-cl07	rtp-sa-cl07:rtp-sa-cl07-svm-01:leafty_demo01_cv_src	N/A	File/Flexvol	None	0.09	0.10	$0.03	$0.01
MUCCBC grid	puijxpiuanpzdnnjuhwyktmrxvlnxrmrtznvsofgqlffyhefawlhqds	N/A	File/Flexvol	None	0.00	0.00	$0.00	$0.00
drv-rtp-gc-mx-sat-1	svm1:a_lun943	N/A	Block	None	0.93	1.00	$0.28	$0.15
drv-rtp-gc-mx-sat-1	svm1:f_lun334	N/A	Block	None	0.93	1.00	$0.28	$0.15
Mendocino-AFF-01-02-03-04	ste_dpsas_dst_c1_1_483:ste_dpsas_ste_dpsas_src_c1_cg_3634_483_1_dst	N/A	Block	None	9.31	10.00	$2.80	$1.49
drv-rtp-gc-mx-sat-1	svm1:f_lun728	N/A	Block	None	0.93	1.00	$0.28	$0.15
Mendocino-AFF-01-02-03-04	ste_dpsas_dst_c1_1_483:ste_dpsas_ste_dpsas_src_c1_cg_4083_483_1_dst	N/A	Block	None	9.31	10.00	$2.80	$1.49
MUCCBC grid	mbtyhkixppinx	N/A	File/Flexvol	None	0.00	0.00	$0.00	$0.00
Mendocino-AFF-01-02-03-04	ste_dpsas_dst_c1_1_483:ste_dpsas_ste_dpsas_src_c1_cg_4451_483_1_dst	N/A	Block	None	9.31	10.00	$2.80	$1.49
Mendocino-AFF-01-02-03-04	ste_dpsas_dst_c1_1_483:ste_dpsas_ste_dpsas_src_c1_cg_6016_483_1_dst	N/A	Block	None	9.31	10.00	$2.80	$1.49
rtp-cilab-fas2750	rtp-cilab-fas2750:rtp-cilab-fas2750a:vol0	N/A	File/Flexvol	None	140.87	151.29	$42.36	$22.54
Mendocino-AFF-01-02-03-04	ste_dpsas_dst_c1_1_322:lun_smbc_cg_src_c1_cg_45_322_4_dst	N/A	Block	None	9.31	10.00	$2.80	$1.49
A250-41-42-43	A250-41-42-43:nfs_vserver:trident_pvc_77c624b7_8cce_459b_9790_b8ad46d2d88b	N/A	File/Flexvol	None	7.45	0.32	$2.24	$1.19
drv-rtp-gc-mx-sat-1	svm1:d_lun429	N/A	Block	None	0.93	1.00	$0.28	$0.15
Mendocino-AFF-01-02-03-04	ste_dpsas_dst_c1_1_483:ste_dpsas_ste_dpsas_src_c1_cg_6187_483_1_dst	N/A	Block	None	9.31	10.00	$2.80	$1.49
drv-rtp-gc-mx-sat-1	svm1:g_lun491	N/A	Block	None	0.93	1.00	$0.28	$0.15
drv-rtp-gc-mx-sat-1	svm1:g_lun885	N/A	Block	None	0.93	1.00	$0.28	$0.15
MUCCBC grid	unxgtsxylbidcvg	N/A	File/Flexvol	None	0.00	0.00	$0.00	$0.00
bahamas	bahamas:svm_alexz_ansible_sap:vmfs_bahamas_012	N/A	File/Flexvol	None	14,301.68	15,360.00	$4,300.80	$2,288.27
MUCCBC grid	joifqfnhzmvrdbxpapztextpoyamcnckove	N/A	File/Flexvol	None	0.00	0.00	$0.00	$0.00

Description: This report shows projected costs from migrating onprem volume workloads to Cloud Volumes ONTAP in AWS.

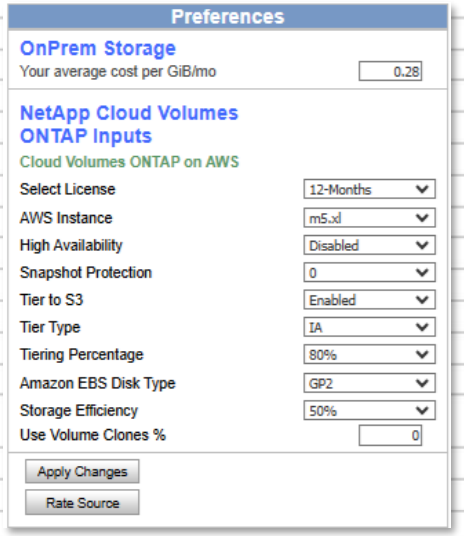
Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML for AWS: 6.0 OnPrem Storage - Projected Costs for CVO using AWS

NetApp

6.0 OnPrem Storage – Projected Costs for CVO using AWS Definitions

Metric/Attribute	Description
Array	Name of the Cluster discovered and monitored by Data Infrustructure Insights (DII)
Volume	Name of the Volume associated with the storage device discovered and monitored by DII
Application	Name of the Application associated with the volume
Type	The type of capacity e.g. Block (SAN) or File (NAS)
DR Technology	Indicates whether or not an individual volume is a replica
Allocated (GiB)	Provisioned capacity in GiB for logical volumes associated with onprem storage devices
Allocated (GiB) w/efficiencies	Provisioned capacity in GiB for logical volumes less efficiency technologies like dedupe and compression
OnPrem Cost	This is the average monthly cost of capacity per GiB from an Opex and Capex perspective entered manually in the top right side of the report
CVO cost/mo - 1yr	Allocated GiB * NetApp Licenses Cost + Efficiency Cost + Snapshot Protection Cost + Volume Clones Cost + Tiering Cost
Required Capacity	Total provisioned capacity selected for projected CVO migration without efficiency
Required CVO Licenses	Number of CVO licenses required per 2 PiB of capacity migrated
NetApp License	The selected CVO license e.g. 12-Months, BYOL or PayGo. Only 12-Month is currently available in this report
Tier to S3	Whether or not (enabled or disabled) capacity is tiered to S3 buckets
Tier Type	Currently defaults to IA. Other tier types will be added in the future
Tiering Percentage	The % of allocated capacity that will be tiered to cloud storage (S3 buckets)
Volume Clones %	The % of capacity that is allocated to volume clones
High Availability	Whether or not high availability is enabled or disabled. Default is disabled
Snapshot Protection	Number of snapshots 0-30 that are required
Netapp License Cost	The cost of the NetApp CVO for AWS license (.065 / GiB default, .095 / GiB if high availability is enabled)
Storage Efficiency Cost	Cost per GiB for storage efficiency technology deployed in CVO (See rate card)
Tiering Cost	Cost for S3 tiering per GiB
Volume Clones Cost	Cost for Volume Clones per GiB
Snapshot Protection Cost	Cost for selected # of snapshots per GiB
CVO for AWS Total Cost per/mo	Same as CVO cost/mo - 1 yr
AWS EC2 Instance cost/hr	The cost / hr of the selected AWS instance (default is m5.xl @ .3050 per hour)
AWS Compute cost/mo * number of licenses	AWS Compute cost/mo * number of CVO licenses
EBS cost/mo	Cost of EBS disks for each instance
AWS cost/mo	AWS Compute Cost - 1yr + EBS Disk Cost
Total Cost per month	AWS Costs - 1yr + CVO for AWS Total Costs
Total Savings	IF(([CVO for AWS Total Costs])-([Total Costs per/mo 1yr])>0) THEN (0) ELSE (([Total Costs per/mo 1yr])-([Total OnPrem Cost for Report]))



6.0 OnPrem Storage – Projected Costs for CVO using AZURE

Powered by Data Infrastructure Insights

OnPrem Storage - Projected Costs for Cloud Volumes ONTAP (CVO) using AZURE

Total OnPrem Allocated	Total OnPrem Monthly Costs	Number of Workloads	Total CVO Monthly Costs	% Savings - 1yr
15,081 TiB	$4,369,907	32,690	$3,623,463	17%
Total Allocated w/o Eff 15,241 TB Average Efficiency % 1%				

Summary - Moving Storage Capacity to the Cloud *(current month, costs are monthly totals)*

Selected Use Case: **All**

Cloud Volumes ONTAP Costs	Selected Features
Required Capacity	15,241 (TiB)
Required CVO Licenses (one per 2 PiB onprem)	8 License(s)
NetApp License	12-Months
Storage Efficiency	50%
Tier to Azure Blob	Enabled
Tier Type	Cool
Tiering Percentage	80%
Volume Clones %	0
High Availability	Disabled
Snapshot Protection	0
IO Reads per month	80000
IO Writes per month	20000

Feature	Cost per GiB	Total Cost
NetApp License	$0.030	$468,204
Storage Efficiency	$0.090	$1,404,613
Tiering	$0.112	$1,747,963
Volume Clones	$0.000	$0
Snapshot Protection	$0.000	$0
IO Reads $0.001 PER 10k ops		$80
IO Writes $0.01 per 10k ops		$200
CVO for AZURE Total Cost per/mo		$3,621,060
Azure VM cost / hr		$0.34780
Azure VM cost/mo * number of licenses		$2,003.33
Azure Disk cost/mo		$400.00
Azure cost/mo		$2,403.33
Total Cost per month		$3,623,463
Total Savings		($746,444)

Selected OnPrem Storage - Cost Projections Detail — CVO cost is less than OnPrem — CVO cost is greater than or equal to OnPrem

Array	Volume	Application	Type	DR Technology	Allocated (GiB)	Allocated (GiB) w/efficiencies	OnPrem Cost	CVO cost/mo - 1yr
drv-rtp-gc-mx-sat-1	svm1:g_lun383	N/A	Block	None	0.93	1.00	$0.28	$0.22
MUCCBC grid	kedhupjedvlatil	N/A	File/Flexvol	None	0.00	0.00	$0.00	$0.00
drv-rtp-gc-mx-sat-1	svm1:b_lun797	N/A	Block	None	0.93	1.00	$0.28	$0.22
MUCCBC grid	izchclghsalgsq	N/A	File/Flexvol	None	0.00	0.00	$0.00	$0.00
drv-rtp-gc-mx-sat-1	svm1:b_lun944	N/A	Block	None	0.93	1.00	$0.28	$0.22
MUCCBC grid	twjtudzqegbmhvecwugkkv	N/A	File/Flexvol	None	0.00	0.00	$0.00	$0.00
Mendocino-AFF-01-02-03-04	ste_dpsas_dst_c1_1_483:ste_dpsas_ste_dpsas_src_c1_cg_4196_483_1_dst	N/A	Block	None	9.31	10.00	$2.80	$2.16
ntapit-osg-prd01	cesoa-devint	N/A	File/Flexvol	None	3.38	3.83	$1.02	$0.78
drv-rtp-gc-mx-sat-1	svm1:c_lun078	N/A	Block	None	0.93	1.00	$0.28	$0.22
Mendocino-AFF-01-02-03-04	ste_dpsas_dst_c1_1_483:ste_dpsas_ste_dpsas_src_c1_cg_4975_483_1_dst	N/A	Block	None	9.31	10.00	$2.80	$2.16
MUCCBC grid	lvhkgpigcwtkrskni	N/A	File/Flexvol	None	0.00	0.00	$0.00	$0.00
MUCCBC grid	hrubwzojarzpxowxos	N/A	File/Flexvol	None	0.00	0.00	$0.00	$0.00
drv-rtp-gc-mx-sat-1	svm1:a_lun554	N/A	Block	None	0.93	1.00	$0.28	$0.22
MUCCBC grid	zhvtgkba	N/A	File/Flexvol	None	0.00	0.00	$0.00	$0.00
MUCCBC grid	tgihidzxfngcmw	N/A	File/Flexvol	None	0.00	0.00	$0.00	$0.00
drv-rtp-gc-mx-sat-1	svm1:x_lun82	N/A	Block	None	0.93	1.00	$0.28	$0.22
Mendocino-AFF-01-02-03-04	ste_dpsas_dst_c1_1_483:ste_dpsas_ste_dpsas_src_c1_cg_908_483_1_dst	N/A	Block	None	9.31	10.00	$2.80	$2.16
Mendocino-AFF-01-02-03-04	ste_dpsas_dst_c1_1_483:ste_dpsas_ste_dpsas_src_c1_cg_2927_483_1_dst	N/A	Block	None	9.31	10.00	$2.80	$2.16
drv-rtp-gc-mx-sat-1	svm1:f_lun492	N/A	Block	None	0.93	1.00	$0.28	$0.22
MUCCBC grid	swtkouyyapgwfxtmzzdgfbzajmecuibuiqggtvjsvsnkoxnxgzqumcj	N/A	File/Flexvol	None	0.00	0.00	$0.00	$0.00
Mendocino-AFF-01-02-03-04	ste_dpsas_dst_c1_1_483:ste_dpsas_ste_dpsas_src_c1_cg_4051_483_1_dst	N/A	Block	None	9.31	10.00	$2.80	$2.16

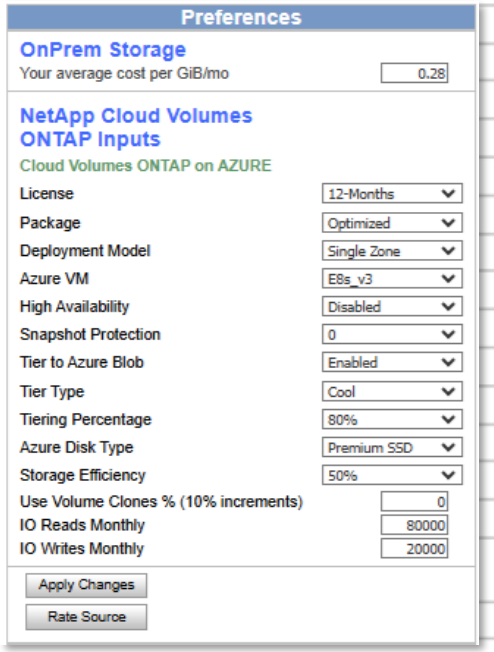
Description: This report shows projected costs from migrating onprem volume workloads to Cloud Volumes ONTAP in AZURE.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML for AZURE: 6.0 OnPrem Storage - Projected Costs for CVO using AZURE

6.0 OnPrem Storage – Projected Costs for CVO using AZURE Definitions

Metric/Attribute	Description
Array	Name of the Cluster discovered and monitored by Data Infrustructure Insights (DII)
Volume	Name of the Volume associated with the storage device discovered and monitored by DII
Application	Name of the Application associated with the volume
Type	The type of capacity e.g. Block (SAN) or File (NAS)
DR Technology	Indicates whether or not an individual volume is a replica
Allocated (GiB)	Provisioned capacity in GiB for logical volumes associated with onprem storage devices
Allocated (GiB) w/efficiencies	Provisioned capacity in GiB for logical volumes less efficiency technologies like dedupe and compression
OnPrem Cost	This is the average monthly cost of capacity per GiB from an Opex and Capex perspective entered manually in the top right side of the report
CVO cost/mo - 1yr	Allocated GiB * NetApp Licenses Cost + Efficiency Cost + Snapshot Protection Cost + Volume Clones Cost + Tiering Cost + IO Reads Cost + IO Writes Cost
Required Capacity	Total provisioned capacity selected for projected CVO migration without efficiency
Required CVO Licenses	Number of CVO licenses required per 2 PiB of capacity migrated
NetApp License	The selected CVO license e.g. 12-Months, BYOL or PayGo. Only 12-Month is currently available in this report
Tier to Azure Blob	Whether or not (enabled or disabled) capacity is tiered to AZURE Blob
Tier Type	Currently defaults to Cool. Hot can be added in the future
Tiering Percentage	The % of allocated capacity that will be tiered to cloud storage (AZURE Blob)
Volume Clones %	The % of capacity that is allocated to volume clones
High Availability	Whether or not high availability is enabled or disabled. Default is disabled
Snapshot Protection	Number of snapshots 0-30 that are required
IO Reads	$ 0.001 Per 10k Operations
IO Writes	$ 0.01 Per 10k Operations
Netapp License Cost	The cost of the NetApp CVO for AZURE license (see rate card)
Storage Efficiency Cost	Cost per GiB for storage efficiency technology deployed in CVO (See rate card)
Tiering Cost	Cost for AZURE Blob tiering per GiB
Volume Clones Cost	Cost for Volume Clones per GiB
Snapshot Protection Cost	Cost for selected # of snapshots per GiB
CVO for AZURE Total Cost per/mo	Same as CVO cost/mo - 1 yr
AZURE VM Instance cost/hr	The cost / hr of the selected AWS instance (default is E8s_v3 @ .704 per hour)
AZURE Compute cost/mo * number of licenses	AZURE Compute cost/mo * number of CVO licenses
Disk cost/mo	Cost of EBS disks for each instance
AZURE cost/mo	AZURE Compute Cost - 1yr + Disk Cost
Total Cost per month	AZURE Costs - 1yr + CVO for AZURE Total Costs
Total Savings	IF(([CVO for AZURE Total Costs])-([Total Costs per/mo 1yr])>0) THEN (0) ELSE (([Total Costs per/mo 1yr])-([Total OnPrem Cost for Report]))



6.0 OnPrem Storage – Projected Costs for CVO using GCP

Powered by Data Infrastructure Insights

OnPrem Storage - Projected Costs for Cloud Volumes ONTAP (CVO) using GCP

Total OnPrem Allocated	Total OnPrem Monthly Costs	Number of Workloads	% Savings - Pay-As-You-Go	% Savings - 3yr	% Savings - 1yr
14,933 TiB	**$1,086,157**	**23,631**	**53%**	**61%**	**57%**
Total Allocated w/o Eff **15,153 TB**					
Average Efficiency % **1%**					

Summary - Moving Storage Capacity to the Cloud *(current month, costs are monthly totals)*

Selected Use Case: **All**
Selected Service Option: **Optimized**
Selected Contract Period: **3yr Contract**

Cloud Volumes ONTAP Costs	Pay-As-You-Go			3 yr Contract			2 yr Contract			1 yr Contract		
Required Capacity Required CVO Licenses (one per 2 PiB onprem)	15,153 (TiB) 8 License(s)			15,153 (TiB) 8 License(s)			15,153 (TiB) 8 License(s)			15,153 (TiB) 8 License(s)		
	Optimized	Essentials	Professional	Optimized	Essentials	Professional	Optimized	Essentials	Professional	Optimized	Essentials	Professional
CVO for GCP Cost per/mo	$0.033	$0.044	$0.132	$0.027	$0.036	$0.108	$0.029	$0.038	$0.114	$0.030	$0.040	$0.120
CVO for GCP Total Cost per/mo	$512K	$683K	$2,048K	$419K	$559K	$1,676K	$450K	$590K	$1,769K	$465K	$621K	$1,862K
GCP n2-standard-8 compute cost / hr GCP Compute cost/mo * number of licenses GCP Disk cost/mo (500 GiB Standard $0.044 per GiB) GCP Cloud Backup $.0475/mo GCP Cost/mo	$0.43751 $2,520.07 $22.00 $0.00 $2,542.07			$0.23169 $1,334.54 $22.00 $0.00 $1,356.54			$0.26186 $1,508.34 $22.00 $0.00 $1,530.34			$0.26186 $1,508.34 $22.00 $0.00 $1,530.34		
Total Cost per TiB per month	$500.04			$409.13			$439.43			$454.59		
Total Cost per month	$514,587.53			$420,302.83			$451,509.68			$467,026.21		
Total Savings	($571,569.51)			($665,854.21)			($634,647.36)			($619,130.83)		

Selected OnPrem Storage - Cost Projections Detail — CVO cost is less than OnPrem — CVO cost is greater than or equal to OnPrem

Array	Volume	Application	Type	DR Technology	Allocated (GiB)	Allocated (GiB) w/efficiencies	Peak IOpS	Avg IOpS	IO Density	Avg MBps	Peak MBps	OnPrem Cost	Egress Pricing	Egress Out - Internet	CVO cost/mo - PayGo	CVO cost/mo - 3yr	CVO cost/mo - 2yr	CVO cost/mo - 1yr
rtp-cilab-fas2750	rtp-cilab-fas2750:vmwareDatastores:vol_general_ds	App1_Production_Primary Site	File/Flexvol	None	1,003.62	1,077.89	2,497	2,344	62,966	21	23	$75.45	$0.00	$0.00	$33.12	$27.10	$29.11	$30.11
grenada	grenada:svm-sap01:M01_sapmaxdb	N/A	File/Flexvol	None	139.66	84.00	1,535	1,289	353,005	0	0	$10.50	$0.00	$0.00	$4.61	$3.77	$4.05	$4.19
grenada	grenada:svm-sap01:M02_sapmaxdb	N/A	File/Flexvol	None	139.66	84.00	1,302	1,237	341,093	0	0	$10.50	$0.00	$0.00	$4.61	$3.77	$4.05	$4.19
grenada	grenada:svm-kvm:cbc_proxmox_ds_01	N/A	File/Flexvol	None	9,534.45	5,324.80	1,276	1,193	270	26	28	$716.80	$0.00	$0.00	$314.64	$257.43	$276.50	$286.03
rtp-cilab-fas2750	rtp-cilab-fas2750:vmwareDSfc01:Tier3_VMwareDS01	App1_Production_Primary Site	File/Flexvol	None	391.06	420.00	891	797	12,753	3	4	$29.40	$0.00	$0.00	$12.91	$10.56	$11.34	$11.73
rtp-cilab-fas2750	vmwareDSfc01:Tier3_VMwareDS01:/vol/Tier3_VMwareDS01/Tier3_VMwareDS01		Block	None	238.36	256.00	892	797	12,842	3	4	$17.92	$0.00	$0.00	$7.87	$6.44	$6.91	$7.15
rtp-sa-cl01	rtp-sa-cl01:rtp-sa-cl01-06:vol0	N/A	File/Flexvol	None	630.44	677.09	1,129	788	11,650	0	0	$47.40	$0.00	$0.00	$20.80	$17.02	$18.28	$18.91
rtp-sa-cl01	rtp-sa-cl01:rtp-sa-cl01-08:vol0	N/A	File/Flexvol	None	630.44	677.09	1,026	669	13,055	0	0	$47.40	$0.00	$0.00	$20.80	$17.02	$18.28	$18.91
grenada	grenada:svm-snapcenter:smhv_snapinfo	N/A	File/Flexvol	None	18.62	15.80	496	474	7,800,885	1	1	$1.40	$0.00	$0.00	$0.61	$0.50	$0.54	$0.56
rtp-sa-cl01	rtp-sa-cl01:rtp-sa-cl01-05:vol0	N/A	File/Flexvol	None	630.44	677.09	591	463	6,720	0	0	$47.40	$0.00	$0.00	$20.80	$17.02	$18.28	$18.91
bahamas	bahamas:bahamas-02:vol0	N/A	File/Flexvol	None	140.87	151.29	661	443	6,398	0	1	$10.59	$0.00	$0.00	$4.65	$3.80	$4.09	$4.23
A250-41-42-43	A250-41-42-43:A250-42:vol0	N/A	File/Flexvol	None	140.87	151.29	424	409	5,072	0	0	$10.59	$0.00	$0.00	$4.65	$3.80	$4.09	$4.23
antigua	antigua:antigua-01:vol0	N/A	File/Flexvol	None	324.60	348.82	416	405	4,706	0	0	$24.40	$0.00	$0.00	$10.71	$8.76	$9.41	$9.74

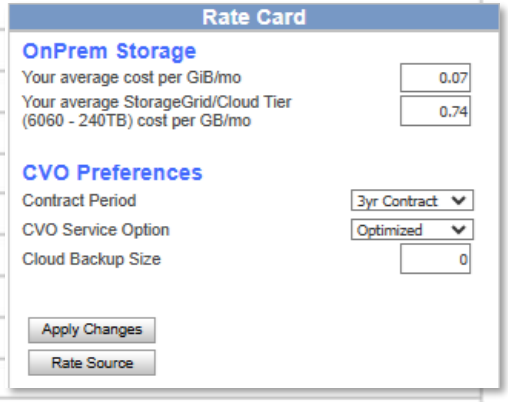
Description: This report shows projected costs from migrating onprem volume workloads to Cloud Volumes ONTAP in Google Cloud.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

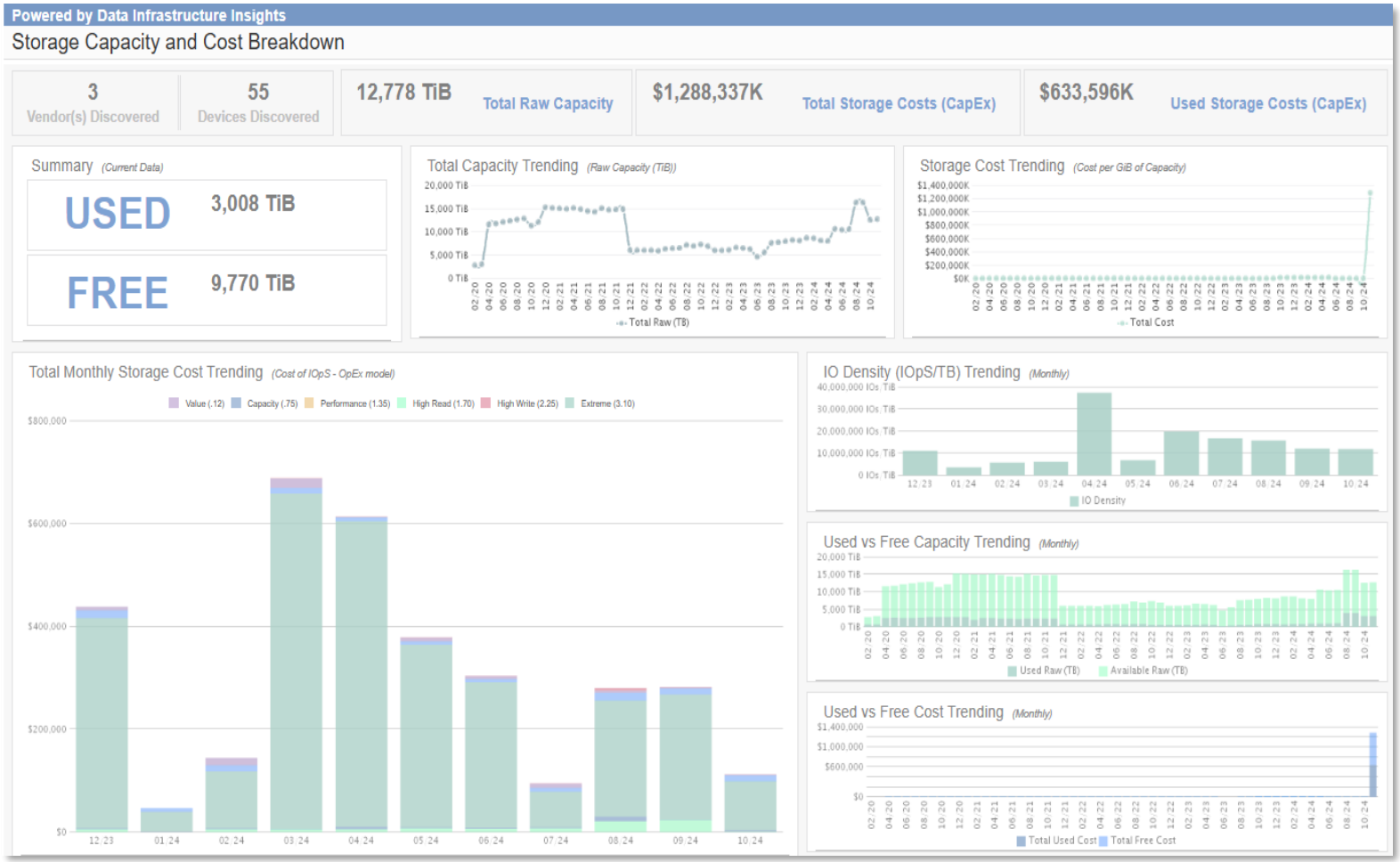
Report XML for GCP: 6.0 OnPrem Storage - Projected Costs for CVO using GCP

6.0 OnPrem Storage – Projected Costs for CVO using GCP Definitions

Metric/Attribute	Description
Array	Name of the Cluster discovered and monitored by Data Infrustructure Insights (DII)
Volume	Name of the Volume associated with the storage device discovered and monitored by DII
Application	Name of the Application associated with the volume
Type	The type of capacity e.g. Block (SAN) or File (NAS)
DR Technology	Indicates whether or not an individual volume is a replica
Allocated (GiB)	Provisioned capacity in GiB for logical volumes associated with onprem storage devices
Allocated (GiB) w/efficiencies	Provisioned capacity in GiB for logical volumes less efficiency technologies like dedupe and compression
Peak IOpS	Maximum of average IOpS over 14 day hourly collection period
Avg IOpS	Average IOpS over 14 day hourly collection period
IO Density	Average IOpS per TiB of Used Capacity over 14 day hourly collection period
Avg MBps	Average Throughput in Megabytes per second over 14 day hourly collection period
Peak MBps	Maximum of average Throughput in Megabytes per second over 14 day hourly collection period
OnPrem Cost	This is the average monthly cost of capacity per GiB from an Opex and Capex perspective entered manually in the top right side of the report
Egress Pricing	This is the cost of data exiting Google Cloud
CVO Service Option	The CVO for GCP service option has three silos; Optimized (default), Essentials and Professional. Essentials does not include High Availability or Primary Workloads by default. Optimized does not include Primary Workloads or IO Operations. The detailed pricing chart is available here: https://bluexp.netapp.com/pricing
CVO cost/mo - PayGo	The Pay as You Go cost for Service Options; Optimized $0.033; Essentials $0.044 and Professional $0.132
CVO cost/mo - 3yr	The 3 year cost for Service Options; Optimized $0.027; Essentials $0.036 and Professional $0.108
CVO cost/mo - 2yr	The 2 year cost for Service Options; Optimized $0.029; Essentials $0.038 and Professional $0.114
CVO cost/mo - 1yr	The 1 year cost for Service Options; Optimized $0.030; Essentials $0.040 and Professional $0.120
CVO for GCP Total Cost per/month	(Service Option Monthly Cost per GiB * (Required Capacity(TiB) * 1024))/1000
Required Capacity	Total provisioned capacity selected for projected CVO migration without efficiency
Required CVO Licenses	Number of CVO licenses required per 2 PiB of capacity migrated
GCP n2-standard-8 compute cost /hr	The hourly compute cost for the default instance (n2-standard-8) in Google Cloud
Total Cost per TiB per month	Service Option Monthly Cost per GiB * Required Capacity TiB
Total Cost per month	Service Option Monthly Cost per GiB +(CVO Costs - PayGo Optimized Total * 1000)
Total Savings	IF(([CVO Costs - Service Option Optimized Total])-(Total Costs per/mo for Service Option)>0) THEN (0) ELSE ((Total Costs per/mo)-(Total OnPrem Cost for Report))



6.3 Storage Capacity and Cost Breakdown



Description: This report shows a storage capacity breakdown of costs and utilization trends as well as IOPS/TiB (IO Density) distrubution and performance impact.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 6.3 Storage Capacity and Cost Breakdown

6.3 Storage Capacity and Cost Breakdown Definitions

Metric/Attribute	Description
Vendors Discovered	Number of vendors discovered by CI
Array Count	Number of storage arrays discovered by CI
Total Raw (TB)	Total Raw Capacity in TB associated with the Storage Array discovered by CI
Total Raw Cost	CapEx cost derived from the CI Cost Annotation or a default of .02 cents per GB of Raw Capacity
Total Raw Used Cost	CapEx cost derived from the CI Cost Annotation or a default of .02 cents per GB of Used Raw Capacity
Used	Used capcity in TB as reported by the storage pool associated with the storage array discovered by CI
Free	Usable Capcity - Used Capacity in TB
IOpS/TB	Volume IO per Terabyte of Capacity
Cost of IOpS	Cost of IOpS is derived from IOpS per TB and priced as follows: Service Level = 'Value' .12 cents, 'Capacity' .75 cents, 'Performance' $1.35, 'High Read' $1.70, 'High Write' $2.25, 'Extreme' $3.10 per IO
Total Cost	Total CapEx cost derived from the CI Cost Annotation or a default of .02 cents per GB of Raw Capacity
Service Level	WHEN [IOperTB] <= 128 THEN 'Value' WHEN [IOperTB] <= 512 THEN 'Capacity' WHEN [IOperTB] <= 1024 THEN 'Performance' WHEN [IOperTB] <= 2048 THEN 'High Read' WHEN [IOperTB] <= 4096 THEN 'High Write' WHEN [IOperTB] > 4096 THEN 'Extreme'
Date	Date used for time series charts
	NOTE: Green or red values and values in parenthesis are changes from last month

6.4 Chargeback – CVO Volumes (AWS)

Powered by Data Infrastructure Insights

Chargeback - CVO Volumes (AWS)

CVO Required Capacity	Billable Hours	CVO EC2 Instances	CVO License Cost per/month	EC2 Instance Cost per/month	EBS (gp2) cost/month	Total S3 Cost per/month	Total CVO Costs per/month
1,529 GiB	720	1	$36.26 Cost per GiB $0.065	$219.60 Hourly Cost $0.305	$166.92 Cost per GiB $0.100	$10.15 Cost per GiB $0.035	$432.93

CVO Detail *(Current Data)*

Business Unit: N/A

Cluster Name	Aggregate	Aggr Allocated GB	Aggr Used GB	Aggr Extra Space GB	Volume	CVO Total Allocated GB	CVO Total Used GB	CVO % of Extra Space GB	License Cost per/mo	EC2 Cost per Volume	EBS Cost per Volume	S3 Cost per Volume	CVO Cost per/mo
cvoProd06	cvoProd06-01:aggr0_cvoProd06_01	124.01	74.27	49.74	cvoProd06:cvoProd06-01:vol0	147.00	147.00	49.74	$1.77	$21.11	$16.05	$0.49	$39.42
	cvoProd06-01:aggr1	907.12	73.37	833.75	cvoProd06:svm_cvoProd06:dataVolume01	256.00	24.00	44.67	$5.36	$36.77	$27.94	$1.50	$71.57
	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:dataVolume09	41.00	23.00	42.80	$0.14	$5.89	$4.48	$0.04	$10.55
	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:dataVolume06	565.00	275.00	511.79	$26.10	$81.15	$61.67	$7.31	$176.23
	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:dataVolume03	39.00	22.00	40.94	$0.12	$5.60	$4.26	$0.03	$10.01
	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:dataVolume08	40.00	24.00	44.67	$0.13	$5.74	$4.37	$0.04	$10.28
	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:dataVolume11	20.00	0.00	0.00	$0.03	$2.87	$2.18	$0.01	$5.09
	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:dataVolume05	41.00	24.00	44.67	$0.14	$5.89	$4.48	$0.04	$10.55
	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:dataVolume07	52.00	17.00	31.64	$0.22	$7.47	$5.68	$0.06	$13.43
	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:svm_cvoProd06_root	3.00	3.00	5.58	$0.00	$0.43	$0.33	$0.00	$0.76
	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:dataVolume02	40.00	18.00	33.50	$0.13	$5.74	$4.37	$0.04	$10.28
	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:dataVolume04	51.00	18.00	33.50	$0.21	$7.32	$5.57	$0.06	$13.16
	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:dataVolume10	20.00	0.00	0.00	$0.03	$2.87	$2.18	$0.01	$5.09
qacvo	qacvo-01:aggr0_qacvo_01	194.88	74.12	120.75	qacvo:qacvo-01:vol0	147.00	147.00	120.75	$1.77	$21.11	$16.05	$0.49	$39.42
	qacvo-01:aggr1	442.94	18.37	424.57	qacvo:svm_qacvo:svm_qacvo_root	3.00	3.00	29.62	$0.00	$0.43	$0.33	$0.00	$0.76
	qacvo-01:aggr1				qacvo:svm_qacvo:frosa_stream_processing_summary	2.00	2.00	19.75	$0.00	$0.29	$0.22	$0.00	$0.51
	qacvo-01:aggr1				qacvo:svm_qacvo:stream_processing	12.00	12.00	118.48	$0.01	$1.72	$1.31	$0.00	$3.04
	qacvo-01:aggr1				qacvo:svm_qacvo:volume1	30.00	6.00	59.24	$0.07	$4.31	$3.27	$0.02	$7.67
	qacvo-01:aggr1				qacvo:svm_qacvo:iscsi_0	20.00	20.00	197.47	$0.03	$2.87	$2.18	$0.01	$5.09
N/A Total						1,529.00	785.00	1,428.81	$36.26	$219.60	$166.92	$10.15	$432.93

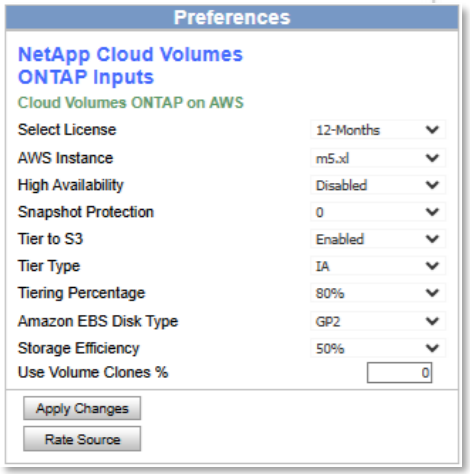
Description: This report shows chargeback costs for CVO volumes in AWS. Capacity is broken down by Business Unit. Volumes will show the allocated percentage of the aggregate and the costs for each workload.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled. Business Unit annotations deployed. Rate card is provided and is updated regularly.

Report XML: 6.4 Chargeback - CVO Volumes (AWS)

6.4 Chargeback – CVO Volumes (AWS) Definitions

Metric/Attribute	Description
Business Unit	Name of the Business Unit assigned to the CVO Internal Volume or Flexvol
Cluster Name	Name of the NetApp Cluster discovered and monitored by Cloud Insights
Aggregate	Name of the Aggregate associated with the node discovered and monitored by Data Infrastructure Insights (DII)
Volume	Name of the CVO Volume or Flexvol associated with the storage node and aggregate
Aggr Allocated GiB	The total usable capacity in GiB associated with the CVO Aggregate
Aggr Used GiB	Total used capacity in GiB associated with the CVO Aggregate
Aggr Extra Space GiB	Aggr Allocated GiB - Aggr Used GiB
CVO Total Allocated GiB	Total Allocated Capacity in GiB as reported by the CVO Flexvol or Internal Volume that is known to DII
CVO Total Used GiB	Total Used Capacity in GiB is logical (effective) capacity that is reported by the CVO Aggregate. If space guarantee is enabled on the volume, then Used will always equal Allocated. The logical size is computed based on physical usage (real writes) and savings obtained in the aggregate.
CVO % of Extra Space GiB	This is the Sum of Aggr Extra Space in GB * The CVO percent of Total Used e.g. ([CVO Total Used GB]/[CVO Total Used by Aggr GiB])
Flexvol Physical Used GiB	The amount of space being used for data now (rather than being reserved for future use. Includes space used by aggregate Snapshot copiesThis is space that is actually consumed or written by the client.
CVO Required Capacity	Total provisioned capacity selected for projected CVO migration without efficiency. For this use case, its the sum of Aggr Allocated GiB associated with the CVO node.
% of Total Required	[CVO Total Allocated GiB] / [CVO Required Capacity GiB]
CVO License Cost per/month - 1yr	The sum of License Cost per Volume: _round(([License Cost per/mo]+([Efficiency]*[CVO Total Allocated GB])+([Volume Clones per GiB]*[CVO Total Allocated GB])+([Snapshot Protection]*[CVO Total Allocated GB]))*[% of Total Required],2)
License Cost per Volume	[License Cost per/mo] * [% of Total Required]
Billable Hours	Number of total hours for the current month. Formula: (DAY(LAST_DAY(NOW()))*24). All EC2 Instances that support Cloud Volumes ONTAP should be powered on for the entire month.
EC2 cost per/mo	([AWS Instance]*24*(_day(_last_of_month (current_date)))*[Required Licenses])
EC2 Cost per Volume	([AWS Instance]*24*(_day(_last_of_month (current_date)))*[Required Licenses])*[% of Total Required]
EBScostPerMonth	The sum of EBS Cost per Volume
EBS Cost per Volume	_round([EBScostPerMonth]*[% of Total Required],2)
CVO Cost per/mo	[License Cost per Volume]+[EC2 Cost per Volume]+[S3 Cost per Volume]+[EBS Cost per Volume]
Total S3 Cost	The sum of S3 Cost per Volume
S3 Cost per Volume	_round(([Tiering]*[CVO Total Allocated GB])*[% of Total Required],2)
CVO EC2 Instances	The number of EC2 instances required for CVO volumes. Based on the number of licenses: 1 license = 1 EC2 instance
EC2 Instance Cost per/month	Same as [EC2 cost per/mo] only totaled for report
Required CVO Licenses	Number of CVO licenses required per 2 PiB of capacity migrated
NetApp License	The selected CVO license e.g. 12-Months, BYOL or PayGo. Only 12-Month is currently available in this report
Tier to S3	Whether or not (enabled or disabled) capacity is tiered to S3 buckets
Tier Type	Currently defaults to IA. Other tier types will be added in the future
Tiering Percentage	The % of allocated capacity that will be tiered to cloud storage (S3 buckets)
Volume Clones %	The % of capacity that is allocated to volume clones
High Availability	Whether or not high availability is enabled or disabled. Default is disabled
Snapshot Protection	Number of snapshots 0-30 that are required
Netapp License Cost	The cost of the NetApp CVO for AWS license (.065 / GiB default, .095 / GiB if high availability is enabled)
Storage Efficiency Cost	Cost per GiB for storage efficiency technology deployed in CVO (See rate card)
Tiering Cost	Cost for S3 tiering per GiB
Volume Clones Cost	Cost for Volume Clones per GiB
Snapshot Protection Cost	Cost for selected # of snapshots per GiB
CVO for AWS Total Cost per/mo	Same as CVO cost/mo - 1 yr



6.4 Chargeback – CVO Volumes (AZURE)

Powered by Data Infrastructure Insights

Chargeback - CVO Volumes (AZURE)

CVO Required Capacity	Billable Hours	CVO Azure Instances	CVO License Cost per/month	Azure Instance Cost per/month	Disk cost/month	Total Blob Cold Cost per/month	Total CVO Costs per/month
1.49 TB	720	1	$354.57 Cost per GiB $0.167	$250.42 Hourly Cost $0.348	$50.04 Cost per GiB $0.030	$32.49	$687.52

CVO Detail *(Current Data)*

Business Unit: N/A

Cluster Name	SVM	Aggregate	Aggr Allocated GB	Aggr Used GB	Aggr Extra Space GB	Volume	CVO Total Allocated GB	CVO Total Used GB	CVO % of Extra Space GB	License Cost per/mo	Azure VM Cost per Volume	Disk Cost per Volume	Cold Blob Cost per Volume	CVO Cost per/mo
cvoProd06	cvoProd06-01	cvoProd06-01:aggr0_cvoProd06_01	124.01	74.27	49.74	cvoProd06:cvoProd06-01:vol0	147.00	147.00	49.74	$30.55	$24.08	$4.81	$1.58	$61.02
	svm_cvoProd06	cvoProd06-01:aggr1	907.12	73.37	833.75	cvoProd06:svm_cvoProd06:dataVolume03	39.00	22.00	40.94	$7.40	$6.39	$1.28	$0.11	$15.18
	svm_cvoProd06	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:dataVolume11	20.00	0.00	0.00	$3.73	$3.28	$0.65	$0.03	$7.69
	svm_cvoProd06	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:dataVolume05	41.00	24.00	44.67	$7.79	$6.71	$1.34	$0.12	$15.96
	svm_cvoProd06	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:dataVolume07	52.00	17.00	31.64	$9.98	$8.52	$1.70	$0.20	$20.40
	svm_cvoProd06	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:dataVolume02	40.00	18.00	33.50	$7.59	$6.55	$1.31	$0.12	$15.57
	svm_cvoProd06	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:svm_cvoProd06_root	3.00	3.00	5.58	$0.55	$0.49	$0.10	$0.00	$1.14
	svm_cvoProd06	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:dataVolume04	51.00	18.00	33.50	$9.78	$8.35	$1.67	$0.19	$19.99
	svm_cvoProd06	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:dataVolume10	20.00	0.00	0.00	$3.73	$3.28	$0.65	$0.03	$7.69
	svm_cvoProd06	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:dataVolume01	256.00	24.00	44.67	$57.90	$41.93	$8.38	$4.80	$113.01
	svm_cvoProd06	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:dataVolume09	41.00	23.00	42.80	$7.79	$6.71	$1.34	$0.12	$15.96
	svm_cvoProd06	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:dataVolume06	565.00	275.00	511.79	$157.12	$92.53	$18.50	$23.38	$291.53
	svm_cvoProd06	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:dataVolume08	40.00	24.00	44.67	$7.59	$6.55	$1.31	$0.12	$15.57
qacvo	qacvo-01	qacvo-01:aggr0_qacvo_01	194.88	74.12	120.75	qacvo:qacvo-01:vol0	147.00	147.00	120.75	$30.55	$24.08	$4.81	$1.58	$61.02
	svm_qacvo	qacvo-01:aggr1	442.94	18.37	424.57	qacvo:svm_qacvo:svm_qacvo_root	3.00	3.00	29.62	$0.55	$0.49	$0.10	$0.00	$1.14
	svm_qacvo	qacvo-01:aggr1				qacvo:svm_qacvo:frosa_stream_processing_summary	2.00	2.00	19.75	$0.37	$0.33	$0.07	$0.00	$0.77
	svm_qacvo	qacvo-01:aggr1				qacvo:svm_qacvo:stream_processing	12.00	12.00	118.48	$2.22	$1.97	$0.39	$0.01	$4.59
	svm_qacvo	qacvo-01:aggr1				qacvo:svm_qacvo:volume1	30.00	6.00	59.24	$5.65	$4.91	$0.98	$0.07	$11.61
	svm_qacvo	qacvo-01:aggr1				qacvo:svm_qacvo:iscsi_0	20.00	20.00	197.47	$3.73	$3.28	$0.65	$0.03	$7.69
N/A Total							1,529.00	785.00	1,428.81	$354.57	$250.42	$50.04	$32.49	$687.52

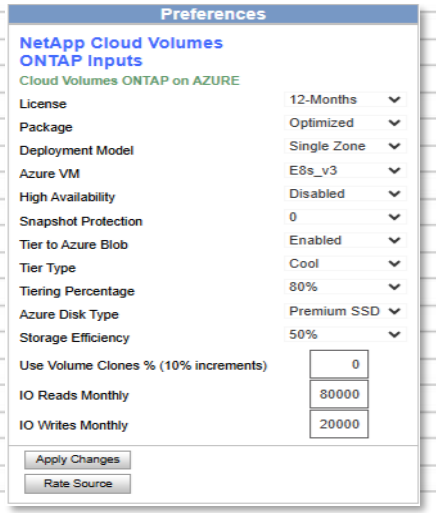
Description: This report shows chargeback costs for CVO volumes in AZURE.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled. Business Unit annotations deployed. Rate card is provided and is updated regularly.

Report XML: 6.4 Chargeback - CVO Volumes (AZURE)

6.4 Chargeback – CVO Volumes (AZURE) Definitions

Metric/Attribute	Description
Business Unit	Name of the Business Unit assigned to the CVO Internal Volume or Flexvol
Cluster Name	Name of the NetApp Cluster discovered and monitored by Cloud Insights
Aggregate	Name of the Aggregate associated with the node discovered and monitored by Cloud Insights
Volume	Name of the CVO Volume or Flexvol associated with the storage node and aggregate
Aggr Allocated GB	The total usable capacity in GB associated with the CVO Aggregate
Aggr Used GB	Total used capacity in GB associated with the CVO Aggregate
Aggr Extra Space GB	Aggr Allocated GB - Aggr Used GB
CVO Total Allocated GB	Total Allocated Capacity in GB as reported by the CVO Flexvol or Internal Volume that is known to Cloud Insights
CVO Total Used GB	Total Used Capacity in GB is logical (effective) capacity that is reported by the CVO Aggregate. If space guarantee is enabled on the volume, then Used will always equal Allocated. The logical size is computed based on physical usage (real writes) and savings obtained in the aggregate.
CVO % of Extra Space GB	This is the Sum of Aggr Extra Space in GB * The CVO percent of Total Used e.g. ([CVO Total Used GB]/[CVO Total Used by Aggr GB])
Required Capacity	Total provisioned capacity selected for projected CVO migration without efficiency
Required CVO Licenses	Number of CVO licenses required per 2 PiB of capacity migrated
% of Total Required	[CVO Total Allocated GB] / [CVO Required Capacity GB]
Instances	Number of CVO VM instances required based on required capacity for CVO volumes. For each 2 PiB of CVO capacity, one license and one instance is required.
NetApp License	The selected CVO license e.g. 12-Months, BYOL or PayGo. Only 12-Month is currently available in this report
Licenses Cost per/mo	[NetApp License]*[CVO Total Allocated GB]
Licenses Cost per Volume	_round(([License Cost per/mo]+([Efficiency]*[CVO Total Allocated GB])+([Volume Clones per GiB]*[CVO Total Allocated GB])+([Snapshot Protection]*[CVO Total Allocated GB])+[IO Reads Cost/mo]+[IO Writes Cost/mo])*[% of Total Required],2)
Billable Hours	Number of total hours for the current month. Formula: (DAY(LAST_DAY(NOW()))*24). All AZURE VMs that support Cloud Volumes ONTAP should be powered on for the entire month.
CVO Cost per/mo	[ONTAP Cost per Volume] + [Azure VM Cost per Volume] + [Hot Blob Cost per Volume] + [Disk Cost per Volume]
Blob (Tiering) Cold Cost per Volume	_round(([Tiering]*[CVO Total Allocated GB])*[% of Total Required],2)
CVO Azure VM Instances	The number of Azure VM instances required for CVO volumes. Same as [Instances Blob Hot Tier].
Allocated (GiB)	Provisioned capacity in GiB for logical volumes associated with onprem storage devices
Allocated (GiB) w/efficiencies	Provisioned capacity in GiB for logical volumes less efficiency technologies like dedupe and compression
CVO cost/mo - 1yr	Allocated GiB * NetApp Licenses Cost + Efficiency Cost + Snapshot Protection Cost + Volume Clones Cost + Tiering Cost + IO Reads Cost + IO Writes Cost
Tier to Azure Blob	Whether or not (enabled or disabled) capacity is tiered to AZURE Blob
Tier Type	Currently defaults to Cool. Hot can be added in the future
Tiering Percentage	The % of allocated capacity that will be tiered to cloud storage (AZURE Blob)
Volume Clones %	The % of capacity that is allocated to volume clones
High Availability	Whether or not high availability is enabled or disabled. Default is disabled
Snapshot Protection	Number of snapshots 0-30 that are required
IO Reads	$ 0.001 Per 10k Operations
IO Writes	$ 0.01 Per 10k Operations
Netapp License Cost	The cost of the NetApp CVO for AZURE license (see rate card)
Storage Efficiency Cost	Cost per GiB for storage efficiency technology deployed in CVO (See rate card)
Volume Clones Cost	Cost for Volume Clones per GiB
Snapshot Protection Cost	Cost for selected # of snapshots per GiB
CVO for AZURE Total Cost per/mo	Same as CVO cost/mo - 1 yr
AZURE VM Instance cost/hr	The cost / hr of the selected AWS instance (default is E8s_v3 @ .704 per hour)
AZURE VM cost/mo * number of licenses	AZURE Compute cost/mo * number of CVO licenses
Azure VM Cost per Volume	([Azure VM]*24*(_day(_last_of_month (current_date)))*[Required Licenses])*[% of Total Required]
Disk cost/mo	Cost of EBS disks for each instance
Disk Cost per Volume	_round([DiskcostPerMonth]*[% of Total Required],2)
AZURE cost/mo	AZURE Compute Cost - 1yr + Disk Cost
Total Cost per month	AZURE Costs - 1yr + CVO for AZURE Total Costs



6.4 Chargeback – CVO Volumes (GCP)

Powered by Data Infrastructure Insights

Chargeback - CVO Volumes (GCP)

CVO Required Capacity	Billable Hours	CVO Instances	License Cost per/month	GCP Instance Cost per/month	GCP Disk cost/month	Cloud Storage Cost per/month	CVO Costs per/month
1,529 GB	720	1	$41.28	$166.82	$22.01	$0.00	$230.11

CVO Detail *(Current Data)*

Business Unit: N/A

Cluster Name	Aggregate	Aggr Allocated GB	Aggr Used GB	Aggr Extra Space GB	Volume	CVO Total Allocated GB	CVO Total Used GB	CVO % of Extra Space GB	License Cost per/mo	Compute Cost per Volume	Disk Cost per Volume	Cloud Storage Cost per Volume	CVO Cost per/mo
cvoProd06	cvoProd06-01:aggr0_cvoProd06_01	124.01	74.27	49.74	cvoProd06:cvoProd06-01:vol0	147.00	147.00	49.74	$3.97	$16.04	$2.12	$0.00	$22.13
	cvoProd06-01:aggr1	907.12	73.37	833.75	cvoProd06:svm_cvoProd06:dataVolume01	256.00	24.00	44.67	$6.91	$27.93	$3.68	$0.00	$38.52
	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:dataVolume09	41.00	23.00	42.80	$1.11	$4.47	$0.59	$0.00	$6.17
	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:dataVolume06	565.00	275.00	511.79	$15.26	$61.64	$8.13	$0.00	$85.03
	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:dataVolume03	39.00	22.00	40.94	$1.05	$4.25	$0.56	$0.00	$5.87
	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:dataVolume08	40.00	24.00	44.67	$1.08	$4.36	$0.58	$0.00	$6.02
	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:dataVolume11	20.00	0.00	0.00	$0.54	$2.18	$0.29	$0.00	$3.01
	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:dataVolume05	41.00	24.00	44.67	$1.11	$4.47	$0.59	$0.00	$6.17
	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:dataVolume07	52.00	17.00	31.64	$1.40	$5.67	$0.75	$0.00	$7.83
	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:svm_cvoProd06_root	3.00	3.00	5.58	$0.08	$0.33	$0.04	$0.00	$0.45
	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:dataVolume02	40.00	18.00	33.50	$1.08	$4.36	$0.58	$0.00	$6.02
	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:dataVolume04	51.00	18.00	33.50	$1.38	$5.56	$0.73	$0.00	$7.67
	cvoProd06-01:aggr1				cvoProd06:svm_cvoProd06:dataVolume10	20.00	0.00	0.00	$0.54	$2.18	$0.29	$0.00	$3.01
qacvo	qacvo-01:aggr0_qacvo_01	194.88	74.12	120.75	qacvo:qacvo-01:vol0	147.00	147.00	120.75	$3.97	$16.04	$2.12	$0.00	$22.13
	qacvo-01:aggr1	442.94	18.37	424.57	qacvo:svm_qacvo:svm_qacvo_root	3.00	3.00	29.62	$0.08	$0.33	$0.04	$0.00	$0.45
	qacvo-01:aggr1				qacvo:svm_qacvo:frosa_stream_processing_summary	2.00	2.00	19.75	$0.05	$0.22	$0.03	$0.00	$0.30
	qacvo-01:aggr1				qacvo:svm_qacvo:stream_processing	12.00	12.00	118.48	$0.32	$1.31	$0.17	$0.00	$1.80
	qacvo-01:aggr1				qacvo:svm_qacvo:volume1	30.00	6.00	59.24	$0.81	$3.27	$0.43	$0.00	$4.51
	qacvo-01:aggr1				qacvo:svm_qacvo:iscsi_0	20.00	20.00	197.47	$0.54	$2.18	$0.29	$0.00	$3.01
Business Unit: N/A						**1,529.00**	**785.00**	**1,428.81**	**$41.28**	**$166.82**	**$22.01**	**$0.00**	**$230.11**

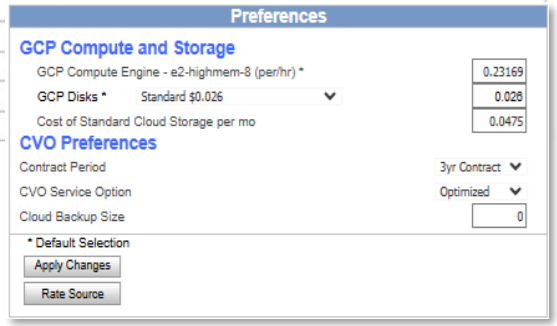
Description: This report shows chargeback costs for CVO volumes in Google Cloud.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled. Business Unit annotations deployed. Rate card is provided and is updated regularly.

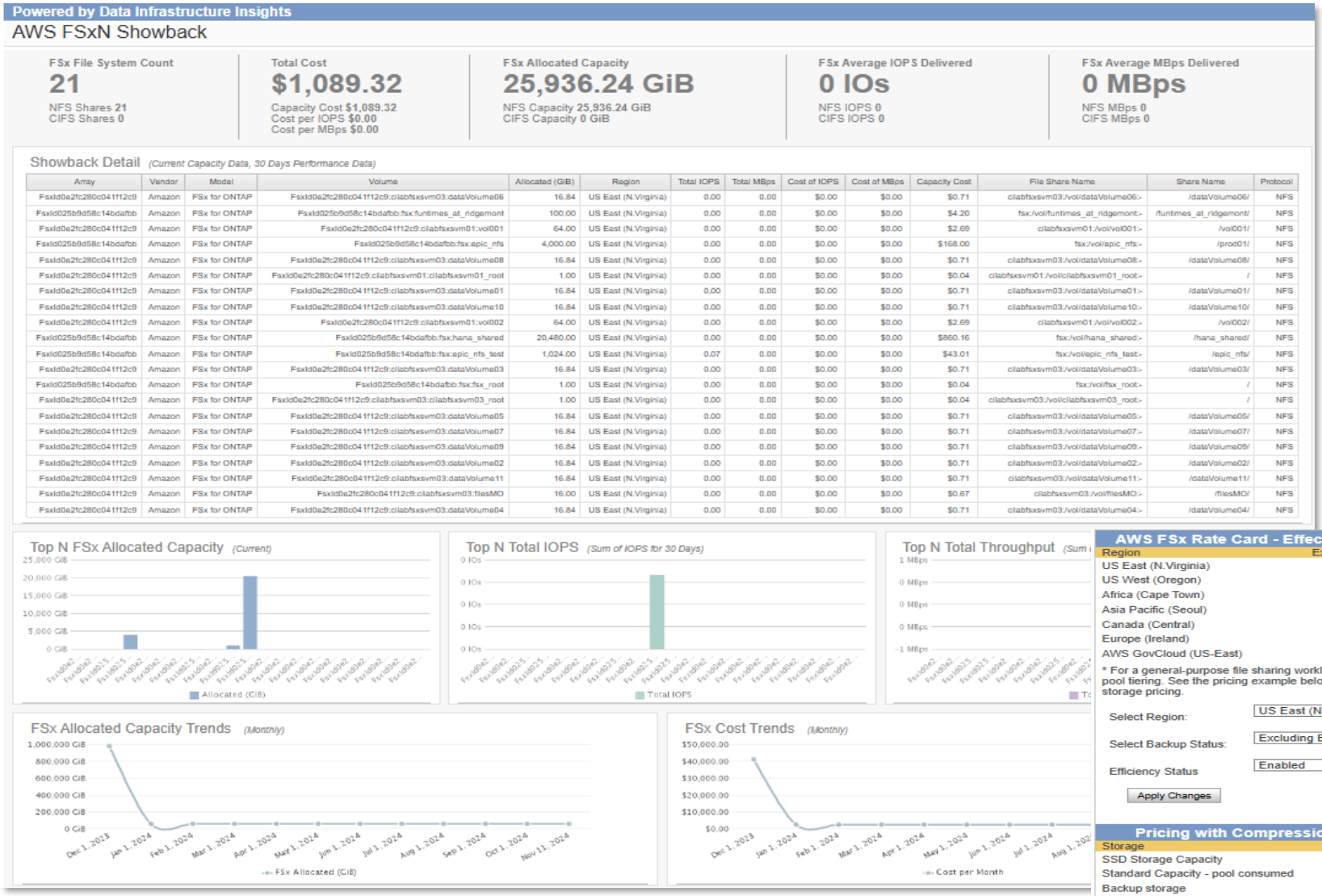
Report XML: 6.4 Chargeback - CVO Volumes (GCP)

6.4 Chargeback – CVO Volumes (GCP) Definitions

Metric/Attribute	Description
Business Unit	Name of the Business Unit assigned to the CVO Internal Volume or Flexvol
Cluster Name	Name of the NetApp Cluster discovered and monitored by Cloud Insights
Aggregate	Name of the Aggregate associated with the node discovered and monitored by Cloud Insights
Required CVO Licenses	Number of CVO licenses required per 2 PiB of capacity
Aggr Allocated GB	The total usable capacity in GB associated with the CVO Aggregate
Aggr Used GB	Total used capacity in GB associated with the CVO Aggregate
Aggr Extra Space GB	Aggr Allocated GB - Aggr Used GB
Volume	Name of the CVO Volume or Flexvol associated with the storage node and aggregate
% of Total Required	[CVO Total Allocated GB] / [CVO Required Capacity GB]
CVO Total Allocated GB	Total Allocated Capacity in GB as reported by the CVO Flexvol or Internal Volume that is known to Cloud Insights
CVO Total Used GB	Total Used Capacity in GB is logical (effective) capacity that is reported by the CVO Aggregate. If space guarantee is enabled on the volume, then Used will always equal Allocated. The logical size is computed based on physical usage (real writes) and savings obtained in the aggregate.
CVO % of Extra Space GB	This is the Sum of Aggr Extra Space in GB * The CVO percent of Total Used e.g. ([CVO Total Used GB]/[CVO Total Used by Aggr GB])
Licenses Cost per /mo	(CVO Service Option Selection + Contract Period Selection = License Cost per GiB/mo) * [Total CVO Allocated GB]
Licenses Cost per Volume	[License Cost per/mo]*[% of Total Required]
GCP Instance Cost per /mo	Contract Period Selection = 3yr then hourly cost is .23169 (default)
Compute Cost per Volume	[Compute Cost /mo]*[% of Total Required]
GCP Disk Cost per /mo	.044 * 500 GiB (default)
Disk Cost per Volume	_round([DiskcostPerMonth]*[% of Total Required],2)
Cloud Storage Cost per /mo	Cloud Backup Size * .0475 (default)
Cloud Storage Cost per Volume	_round([Total Cloud Cost]*[% of Total Required],2)
CVO Cost per/mo	[License Cost per Volume]+[Compute Cost per Volume]+[Cloud Storage Cost per Volume]+[Disk Cost per Volume]
CVO Required Capacity	Total provisioned CVO capacity without efficiency
Billable Hours	Number of total hours for the current month. Formula: (DAY(LAST_DAY(NOW()))*24). All AZURE VMs that support Cloud Volumes ONTAP should be powered on for the entire month.
CVO Instances	Number of CVO VM instances required based on required capacity for CVO volumes. For each 2 PiB of CVO capacity, one license and one instance is required.
Licenses Cost per /month	Sum of (CVO Service Option Selection + Contract Period Selection = License Cost per GiB/mo) * [Total CVO Allocated GB]
GCP Instance Cost per /month	Sum of GCP Instance Cost per Month
GCP Disk Cost per /month	Sum of GCP Disk Cost per /mo
Cloud Storage Cost per/month	Sum of Cloud Storage Cost per /mo
CVO Costs per/month	Sum of [License Cost per Volume]+[Compute Cost per Volume]+[Cloud Storage Cost per Volume]+[Disk Cost per Volume]



6.6 AWS FSx Showback



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AWS FSxN Showback

FSx File System Count	Total Cost	FSx Allocated Capacity	FSx Average IOPS Delivered	FSx Average MBps Delivered
21	$1,089.32	25,936.24 GiB	0 IOs	0 MBps
NFS Shares 21 CIFS Shares 0	Capacity Cost $1,089.32 Cost per IOPS $0.00 Cost per MBps $0.00	NFS Capacity 25,936.24 GiB CIFS Capacity 0 GiB	NFS IOPS 0 CIFS IOPS 0	NFS MBps 0 CIFS MBps 0

Showback Detail *(Current Capacity Data, 30 Days Performance Data)*

Array	Vendor	Model	Volume	Allocated (GiB)	Region	Total IOPS	Total MBps	Cost of IOPS	Cost of MBps	Capacity Cost	File Share Name	Share Name	Protocol
Fsxid0e2fc280c041f12c9	Amazon	FSx for ONTAP	Fsxid0e2fc280c041f12c9:cilabfsxsvm03:dataVolume06	16.84	US East (N.Virginia)	0.00	0.00	$0.00	$0.00	$0.71	cilabfsxsvm03:/vol/dataVolume06:-	/dataVolume06/	NFS
Fsxid025b9d58c14bdafbb	Amazon	FSx for ONTAP	Fsxid025b9d58c14bdafbb:fsx:funtimes_at_ridgemont	100.00	US East (N.Virginia)	0.00	0.00	$0.00	$0.00	$4.20	fsx:/vol/funtimes_at_ridgemont:-	/funtimes_at_ridgemont/	NFS
Fsxid0e2fc280c041f12c9	Amazon	FSx for ONTAP	Fsxid0e2fc280c041f12c9:cilabfsxsvm01:vol001	64.00	US East (N.Virginia)	0.00	0.00	$0.00	$0.00	$2.69	cilabfsxsvm01:/vol/vol001:-	/vol001/	NFS
Fsxid025b9d58c14bdafbb	Amazon	FSx for ONTAP	Fsxid025b9d58c14bdafbb:fsx:epic_nfs	4,000.00	US East (N.Virginia)	0.00	0.00	$0.00	$0.00	$168.00	fsx:/vol/epic_nfs:-	/prod01/	NFS
Fsxid0e2fc280c041f12c9	Amazon	FSx for ONTAP	Fsxid0e2fc280c041f12c9:cilabfsxsvm03:dataVolume08	16.84	US East (N.Virginia)	0.00	0.00	$0.00	$0.00	$0.71	cilabfsxsvm03:/vol/dataVolume08:-	/dataVolume08/	NFS
Fsxid0e2fc280c041f12c9	Amazon	FSx for ONTAP	Fsxid0e2fc280c041f12c9:cilabfsxsvm01:cilabfsxsvm01_root	1.00	US East (N.Virginia)	0.00	0.00	$0.00	$0.00	$0.04	cilabfsxsvm01:/vol/cilabfsxsvm01_root:-	/	NFS
Fsxid0e2fc280c041f12c9	Amazon	FSx for ONTAP	Fsxid0e2fc280c041f12c9:cilabfsxsvm03:dataVolume01	16.84	US East (N.Virginia)	0.00	0.00	$0.00	$0.00	$0.71	cilabfsxsvm03:/vol/dataVolume01:-	/dataVolume01/	NFS
Fsxid0e2fc280c041f12c9	Amazon	FSx for ONTAP	Fsxid0e2fc280c041f12c9:cilabfsxsvm03:dataVolume10	16.84	US East (N.Virginia)	0.00	0.00	$0.00	$0.00	$0.71	cilabfsxsvm03:/vol/dataVolume10:-	/dataVolume10/	NFS
Fsxid0e2fc280c041f12c9	Amazon	FSx for ONTAP	Fsxid0e2fc280c041f12c9:cilabfsxsvm01:vol002	64.00	US East (N.Virginia)	0.00	0.00	$0.00	$0.00	$2.69	cilabfsxsvm01:/vol/vol002:-	/vol002/	NFS
Fsxid025b9d58c14bdafbb	Amazon	FSx for ONTAP	Fsxid025b9d58c14bdafbb:fsx:hana_shared	20,480.00	US East (N.Virginia)	0.00	0.00	$0.00	$0.00	$860.16	fsx:/vol/hana_shared:-	/hana_shared/	NFS
Fsxid025b9d58c14bdafbb	Amazon	FSx for ONTAP	Fsxid025b9d58c14bdafbb:fsx:epic_nfs_test	1,024.00	US East (N.Virginia)	0.07	0.00	$0.00	$0.00	$43.01	fsx:/vol/epic_nfs_test:-	/epic_nfs/	NFS
Fsxid0e2fc280c041f12c9	Amazon	FSx for ONTAP	Fsxid0e2fc280c041f12c9:cilabfsxsvm03:dataVolume03	16.84	US East (N.Virginia)	0.00	0.00	$0.00	$0.00	$0.71	cilabfsxsvm03:/vol/dataVolume03:-	/dataVolume03/	NFS
Fsxid025b9d58c14bdafbb	Amazon	FSx for ONTAP	Fsxid025b9d58c14bdafbb:fsx:fsx_root	1.00	US East (N.Virginia)	0.00	0.00	$0.00	$0.00	$0.04	fsx:/vol/fsx_root:-	/	NFS
Fsxid0e2fc280c041f12c9	Amazon	FSx for ONTAP	Fsxid0e2fc280c041f12c9:cilabfsxsvm03:cilabfsxsvm03_root	1.00	US East (N.Virginia)	0.00	0.00	$0.00	$0.00	$0.04	cilabfsxsvm03:/vol/cilabfsxsvm03_root:-	/	NFS
Fsxid0e2fc280c041f12c9	Amazon	FSx for ONTAP	Fsxid0e2fc280c041f12c9:cilabfsxsvm03:dataVolume05	16.84	US East (N.Virginia)	0.00	0.00	$0.00	$0.00	$0.71	cilabfsxsvm03:/vol/dataVolume05:-	/dataVolume05/	NFS
Fsxid0e2fc280c041f12c9	Amazon	FSx for ONTAP	Fsxid0e2fc280c041f12c9:cilabfsxsvm03:dataVolume07	16.84	US East (N.Virginia)	0.00	0.00	$0.00	$0.00	$0.71	cilabfsxsvm03:/vol/dataVolume07:-	/dataVolume07/	NFS
Fsxid0e2fc280c041f12c9	Amazon	FSx for ONTAP	Fsxid0e2fc280c041f12c9:cilabfsxsvm03:dataVolume09	16.84	US East (N.Virginia)	0.00	0.00	$0.00	$0.00	$0.71	cilabfsxsvm03:/vol/dataVolume09:-	/dataVolume09/	NFS
Fsxid0e2fc280c041f12c9	Amazon	FSx for ONTAP	Fsxid0e2fc280c041f12c9:cilabfsxsvm03:dataVolume02	16.84	US East (N.Virginia)	0.00	0.00	$0.00	$0.00	$0.71	cilabfsxsvm03:/vol/dataVolume02:-	/dataVolume02/	NFS
Fsxid0e2fc280c041f12c9	Amazon	FSx for ONTAP	Fsxid0e2fc280c041f12c9:cilabfsxsvm03:dataVolume11	16.84	US East (N.Virginia)	0.00	0.00	$0.00	$0.00	$0.71	cilabfsxsvm03:/vol/dataVolume11:-	/dataVolume11/	NFS
Fsxid0e2fc280c041f12c9	Amazon	FSx for ONTAP	Fsxid0e2fc280c041f12c9:cilabfsxsvm03:filesMO	16.00	US East (N.Virginia)	0.00	0.00	$0.00	$0.00	$0.67	cilabfsxsvm03:/vol/filesMO:-	/filesMO/	NFS
Fsxid0e2fc280c041f12c9	Amazon	FSx for ONTAP	Fsxid0e2fc280c041f12c9:cilabfsxsvm03:dataVolume04	16.84	US East (N.Virginia)	0.00	0.00	$0.00	$0.00	$0.71	cilabfsxsvm03:/vol/dataVolume04:-	/dataVolume04/	NFS

Top N FSx Allocated Capacity *(Current)*

Top N Total IOPS *(Sum of IOPS for 30 Days)*

Top N Total Throughput *(Sum*

FSx Allocated Capacity Trends *(Monthly)*

FSx Cost Trends *(Monthly)*

AWS FSx Rate Card - Effective Storage Pricing per GiB/Mo*

Region	Excluding Backups	Including Backups
US East (N.Virginia)	$0.042	$0.059
US West (Oregon)	$0.042	$0.059
Africa (Cape Town)	$0.053	$0.074
Asia Pacific (Seoul)	$0.047	$0.064
Canada (Central)	$0.046	$0.065
Europe (Ireland)	$0.045	$0.063
AWS GovCloud (US-East)	$0.061	$0.085

* For a general-purpose file sharing workload with storage efficiency savings and capacity pool tiering. See the pricing example below for details on how we calculate effective storage pricing.

Select Region: US East (N.Virginia)

Select Backup Status: Excluding Backup

Efficiency Status: Enabled

Apply Changes

Pricing with Compression + Deduplication per GiB/Mo

Storage	Enabled	Disabled
SSD Storage Capacity	$0.0875	$0.0250
Standard Capacity - pool consumed	$0.0153	$0.0438
Backup storage	$0.0175	$0.050

Throughput Capacity, IOPS and Requests per Mo

Type	Pricing (Multi-AZ file systems)
Throughput Capacity	$1.200 per MBps-month
SSD IOPS	$0.0340 per IOPS-month
Capacity pool read requests	$0.0004 per 1000 requests
Capacity pool write requests	$0.064per 1000 requests

Description: This report shows AWS FSx volume capacity and costs. Top workloads are highlighted with capacity and performance trends.

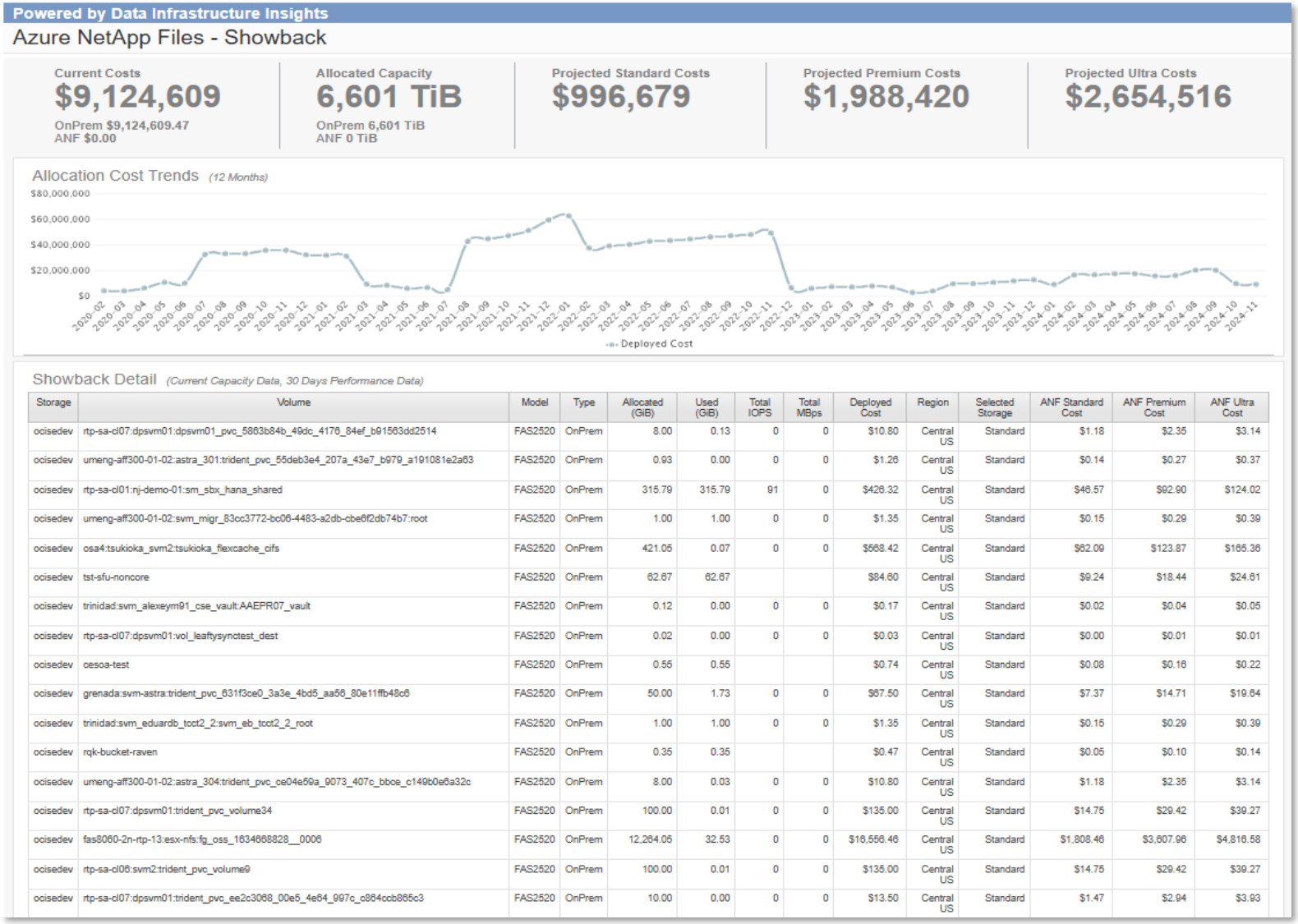
Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 6.4 AWS FSx Showback

6.4 AWS FSx Showback

Metric/Attribute	Description
Array	Name of the storage device discovered and monitored by DII
Vendor	Manufacturer of the storage device
Model	Model name of the storage device
Volume	Name of the FSx volume associated with the storage device
Allocated (GiB)	Allocated capacity in Gibibytes for the FSx volume
Region	AWS region where the FSx volume resides
Total IOPS	Measures the maximum I/O service requests on the FSx volume during the selected time period (measured in I/O per sec)
Total MBps	The Rate at which data is being transmitted (both read+write) in a fixed amount of time in response to I/O service requests (measured in MB per sec)
Cost of IOPS	Using the AWS FSx Rate Card: Total IOPS * .0340 per month
Cost of MBps	Using the AWS FSx Rate Card: Total MBps * .1.20 per month
Effective Rate	The effective rate is derived from selection Region + Backup Status + Efficiency Status. Default Allocated capacity rate is .042 (US East N.Virginia, Excluding Backups, and no Efficiency
Capacity Cost	Using the AWS FSx Rate Card: Allocated (GiB) * Effective Rate per month
File Share Name	Name of the file share associated with the FSx volume
Protocol	The protocol in use for the FSx volume e.g. NFS
Full Date	Full Date field available in the DWH Date Dimension table

6.7 Azure NetApp Files (ANF) Showback



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Azure NetApp Files - Showback

Current Costs	Allocated Capacity	Projected Standard Costs	Projected Premium Costs	Projected Ultra Costs
$9,124,609	6,601 TiB	$996,679	$1,988,420	$2,654,516
OnPrem $9,124,609.47 ANF $0.00	OnPrem 6,601 TiB ANF 0 TiB			

Allocation Cost Trends *(12 Months)*

Showback Detail *(Current Capacity Data, 30 Days Performance Data)*

Storage	Volume	Model	Type	Allocated (GiB)	Used (GiB)	Total IOPS	Total MBps	Deployed Cost	Region	Selected Storage	ANF Standard Cost	ANF Premium Cost	ANF Ultra Cost
ocisedev	rtp-sa-cl07:dpsvm01:dpsvm01_pvc_5863b84b_49dc_4176_84ef_b91563dd2514	FAS2520	OnPrem	8.00	0.13	0	0	$10.80	Central US	Standard	$1.18	$2.35	$3.14
ocisedev	umeng-aff300-01-02:astra_301:trident_pvc_55deb3e4_207a_43e7_b979_a191081e2a83	FAS2520	OnPrem	0.93	0.00	0	0	$1.26	Central US	Standard	$0.14	$0.27	$0.37
ocisedev	rtp-sa-cl01:nj-demo-01:sm_sbx_hana_shared	FAS2520	OnPrem	315.79	315.79	91	0	$426.32	Central US	Standard	$46.57	$92.90	$124.02
ocisedev	umeng-aff300-01-02:svm_migr_83cc3772-bc06-4483-a2db-cbe6f2db74b7:root	FAS2520	OnPrem	1.00	1.00	0	0	$1.35	Central US	Standard	$0.15	$0.29	$0.39
ocisedev	osa4:tsukioka_svm2:tsukioka_flexcache_cifs	FAS2520	OnPrem	421.05	0.07	0	0	$568.42	Central US	Standard	$62.09	$123.87	$166.36
ocisedev	tst-sfu-noncore	FAS2520	OnPrem	62.67	62.67			$84.60	Central US	Standard	$9.24	$18.44	$24.61
ocisedev	trinidad:svm_alexeym91_cse_vault:AAEPR07_vault	FAS2520	OnPrem	0.12	0.00	0	0	$0.17	Central US	Standard	$0.02	$0.04	$0.05
ocisedev	rtp-sa-cl07:dpsvm01:vol_leaftysynctest_dest	FAS2520	OnPrem	0.02	0.00	0	0	$0.03	Central US	Standard	$0.00	$0.01	$0.01
ocisedev	oesoa-test	FAS2520	OnPrem	0.55	0.55			$0.74	Central US	Standard	$0.08	$0.16	$0.22
ocisedev	grenada:svm-astra:trident_pvc_631f3ce0_3a3e_4bd5_aa56_80e11ffb48c6	FAS2520	OnPrem	50.00	1.73	0	0	$67.50	Central US	Standard	$7.37	$14.71	$19.64
ocisedev	trinidad:svm_eduardb_tcct2_2:svm_eb_tcct2_2_root	FAS2520	OnPrem	1.00	1.00	0	0	$1.35	Central US	Standard	$0.15	$0.29	$0.39
ocisedev	rqk-bucket-raven	FAS2520	OnPrem	0.35	0.35			$0.47	Central US	Standard	$0.05	$0.10	$0.14
ocisedev	umeng-aff300-01-02:astra_304:trident_pvc_ce04e59a_9073_407c_bboe_c149b0e6a32c	FAS2520	OnPrem	8.00	0.03	0	0	$10.80	Central US	Standard	$1.18	$2.35	$3.14
ocisedev	rtp-sa-cl07:dpsvm01:trident_pvc_volume34	FAS2520	OnPrem	100.00	0.01	0	0	$135.00	Central US	Standard	$14.75	$29.42	$39.27
ocisedev	fas8060-2n-rtp-13:esx-nfs:fg_oss_1634668828__0006	FAS2520	OnPrem	12,264.05	32.53	0	0	$16,556.46	Central US	Standard	$1,808.46	$3,607.96	$4,816.58
ocisedev	rtp-sa-cl06:svm2:trident_pvc_volume9	FAS2520	OnPrem	100.00	0.01	0	0	$135.00	Central US	Standard	$14.75	$29.42	$39.27
ocisedev	rtp-sa-cl07:dpsvm01:trident_pvc_ee2c3068_00e5_4e64_997c_c864ccb865c3	FAS2520	OnPrem	10.00	0.00	0	0	$13.50	Central US	Standard	$1.47	$2.94	$3.93

Description: This report shows OnPrem and ANF workload costs for multiple storage types and scenarios. Cost trends are emphasized.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 6.7 Azure NetApp Files (ANF) Showback

6.7 Azure NetApp Files (ANF) Showback Definitions

Metric/Attribute	Description
Storage	Name of the storage device discovered and monitored by DII
Volume	Name of the ANF volume associated with the storage device
Model	Model name of the storage device
Type	The type of volume e.g OnPrem or ANF
Allocated (GiB)	Allocated capacity in Gibibytes for the internal volume either OnPrem or ANF
Used (GiB)	Used capacity in Gibibytes for the internal volume either OnPrem or ANF
Total IOPS	Measures the total number of I/O service requests (read+write) on the internal volume during the selected time period (measured in I/O per sec)
Total MBps	The Rate at which data is being transmitted from the internal volume in a fixed amount of time in response to I/O service requests (measured in MB per sec)
Deployed Cost	WHEN Type = 'OnPrem' THEN Allocated (GiB) *1.35 (the current OnPrem default price) ELSE [Selected Storage Price]
Region	The AWS region where the capacity resides
Selected Storage	The ANF storage type e.g. Standard, Premium, Ultra
Selected Storage Price	From the AWS FSx rate card: WHEN Selected Storage='Standard' THEN Standard Price(0.14746) * Allocated (GiB) WHEN Selected Storage ='Premium' THEN Premium Price(0.29419) * Allocated (GiB) WHEN Selected Storage='Ultra' THEN Ultra Price(0.39274) * Allocated (GiB) ELSE 1.35
ANF Standard Cost	0.14746 * Allocated (GiB)
ANF Premium Cost	0.29419 * Allocated (GiB)
ANF Ultra Cost	0.39274 * Allocated (GiB)
Projected Standard Costs	Projected costs of migrating OnPrem workloads to ANF Standard
Projected Premium Costs	Projected costs of migrating OnPrem workloads to ANF Premium
Projected Ultra Costs	Projected costs of migrating OnPrem workloads to ANF Ultra
Full Date	Full Date field available in the DWH Date Dimension table

6.8 EBS Infrastructure Costs

Powered by Data Infrastructure Insights

EBS Infrastructure and Costs

EBS Count	EBS Snapshot Count	Orhphaned EBS	Instance Count	Reclaimable Assets
114	2,392	5	65	9
Total Cost $7,759 Total Provisioned 85,682 GiB	Total Cost $9,066 Total Provisioned 181,324 GiB	Total Cost $9 Total Provisioned 90 GiB	Windows Count 1 Linux Count 16 *Other Count 48*	Running 57 Powered Down 8 Idle 1

Infrastructure Detail *(Current Data)*

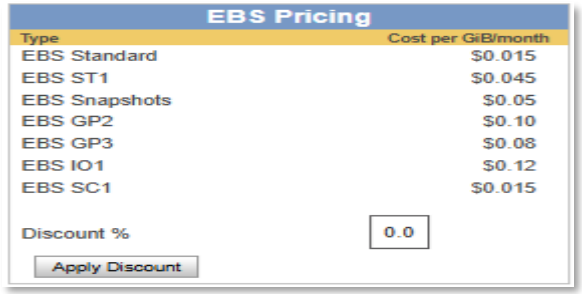
VM	vCPU	vRAM	Instance Type	EBS Name	EBS Type	EBS Provisioned (GiB)	EBS Pricing	Discount %	EBS Cost	Avg IOpS	Peak IOpS
weaviate_node_4	8	32	g5.2xlarge	vol-0c396258383aa7b39	EBS_gp2	1,500	$0.10	0.0	$150.00	0	0
weaviate_node_3	8	32	g5.2xlarge	vol-0d1796b2ce7e0efd3	EBS_gp2	1,500	$0.10	0.0	$150.00	0	0
weaviate_node_2	8	32	g5.2xlarge	vol-03dbeba905c046f2b	EBS_gp2	1,500	$0.10	0.0	$150.00	0	0
weaviate_node_1	8	32	g5.2xlarge	vol-00e443f883606eadc	EBS_gp2	1,500	$0.10	0.0	$150.00	0	0
vsa-HAMediator1d-DO-NOT-DELETE	1	1	t2.micro	vol-085507d86e5169a30	EBS_standard	40	$0.02	0.0	$0.60	0	1
vsa-HAMediator1d-DO-NOT-DELETE	1	1	t2.micro	vol-0242db244c67bf76f	EBS_standard	40	$0.02	0.0	$0.60	2	25
vsa-HAMediator1d-DO-NOT-DELETE	1	1	t2.micro	vol-0dc2547b40c10f211	EBS_gp2	500	$0.10	0.0	$50.00	0	1
vsa-HAMediator1d-DO-NOT-DELETE	1	1	t2.micro	vol-0ee963b06e9c33f85	EBS_standard	80	$0.02	0.0	$1.20	1	15
vsa-HAMediator1c-DO-NOT-DELETE	2	4	t2.medium	vol-0b89b93aa7fa00270	EBS_gp2	40	$0.10	0.0	$4.00	0	0
vsa-HAMediator1c-DO-NOT-DELETE	2	4	t2.medium	vol-040b4109c839348c0	EBS_gp2	80	$0.10	0.0	$8.00	0	0
pkhandel-worker1	8	32	g5.2xlarge	vol-00f5d7a791e1f19c9	EBS_gp3	2,500	$0.08	0.0	$200.00	26	90
pkhandel-master	8	32	g5.2xlarge	vol-08716298215f8af87	EBS_gp2	2,500	$0.10	0.0	$250.00	36	195
Nightly-Med-Install-0-0-45-1-test2	1	1	t2.micro	vol-04244802ee7c4dbe7	EBS_standard	100	$0.02	0.0	$1.50	0	0
netappiq-neo4j-sudip	2	8	m4.large	vol-00fb015f9d0ae14e9	EBS_gp2	640	$0.10	0.0	$64.00	0	0
netappiq-mongodb4	2	8	m4.large	vol-0683fd9c15583f5b6	EBS_gp2	40	$0.10	0.0	$4.00	0	2
netappiq-mongodb3	2	8	m4.large	vol-028e5113c1a408b6f	EBS_gp2	40	$0.10	0.0	$4.00	0	0
netappiq-mongodb2	2	8	m4.large	vol-099fa357ef823c4c3	EBS_gp2	40	$0.10	0.0	$4.00	0	2
netappiq-mongodb1	2	8	m4.large	vol-055c5a3f374f18bcb	EBS_gp2	40	$0.10	0.0	$4.00	7	82
netappiq-memsql-poc	4	8	c5.xlarge	vol-09592e2444a77b2df	EBS_gp2	40	$0.10	0.0	$4.00	0	1
netappiq-elk	4	16	m4.xlarge	vol-0dcffc5b61f7c95fa	EBS_gp2	75	$0.10	0.0	$7.50	0	0
NavyadesignsystemNov11	8	32	t3.2xlarge	vol-0a4a42ad92b2814cc	EBS_gp2	500	$0.10	0.0	$50.00	0	0
Mediator Dev HTTP Server	1	1	t2.micro	vol-06af74e4	EBS_gp2	40	$0.10	0.0	$4.00	0	1
linux01	1	1	t2.micro	vol-013be5c754adfc70c	EBS_gp3	40	$0.08	0.0	$3.20	0	0
kyubey	8	16	c5a.2xlarge	vol-047653b1248c23084	EBS_gp2	500	$0.10	0.0	$50.00	692	3,000
jgarbaci-prowler	1	1	t2.micro	vol-0d08445a227574beb	EBS_gp2	40	$0.10	0.0	$4.00	0	0
i-0f8fb947a2c3a4f40	2	2	t3a.small	vol-0421b0bacac459108	EBS_gp2	100	$0.10	0.0	$10.00	2	13
i-0f716330b70585bf0	2	4	t3.medium	vol-0fbd9b914d9b1fac8	EBS_gp2	100	$0.10	0.0	$10.00	2	19
i-0d08bd5d2919ac0c7	2	2	t3a.small	vol-03f824be20860411f	EBS_gp2	100	$0.10	0.0	$10.00	2	12
i-0cdc2d490342a35fc	4	8	c6a.xlarge	vol-0e14b53499b6cae50	EBS_gp2	100	$0.10	0.0	$10.00	23	263
i-0cb85aeoc2038d851	2	4	t3.medium	vol-08b68b7a86693d9bd	EBS_gp2	100	$0.10	0.0	$10.00	3	12
i-0c80b7a3915148568	4	8	c6a.xlarge	vol-089f6785b249f9898	EBS_gp2	100	$0.10	0.0	$10.00	5	13
i-0b645c941a632b1d0	4	8	c6a.xlarge	vol-09602a5a892f33fd4	EBS_gp2	100	$0.10	0.0	$10.00	9	19
i-0b2a47134f40e25d6	4	8	c6a.xlarge	vol-0bf54c7bc2fb9142e	EBS_gp2	100	$0.10	0.0	$10.00	37	297

Description: This report highlights AWS Elastic Block Storage resources and costs. Emphasis is placed on orphaned volumes or excessive snapshots.

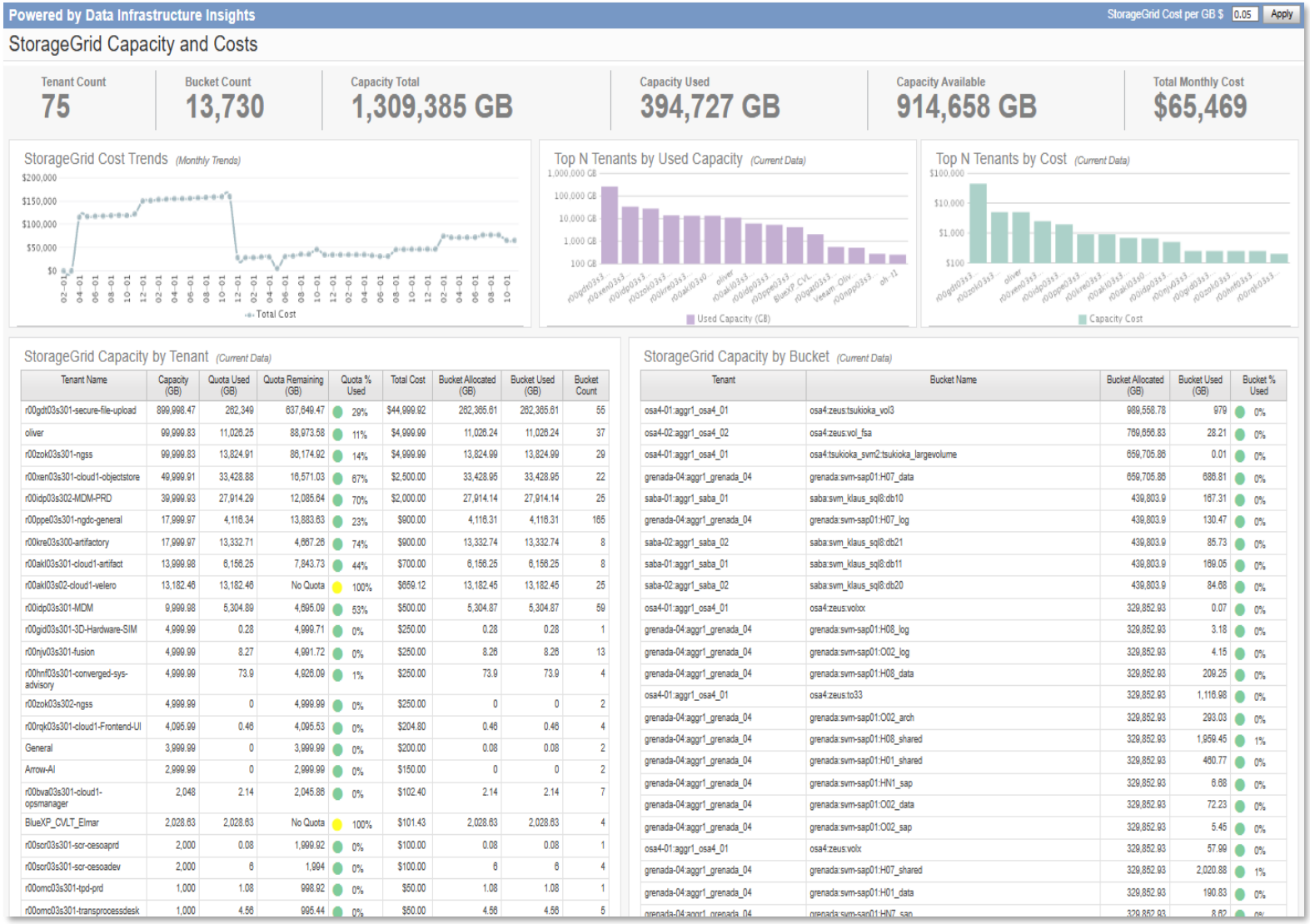
Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 6.8 EBS Infrastructure Costs

6.8 EBS Infrastructure Costs Definitions

Metric/Attribute	Description
VM	Name of the EC2 instance discovered and monitored by DII
vCPU	Number of virtual processors that are allocated to the EC2 instance
vRAM	Amount of Memory in Gibibytes allocated to the EC2 instance
Instance Type	The configuration type associated with the virtual instance e.g. a1.medium, a1.large, a1.xlarge etc.
EBS Name	Name of the Elastic Block Storage virtual disk
EBS Type	The type of EBS disk e.g. GP2, GP3, IO1, SC1 etc.
EBS Provisioned (GiB)	Amount of capacity provisioned in Gibibytes to the EBS disk
EBS Pricing	The monthly cost of the EBS disk type e.g. WHEN [EBS Type] contains 'gp2' THEN .1 WHEN [EBS Type] contains 'gp3' THEN .08 WHEN [EBS Type] contains 'io' THEN .12 WHEN [EBS Type] contains 'st1' THEN .045 WHEN [EBS Type] contains 'sc1' THEN .015 WHEN [EBS Type] contains 'standard' THEN .015 WHEN [EBS Type] contains 'snap' THEN .05 
Discount %	This is the discount percentage applied to the EBS pricing rate card after runtime. This value can be embedded into the pricing tables
EBS Cost	This is the monthly cost of the EBS disk e.g. EBS Pricing * EBS Provisioned (GiB) * Discount %
Avg IOPS	Measures the total number of I/O service requests (read+write) that are averaged over the collection period for the EBS disk in I/Os per second
Peak IOPS	Maximum I/Os per second for the collection period
EBS Count	Total number of EBS disks discovered by DII
EBS Snapshot Count	Total number of EBS snapshots
Orphaned EBS	Total number of EBS disks that are not associated with an EC2 instance
Instance Count	Total number of EC2 instances discovered by DII
Reclaimable Assets	Total number of EC2 instances that are powered off or have zero IOPS

6.9 StorageGrid Capacity and Costs



Description: This report shows StorageGrid showback costs for Tenant and Bucket resources.

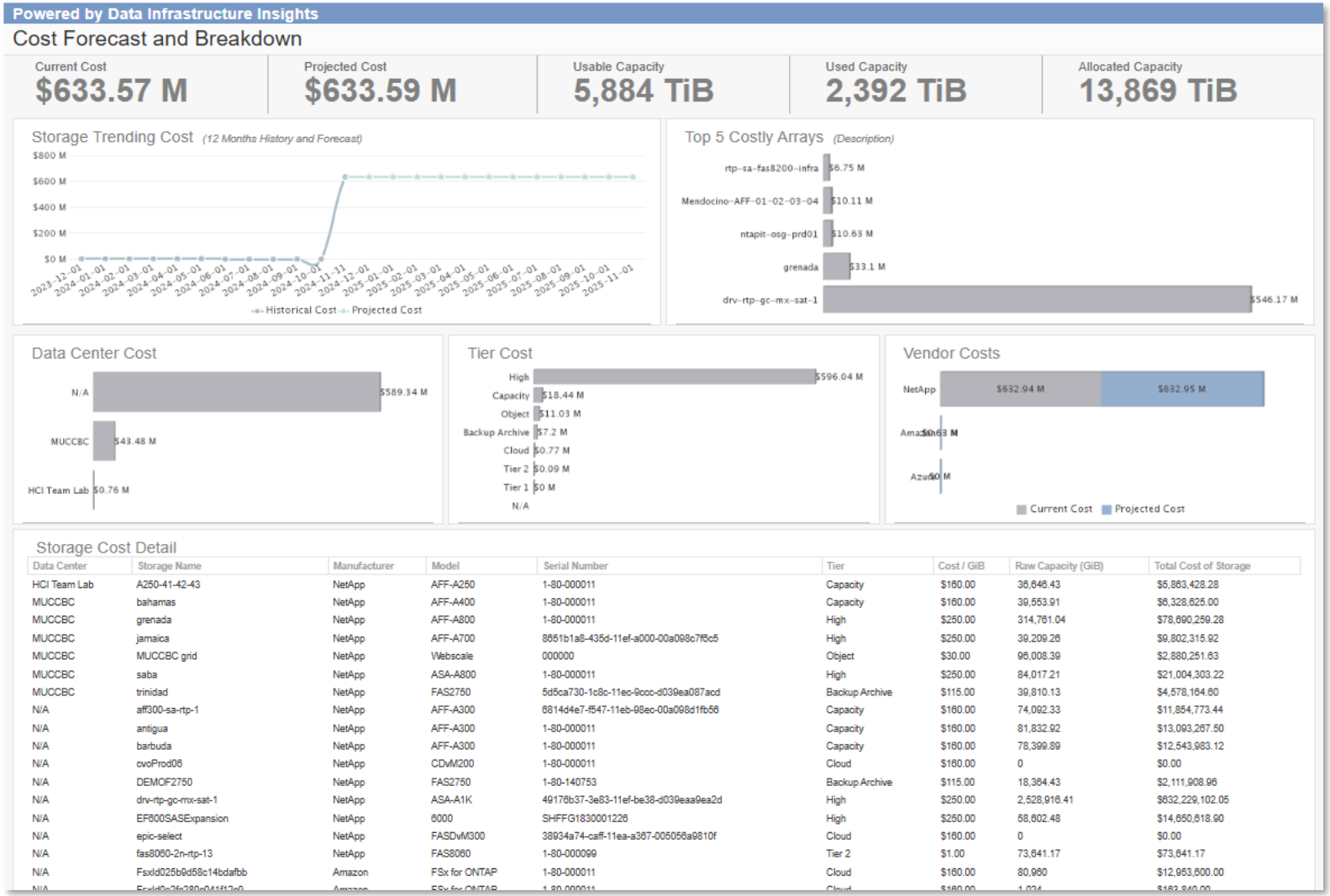
Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 6.9 StorageGRID Capacity and Costs

6.9 StorageGRID Capacity and Costs Definitions

Metric/Attribute	Description
Tenant Name	Name of the StorageGrid tenant associated with the node. A tenant is a separate, isolated space within a NetApp StorageGRID system where a user or organization can store and retrieve data. In the DII model, the StorageGrid Tenant is represented as a storage pool.
Capacity (GB)	Usable capacity allocated for the tenant in Gigabytes (Base 10 units)
Quota Used (GB)	Used capacity in Terabytes as reported by the tenant
Quota Remaining (GB)	IF(Capacity (TB) = Quota Used (TB)) THEN (null) ELSE (Capacity (TB) - Quota Used (TB))
Quota % Used	Quota Used (TB) / Capacity (TB)
Total Cost	
Bucket Name	A "StorageGRID bucket" refers to a container within the NetApp StorageGRID object storage system. In the DII model, a bucket is the same as an internal volume
Bucket Allocated (GB)	Allocated capacity in Terabytes (Base-10) e.g. internal volume AllocatedCapacityMB/1024/1024 * 1.099511627776
Bucket Used (GB)	Used capacity in Terabytes as reported by the internal volume
Bucket Count	Total number of buckets
Bucket % Used	Bucket Used (GB) / Bucket Allocated (GB)
Tenant Count	Total number of tenants (sum of aggregates)
Bucket Count	Total number of buckets (sum of internal volumes)
Capacity Total	Sum of Capacity (GB)
Capacity Used	Sum of Quota Used (GB)
Capacity Available	Capacity Total - Capacity Used
Total Monthly Cost	Sum of Capacity Total * .05
Full Date	Full Date field available in the DWH Date Dimension table

6.10 Cost Forecast and Breakdown



Data Center	Storage Name	Manufacturer	Model	Serial Number	Tier	Cost / GiB	Raw Capacity (GiB)	Total Cost of Storage
HCI Team Lab	A250-41-42-43	NetApp	AFF-A250	1-80-000011	Capacity	$160.00	36,646.43	$5,863,428.28
MUCCBC	bahamas	NetApp	AFF-A400	1-80-000011	Capacity	$160.00	39,553.91	$6,328,625.00
MUCCBC	grenada	NetApp	AFF-A800	1-80-000011	High	$250.00	314,761.04	$78,690,259.28
MUCCBC	jamaica	NetApp	AFF-A700	8651b1a8-435d-11ef-a000-00a098c7f6c5	High	$250.00	39,209.26	$9,802,315.92
MUCCBC	MUCCBC grid	NetApp	Webscale	000000	Object	$30.00	96,008.39	$2,880,251.63
MUCCBC	saba	NetApp	ASA-A800	1-80-000011	High	$250.00	84,017.21	$21,004,303.22
MUCCBC	trinidad	NetApp	FAS2750	5d5ca730-1c8c-11ec-9ccc-d039ea087acd	Backup Archive	$115.00	39,810.13	$4,578,164.60
N/A	aff300-sa-rtp-1	NetApp	AFF-A300	6814d4e7-f547-11eb-98ec-00a098d1fb56	Capacity	$160.00	74,092.33	$11,854,773.44
N/A	antigua	NetApp	AFF-A300	1-80-000011	Capacity	$160.00	81,832.92	$13,093,267.50
N/A	barbuda	NetApp	AFF-A300	1-80-000011	Capacity	$160.00	78,399.89	$12,543,983.12
N/A	cvoProd06	NetApp	CDvM200	1-80-000011	Cloud	$160.00	0	$0.00
N/A	DEMOF2750	NetApp	FAS2750	1-80-140753	Backup Archive	$115.00	18,364.43	$2,111,908.96
N/A	drv-rtp-gc-mx-sat-1	NetApp	ASA-A1K	49176b37-3e83-11ef-be38-d039eaa9ea2d	High	$250.00	2,528,916.41	$632,229,102.05
N/A	EF600SASExpansion	NetApp	6000	SHFFG1830001226	High	$250.00	58,602.48	$14,650,618.90
N/A	epic-select	NetApp	FASDvM300	38934a74-caff-11ea-a367-005056a9810f	Cloud	$160.00	0	$0.00
N/A	fas8060-2n-rtp-13	NetApp	FAS8060	1-80-000099	Tier 2	$1.00	73,641.17	$73,641.17
N/A	FsxId025b9d58c14bdafbb	Amazon	FSx for ONTAP	1-80-000011	Cloud	$160.00	80,960	$12,953,600.00

Report XML: 6.10 Cost Forecast and Breakdown

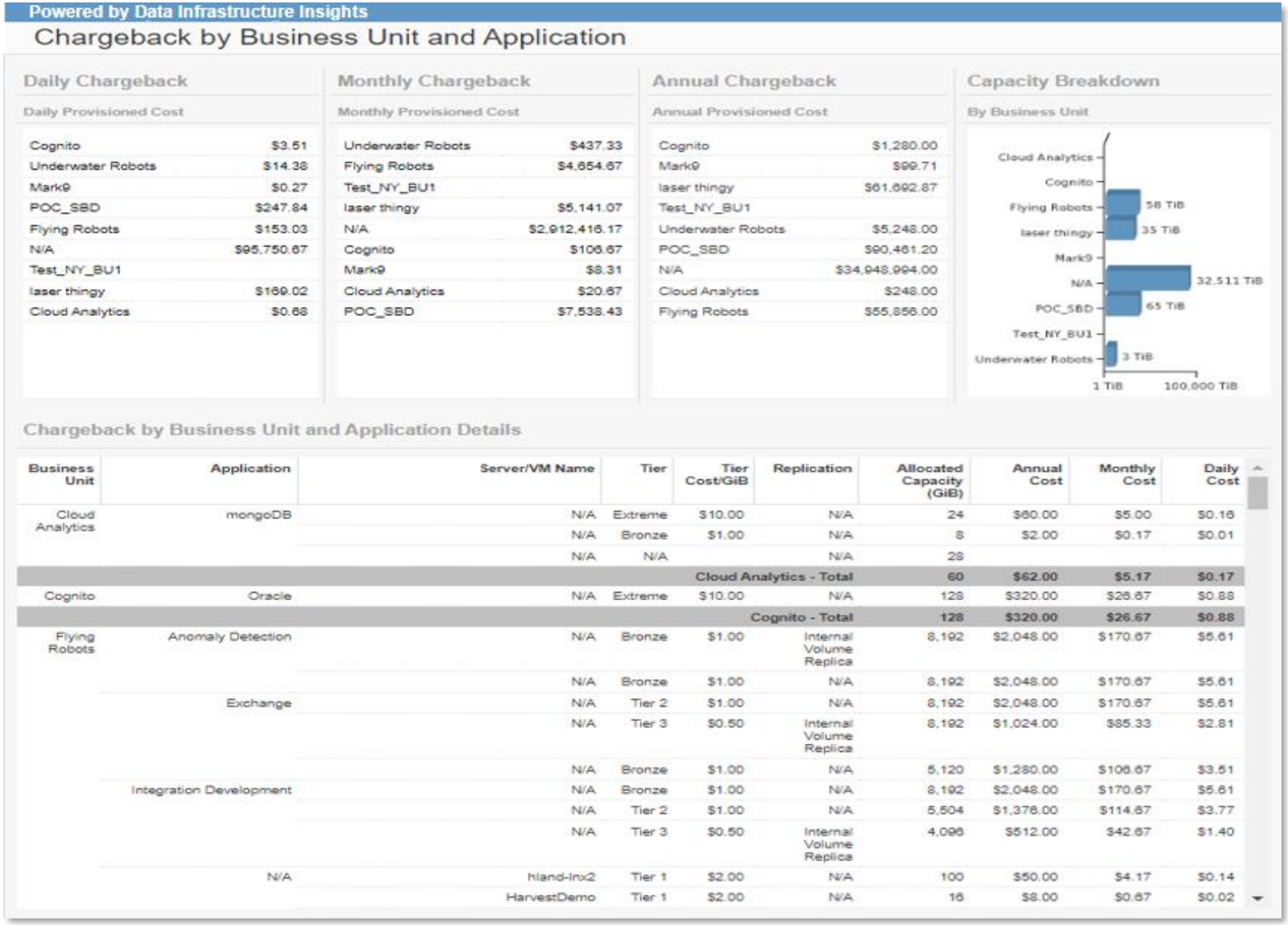
Description: This report displays a Cost Forecast with breakdown by overall storage. A summary of capacity and costs is available at the top of the page. Charts for Top 5 Arrays; Data Center; Tier; and Top 5 Costliest Vendors are shown with a global cost forecast trend. Storage costs detail list is available at the bottom of the page.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled. Application, tier and tier cost annotations deployed.

6.10 Cost Forecast and Breakdown Definitions

Metric/Attribute	Description
Data Center	DII configured annotation. Defines the physical location of the device
Tier	DII configured annotation. Defines tiers of storage based on disk type, disk speed, etc.
Cost /GiB	DII configured annotation. Same as cost. Defines the cost per GiB associated with storage tiers or service levels.
Storage Name	Name of the storage array monitored by DII
Manufacturer/Vendor	The manufacturer of the storage array monitored by DII
Model	The model of the storage array
Serial Number	The serial number of the storage array
Raw Capacity (GiB)	Pre-RAID Raw Capacity in Gibibytes of all disks as reported by the storage device monitored by DII and contained in the Storage and Storage Pool Capacity Fact table. Represented as: capacity * rawToUsableRatio
Used Raw (GiB)	Pre-RAID Used Raw Capacity in Gibibytes of all disks as reported by the storage device monitored by DII and contained in the Storage and Storage Pool Capacity Fact table
Projected Used Raw (GiB)	Forecast Pre-raid/post formatted Used Raw in Gibibytes as reported by the storage pool and calculated via a built-in linear regression formula
Total Cost of Storage	Used Raw (GiB) * Cost / GiB
Historical Cost	Total cost of storage for the past N months
Future Cost	Total cost of storage projected for future 12 months
Date	Fulldate field derived from the Data Dimension table in the Data Warehouse

6.11 Chargeback by Business Unit and Application



Powered by Data Infrastructure Insights

Chargeback by Business Unit and Application

Daily Chargeback

Daily Provisioned Cost

Cognito	$3.51
Underwater Robots	$14.38
Mark9	$0.27
POC_SBD	$247.84
Flying Robots	$153.03
N/A	$95,750.67
Test_NY_BU1	
laser thingy	$169.02
Cloud Analytics	$0.68

Monthly Chargeback

Monthly Provisioned Cost

Underwater Robots	$437.33
Flying Robots	$4,654.67
Test_NY_BU1	
laser thingy	$5,141.07
N/A	$2,912,416.17
Cognito	$106.67
Mark9	$8.31
Cloud Analytics	$20.67
POC_SBD	$7,538.43

Annual Chargeback

Annual Provisioned Cost

Cognito	$1,280.00
Mark9	$99.71
laser thingy	$61,692.87
Test_NY_BU1	
Underwater Robots	$5,248.00
POC_SBD	$90,461.20
N/A	$34,948,994.00
Cloud Analytics	$248.00
Flying Robots	$55,856.00

Capacity Breakdown

By Business Unit

Chargeback by Business Unit and Application Details

Business Unit	Application	Server/VM Name	Tier	Tier Cost/GiB	Replication	Allocated Capacity (GiB)	Annual Cost	Monthly Cost	Daily Cost
Cloud Analytics	mongoDB	N/A	Extreme	$10.00	N/A	24	$60.00	$5.00	$0.16
		N/A	Bronze	$1.00	N/A	8	$2.00	$0.17	$0.01
		N/A	N/A		N/A	28			
					Cloud Analytics - Total	60	$62.00	$5.17	$0.17
Cognito	Oracle	N/A	Extreme	$10.00	N/A	128	$320.00	$26.67	$0.88
					Cognito - Total	128	$320.00	$26.67	$0.88
Flying Robots	Anomaly Detection	N/A	Bronze	$1.00	Internal Volume Replica	8,192	$2,048.00	$170.67	$5.61
		N/A	Bronze	$1.00	N/A	8,192	$2,048.00	$170.67	$5.61
	Exchange	N/A	Tier 2	$1.00	N/A	8,192	$2,048.00	$170.67	$5.61
		N/A	Tier 3	$0.50	Internal Volume Replica	8,192	$1,024.00	$85.33	$2.81
		N/A	Bronze	$1.00	N/A	5,120	$1,280.00	$106.67	$3.51
	Integration Development	N/A	Bronze	$1.00	N/A	8,192	$2,048.00	$170.67	$5.61
		N/A	Tier 2	$1.00	N/A	5,504	$1,376.00	$114.67	$3.77
		N/A	Tier 3	$0.50	Internal Volume Replica	4,096	$512.00	$42.67	$1.40
N/A		hland-lnx2	Tier 1	$2.00	N/A	100	$50.00	$4.17	$0.14
		HarvestDemo	Tier 1	$2.00	N/A	16	$8.00	$0.67	$0.02

Chargeback by Business Unit and Application

Description: This report displays Daily, Monthly, and Annual Chargeback based on Provisioned Cost. On the right is a Capacity breakdown by Business Unit. The bottom section displays Daily, Monthly, and Annual Costs broken down by Business Unit and Application.

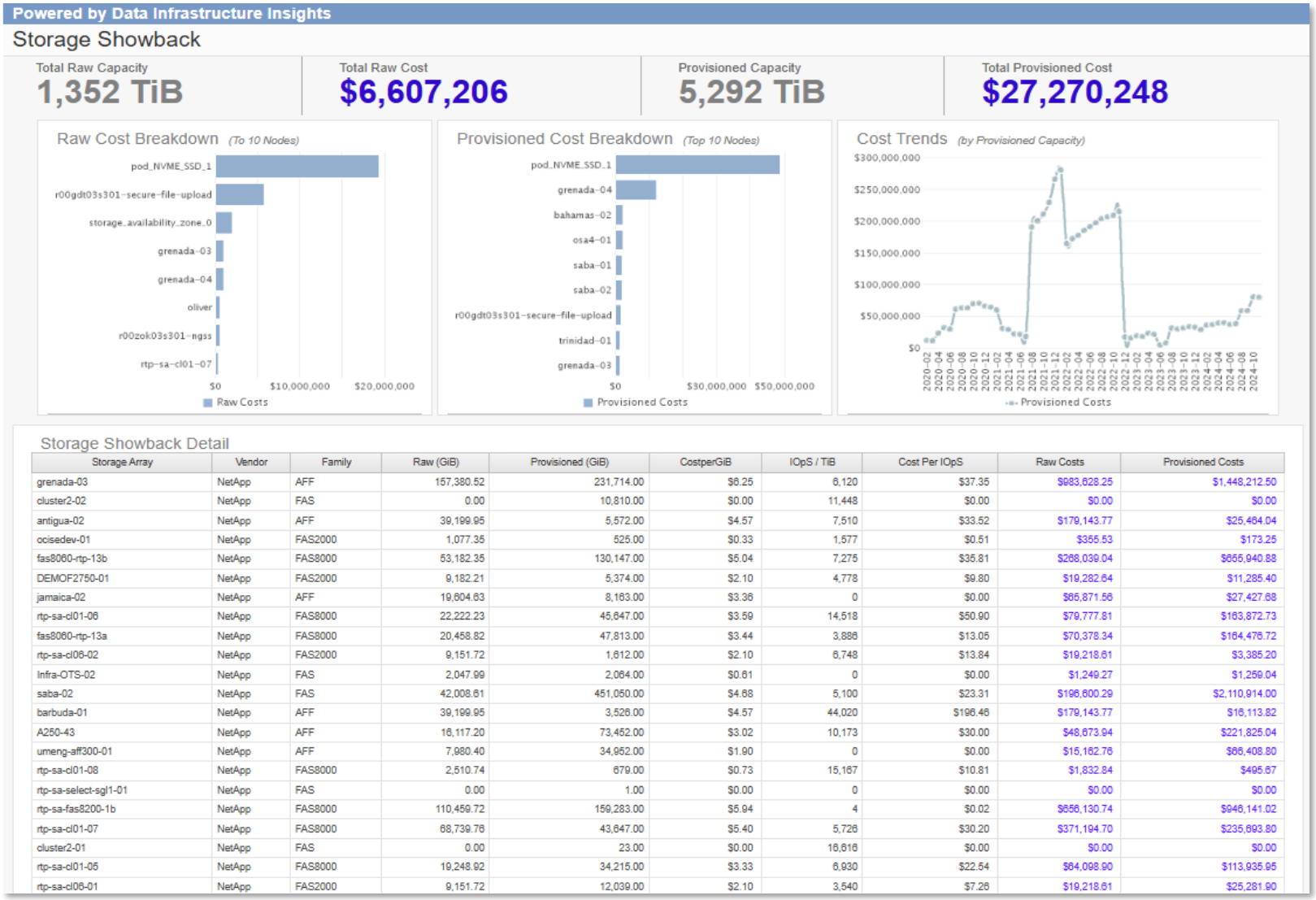
Prerequisites: Data Infrastructure Insights (DII) reporting enabled. Business Unit, Application, tier, service level and tier cost annotations deployed.

Report XML: 6.11

6.11 Chargeback by Business Unit and Application

Metric/Attribute	Description
Business Unit	DII configured annotation. Defines the Business Unit with host, volume, or internal volume capacity
Application	DII configured annotation. Defines the application associated with the virtual machine or backend storage capacity
Tier	DII configured annotation. Defines tiers of storage based on disk type, disk speed, etc.
Tier Cost /GiB	DII configured annotation. Defines the costs associated with the tiers
Server/VM Name	Name of the virtual machine discovered by DII
Replication	Whether or not the Application has a replica component
Allocated Capacity (GiB)	Amount of capacity in Gibibytes allocated to the Application assigned to the virtual machine
Annual Cost	The yearly cost of the capacity associated with the Application
Monthly Cost	The monthly cost of the capacity associated with the Application
Daily Cost	The daily cost of the capacity associated with the Application

6.14 Storage and Compute Showback



Storage Array	Vendor	Family	Raw (GiB)	Provisioned (GiB)	CostperGiB	IOpS / TiB	Cost Per IOpS	Raw Costs	Provisioned Costs
grenada-03	NetApp	AFF	157,380.52	231,714.00	$6.25	6,120	$37.35	$983,628.25	$1,448,212.50
cluster2-02	NetApp	FAS	0.00	10,810.00	$0.00	11,448	$0.00	$0.00	$0.00
antigua-02	NetApp	AFF	39,199.95	5,572.00	$4.57	7,510	$33.52	$179,143.77	$25,464.04
ocisedev-01	NetApp	FAS2000	1,077.35	525.00	$0.33	1,577	$0.51	$355.53	$173.25
fas8060-rtp-13b	NetApp	FAS8000	53,182.35	130,147.00	$5.04	7,275	$35.81	$268,039.04	$655,940.88
DEMOF2750-01	NetApp	FAS2000	9,182.21	5,374.00	$2.10	4,778	$9.80	$19,282.64	$11,285.40
jamaica-02	NetApp	AFF	19,604.63	8,163.00	$3.36	0	$0.00	$65,871.56	$27,427.68
rtp-sa-cl01-06	NetApp	FAS8000	22,222.23	45,647.00	$3.59	14,518	$50.90	$79,777.81	$163,872.73
fas8060-rtp-13a	NetApp	FAS8000	20,458.82	47,813.00	$3.44	3,886	$13.05	$70,378.34	$164,476.72
rtp-sa-cl06-02	NetApp	FAS2000	9,151.72	1,612.00	$2.10	6,748	$13.84	$19,218.61	$3,385.20
Infra-OTS-02	NetApp	FAS	2,047.99	2,064.00	$0.61	0	$0.00	$1,249.27	$1,259.04
saba-02	NetApp	FAS	42,008.61	451,050.00	$4.68	5,100	$23.31	$196,600.29	$2,110,914.00
barbuda-01	NetApp	AFF	39,199.95	3,526.00	$4.57	44,020	$196.46	$179,143.77	$16,113.82
A250-43	NetApp	AFF	16,117.20	73,452.00	$3.02	10,173	$30.00	$48,673.94	$221,825.04
umeng-aff300-01	NetApp	AFF	7,980.40	34,952.00	$1.90	0	$0.00	$15,162.76	$66,408.80
rtp-sa-cl01-08	NetApp	FAS8000	2,510.74	679.00	$0.73	15,167	$10.81	$1,832.84	$495.67
rtp-sa-select-sgl1-01	NetApp	FAS	0.00	1.00	$0.00	0	$0.00	$0.00	$0.00
rtp-sa-fas8200-1b	NetApp	FAS8000	110,459.72	159,283.00	$5.94	4	$0.02	$656,130.74	$946,141.02
rtp-sa-cl01-07	NetApp	FAS8000	68,739.76	43,647.00	$5.40	5,726	$30.20	$371,194.70	$235,693.80
cluster2-01	NetApp	FAS	0.00	23.00	$0.00	16,616	$0.00	$0.00	$0.00
rtp-sa-cl01-05	NetApp	FAS8000	19,248.92	34,215.00	$3.33	6,930	$22.54	$64,098.90	$113,935.95
rtp-sa-cl06-01	NetApp	FAS2000	9,151.72	12,039.00	$2.10	3,540	$7.26	$19,218.61	$25,281.90

Description: This real-world showback report shows costs for compute and storage resources. Cost parameters are added at run-time and have a high degree of complexity when applied to compute resources. This example can be used to customize a similar artifact for prospective users.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled. Tier, service level and tier cost annotations deployed.

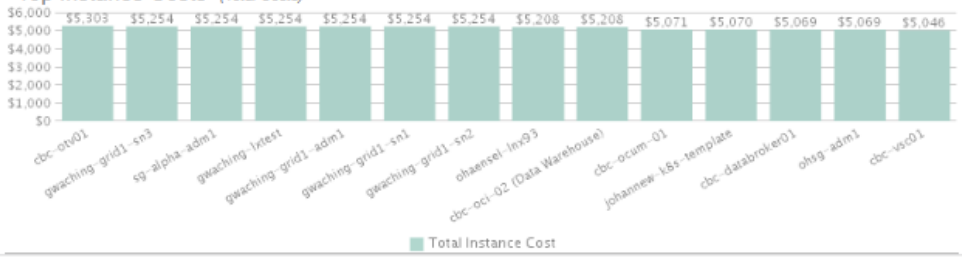
Report XML: 6.14 Storage and Compute Showback

Powered by Data Infrastructure Insights

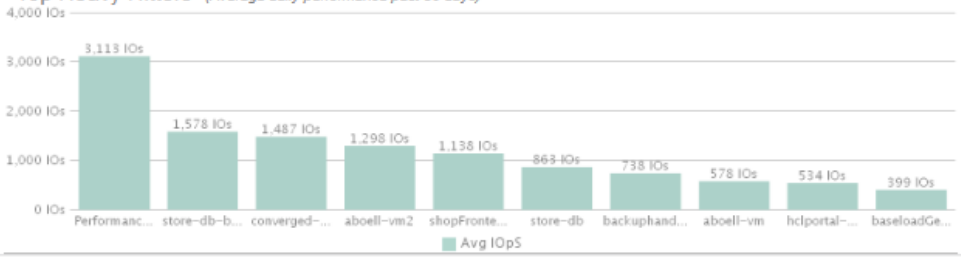
Compute Showback

Storage Summary	Storage Costs	Host Summary	Virtual Storage Summary	Compute Instance Costs (monthly)
12,778 TB Raw	**$6,607,206**	**787 Servers**	**696 TB Allocated**	**$500,961**
50 Arrays		*183 Hosts (23% Physical)*	*216 Datastores*	
5,884 TB Usable		*35 Hypervisors*	*234 TB Used (34%)*	
2,392 TB Used (41%)		*569 VMs (72% Virtual)*	*499 TB Provisioned (72%)*	

Top Instance Costs *(Total Costs)*



Top Heavy Hitters *(Average daily performance past 30 days)*



Infrastructure Detail *(Current Data)*

HyperScaler / vSphere	VM	VM OS	vCPU	vRAM	Avg CPU Utilization %	Peak CPU Utilization %	Instance Type	Instance Cost	Disk Type	Capacity (GiB)	Disk Cost	Avg IOpS	Peak IOpS	Cost of IOPS	Total Instance Cost
vmware	a41-dc	Windows	2	8	1%	1%	VMware	$115.20	VMDK	6,260	$313.00	1	42	$0.06	$428.26
vmware	aboell-vm	Windows	2	8	0.93%	0.93%	VMware	$115.20	VMDK	6,260	$313.00	578	82,864	$37.56	$465.76
vmware	aboell-vm2	Windows	2	8	1.11%	1.11%	VMware	$115.20	VMDK	200	$10.00	1,298	49,999	$84.38	$209.58
aws	Active-Directory VSAQA Dont terminate	Windows	2	4	0.68%	0.68%	t2.medium	$33.41	EBS_standard	150	$7.50	1	55	$0.08	$40.99
vmware	aiqum	Linux	4	12	4.11%	4.11%	VMware	$184.32	VMDK	4,551.19	$227.56	48	235	$3.13	$415.01
vmware		Other Image	8	12	0.39%	0.39%	VMware	$230.40	VMDK	2,378.38	$118.82	9	1,206	$0.57	$349.79
vmware	AIQUM	Linux	4	12	0.52%	0.52%	VMware	$184.32	VMDK	2,346	$117.30	0	1	$0.01	$301.63
vmware	AIQUM 9.11 (vApp)	Linux	4	12	2.4%	2.4%	VMware	$184.32	VMDK	4,626	$231.30	17	73	$1.10	$416.72
vmware	AIQUM 9.12 (Linux)	Other Image	6	16	3.08%	3.08%	VMware	$253.44	VMDK	4,626	$231.30	1	21	$0.10	$484.84
vmware	AIQUM 9.13 (vApp)	Linux	4	12	10.91%	10.91%	VMware	$184.32	VMDK	4,626	$231.30	55	109	$3.56	$419.18
vmware	AIQUM 9.14 (vApp)	Linux	4	12	15.21%	15.21%	VMware	$184.32	VMDK	4,626	$231.30	54	423	$3.54	$419.16
vmware	alexeym-lnx2	Other Image	2	8	0.42%	0.42%	VMware	$115.20	VMDK	18,649.99	$932.50	0	1	0	$1,047.70
vmware	alexz-jump	Linux	2	4	0	0	VMware	$69.12	VMDK	97,701.78	$4,885.09	0	0	0	$4,954.21
vmware	amer-sa-liapenn-RHEL73	Linux	2	16	0.34%	0.34%	VMware	$207.36	VMDK	13,478	$673.90	0	0	0	$881.26
vmware	amer-sa-liapenn-win10	Windows	2	16	0	0	VMware	$207.36	VMDK	13,478	$673.90	0	0	0	$881.26
vmware	amer-sa-liapenn-win2016	Windows	2	16	0.68%	0.68%	VMware	$207.36	VMDK	3,292	$164.60	0	8	0	$371.96
vmware	amer-sa-sfdesktop	Other Image	4	8	0.44%	0.44%	VMware	$138.24	VMDK	1,574	$78.70	0	2	$0.02	$216.96
vmware	AN-JumpHost01	Windows	2	4	1.12%	1.12%	VMware	$69.12	VMDK	600	$30.00	4	541	$0.29	$99.41
vmware	andrease_perf01	Windows	2	16	0.85%	0.85%	VMware	$207.36	VMDK	400	$20.00	1	56	$0.04	$227.40

NetApp

6.14 Storage and Compute Showback Definitions

Metric/Attribute	Description
Storage	
Storage Array	Name of the storage device discovered and monitored by DII
Vendor	Manufacturer of the storage device
Family	Family name of the storage device
Raw (GiB)	Pre-RAID Raw Capacity in Gibibytes of all disks as reported by the storage device monitored by DII and contained in the Storage and Storage Pool Capacity Fact table. Represented as: capacity * rawToUsableRatio
Provisioned (GiB)	The greater of block volume allocated or internal volume allocated capacity in Gibibytes
CostperGiB	From the rate card attached to this report: CapEx_SubTotal + OpeEx_SubTotal / sAcctMonths
Cost Per IOPS	IOPS / TiB * (CostperGiB/1024)
Raw Costs	Raw (GiB) * (CostperGiB/1024)
Provisioned Costs	Provisioned (GiB) * CostperGiB
Compute	
Hyperscaler	Name of the hyperscaler e.g. AWS, AZURE or Google Cloud
VM	Name of the virtual machine discovered by DII
VM OS	The operating system associated with the virtual machine
vCPU	The number of vCPUs (processors) allocated to the virtual machine
vRAM	The amount of RAM in Gibibytes allocated to the virtual machine
Avg CPU Utilization %	Average vCPU Utilization as reported by virtual machine instances for the user selected time period
Peak CPU Utilization %	Maximum vCPU Utilization for the collection period
Instance Type	The configuration type associated with the virtual instance e.g. for AWS, a1.medium, a1.large, a1.xlarge etc.
Billable Hours	The number of billable hours for the current month. E.g. (DAY(LAST_DAY(NOW()))*24)
Instance Hourly Pricing	Instance cost per hour based on the published hyperscaler rate card. Example: WHEN [Instance Type]='a1.medium' THEN 0.0255 WHEN [Instance Type]='a1.large' THEN 0.051 WHEN [Instance Type]='a1.xlarge' THEN 0.102 WHEN [Instance Type]='a1.2xlarge' THEN 0.204 WHEN [Instance Type]='a1.4xlarge' THEN 0.408 WHEN [Instance Type]='a1.metal' THEN 0.408
Instance Cost	Billable Hours * Instance Hourly Pricing
Disk Type	The disk type e.g. EBS_gp2, EBS_gp3 etc..
Capacity (GiB)	The allocated capacity in Gibibytes of the virtual disk
Disk Pricing	Disk cost per month based on the published VMware or hyperscaler rate card. Example: WHEN [Type] contains 'VMDK' THEN .1 WHEN [Type] contains 'gp' THEN .1

	WHEN [Type] contains 'io' THEN .125 WHEN [Type] contains 'st1' THEN .045 WHEN [Type] contains 'sc1' THEN .025 WHEN [Type] contains 'standard' THEN .05 WHEN [Type] contains 'snap' THEN .05 WHEN [Type] contains 'Standard_LRS' THEN .045 WHEN [Type] contains 'Premium_LRS' THEN .12
Disk Cost	Disk Pricing * Capacity GiB
Avg IOPS	Measures the average number of I/O service requests (read+write) on the instance during the selected time period (measured in I/O per sec)
Peak IOPS	Maximum I/O service requests (read+write) on the instance for the collection period
Cost of IOPS	As published by the Hyperscaler (AWS example): WHEN DiskType contains 'gp3' AND [Avg IOpS]>3000 THEN (3000-[Avg IOpS])*.05 WHEN DiskType contains 'io' AND [Avg IOpS]<=32000 THEN [Avg IOpS]*.065 WHEN DiskType contains 'io' AND [Avg IOpS] BETWEEN 32000 AND 64000 THEN [Avg IOpS]*.046 WHEN DiskType contains 'io' AND [Avg IOpS] > 64000 THEN [Avg IOpS]*.032 ELSE [Avg IOpS]*.065
Total Instance Cost	The total cost of the compute instance. IF([Avg IOpS]>0) THEN ([Cost of IOPS]+[Disk Cost]+[Instance Cost]) ELSE ([Disk Cost]+[Instance Cost])

Storage and Compute Showback RATE CARD

Rate Card *(Storage Pricing)*

Storage	
CapEx - Initial Costs (Storage)	
Setup and Config	7,500
Controller Module	27,140
Disk Shelf (19.2 TB per)	99,460
Network Gear	4,500
Cables	1,800
Accessories	0
Racks	11,500
Cooling	2,850
Misc.	0
Sub-Total CapEx	$13,228,107
OpEx (Storage)	
Floor Space	14,300
Energy	1,100
Admin	40,000
Environmental	0
Misc/Other Costs	0
Sub-Total OpEx	$55,400
Accounting Months	36
Average Cost per GiB	$1.68

Refresh

Rate Card *(VMware Pricing - Licenses, Hypervisors costs included with instance)*

Virtual Compute

Instance Type	vCPU	vRAM	Cost/Hr
Small	2	2	0.0208
Medium	2	4	0.0416
Large	4	8	0.0832
xLarge	8	16	0.1664
2xLarge	8	32	0.3328
4xLarge	16	32	0.768
8xLarge	32	64	1.536
Custom	vCPU + vRAM / 96 * 1.536		

Apply Changes

Rate Card *(VMware Pricing - Licenses, Hypervisors costs included with instance)*

Virtual Disk

Disk Type	Disk Cost
VMDK	0.05
gp	.10
io	.125
st1	.045
sc1	.025
standard	.025
snap	.05
Standard LRS	.045
Premium LRS	.12

Apply Changes

Rate Card *(VMware Pricing - Licenses, Hypervisors costs included with instance)*

Cost of IOPS

Disk Type	IOPS Cost
VMDK	0.065
gp3 (1st 3000 free)	.05
io (<=32000 IOs)	.065
io (between 32K and 64K IOs)	.046
io (>64K IOs)	.032

Apply Changes

NetApp

6.15 OnPrem ONTAP Workloads to AWS FSx Costs

Powered by Data Infrastructure Insights

OnPrem ONTAP Workloads to AWS FSxN Costs

Volume Count	Allocated Capacity	Average IOPS Delivered	Average MBps Delivered
1,808	3,654,603 GiB	10.28 IOs	0.17 MBps

OnPrem Workloads to FSx *(Current Capacity Data, 30 Days Performance Data)*

Array	Vendor	Model	Volume	Allocated (GiB)	Deployed Costs	Total IOPS	Total MBps	FSx Cost of IOPS	FSx Cost of MBps	FSx Capacity Cost	Total FSx Costs	FSx Cost Savings
rtp-cilab-fas2750	NetApp	FAS2750	rtp-cilab-fas2750:vmwareDatastores:vol_general_ds	1,077.89	$410	2,517.46	22.68	$85.59	$27.22	$45.27	$158.08	$251.52
grenada	NetApp	AFF-A800	grenada:svm-kvm:cbc_proxmox_ds_01	10,240.00	$3,891	1,774.08	41.86	$60.32	$50.23	$430.08	$540.63	$3,350.57
grenada	NetApp	AFF-A800	grenada:svm-sap01:M02_sapmaxdb	150.00	$57	1,413.77	0.06	$48.07	$0.08	$6.30	$54.45	$2.55
grenada	NetApp	AFF-A800	grenada:svm-sap01:M01_sapmaxdb	150.00	$57	1,387.79	0.07	$47.18	$0.08	$6.30	$53.56	$3.44
rtp-sa-fas8200-infra	NetApp	FAS8200	rtp-sa-fas8200-infra:ESX-NFS:ProdSelectDS1	24,576.00	$9,339	996.53	11.06	$33.88	$13.27	$1,032.19	$1,079.34	$8,259.54
umeng-aff300-01-02	NetApp	AFF-A300	umeng-aff300-01-02:osc:osc_vol01	5,120.00	$1,946	965.23	60.21	$32.82	$72.25	$215.04	$320.11	$1,625.49
grenada	NetApp	AFF-A800	grenada:svm-snapcenter:smhv_snapinfo	20.00	$8	775.58	0.59	$26.37	$0.71	$0.84	$27.92	$0.00
rtp-cilab-fas2750	NetApp	FAS2750	rtp-cilab-fas2750:vmwareDatastores:vol_mysql_ds	200.00	$76	689.76	2.73	$23.45	$3.28	$8.40	$35.13	$40.87
A250-41-42-43	NetApp	AFF-A250	A250-41-42-43:astra_ci_vc_esxi_24_75_data:blueXP_datastore_donot_delete1	4,608.00	$1,751	670.52	31.96	$22.80	$38.36	$193.54	$254.70	$1,496.34
grenada	NetApp	AFF-A800	grenada:svm-esx:cbc_esxi_prod_linux_ds_03	42,000.00	$15,960	392.98	19.96	$13.36	$23.95	$1,764.00	$1,801.31	$14,158.69
rtp-sa-fas8200-infra	NetApp	FAS8200	rtp-sa-fas8200-infra:ESX-NFS:lab_infrastructure	2,048.00	$778	333.65	17.70	$11.34	$21.24	$86.02	$118.60	$659.64
fas8060-2n-rtp-13	NetApp	FAS8060	fas8060-2n-rtp-13:esx-nfs:rtp_sa_SG_1	8,192.00	$3,113	332.98	13.20	$11.32	$15.84	$344.06	$371.22	$2,741.74
rtp-sa-fas8200-infra	NetApp	FAS8200	rtp-sa-fas8200-infra:ESX-NFS:ProdSelectDS2	24,576.00	$9,339	286.12	3.37	$9.73	$4.04	$1,032.19	$1,045.96	$8,292.92
rtp-sa-fas8200-infra	NetApp	FAS8200	rtp-sa-fas8200-infra:ESX-NFS:nfs_mgmt_ds	2,048.00	$778	252.72	4.68	$8.59	$5.61	$86.02	$100.22	$678.02
rtp-sa-fas8200-infra	NetApp	FAS8200	rtp-sa-fas8200-infra:ESX-NFS:bxp_servers_DS	5,120.00	$1,946	202.10	5.50	$6.87	$6.60	$215.04	$228.51	$1,717.09
grenada	NetApp	AFF-A800	grenada:svm-esx:cbc_esxi_prod_linux_ds_01	42,000.00	$15,960	190.66	2.73	$6.48	$3.28	$1,764.00	$1,773.76	$14,186.24
grenada	NetApp	AFF-A800	grenada:svm-sap01:H09_shareddemo	2,270.48	$863	180.78	0.45	$6.15	$0.54	$95.36	$102.05	$760.73
grenada	NetApp	AFF-A800	grenada:svm-sap01:D02_data	150.00	$57	169.19	0.01	$5.75	$0.01	$6.30	$12.06	$44.94
rtp-sa-cl01	NetApp	FAS8020	rtp-sa-cl01:nj-infra-01:ESX_ISOs	400.00	$152	164.25	0.01	$5.58	$0.01	$16.80	$22.39	$129.61
grenada	NetApp	AFF-A800	grenada:svm-esx:cbc_esxi_prod_linux_ds_02	42,000.00	$15,960	161.51	2.13	$5.49	$2.55	$1,764.00	$1,772.04	$14,187.96
rtp-sa-cl01	NetApp	FAS8020	rtp-sa-cl01:nj-demo-01:saplabhana02_hana	151.58	$58	149.06	0.01	$5.07	$0.01	$6.37	$11.45	$46.15
rtp-sa-cl01	NetApp	FAS8020	rtp-sa-cl01:nj-demo-01:SOFTWARE	600.00	$228	145.43	0.51	$4.94	$0.61	$25.20	$30.75	$197.25
grenada	NetApp	AFF-A800	grenada:svm-esx:cbc_esxi_prod_win_ds_03	42,000.00	$15,960	136.51	2.62	$4.64	$3.14	$1,764.00	$1,771.78	$14,188.22
rtp-sa-cl01	NetApp	FAS8020	rtp-sa-cl01:nj-demo-01:sm_t01_hana_shared	315.79	$120	131.14	0.02	$4.46	$0.02	$13.26	$17.74	$102.26
grenada	NetApp	AFF-A800	grenada:svm-sap01:D02_sapdb2	150.00	$57	128.37	0.06	$4.36	$0.07	$6.30	$10.73	$46.27
grenada	NetApp	AFF-A800	grenada:svm-credativ:credativ_proxmox_01	10,778.95	$4,096	127.87	3.75	$4.35	$4.50	$452.72	$461.57	$3,634.44
grenada	NetApp	AFF-A800	grenada:svm-snapcenter:kw_scw1_DATA_Clone_0918241002024671	9.57	$4	116.17	1.83	$3.95	$2.19	$0.40	$6.54	$0.00
grenada	NetApp	AFF-A800	grenada:svm-snapcenter:kw_scw1_DATA	5.90	$2	116.11	1.81	$3.95	$2.17	$0.25	$6.37	$0.00
osa4	NetApp	AFF-A220	osa4:zeus:tsukioka_vol3	307,200.00	$116,736	115.22	1.16	$3.92	$1.39	$12,902.40	$12,907.71	$103,828.29
rtp-sa-cl01	NetApp	FAS8020	rtp-sa-cl01:nj-demo-01:S4D_shared	560.96	$213	103.82	0.01	$3.53	$0.01	$23.56	$27.10	$186.06
rtp-sa-cl01	NetApp	FAS8020	rtp-sa-cl01:nj-demo-01:V01_hana_shared	329.54	$125	97.62	0.01	$3.32	$0.01	$13.84	$17.17	$108.05
rtp-sa-cl01	NetApp	FAS8020	rtp-sa-cl01:nj-demo-01:sm_sbx_hana_shared	315.79	$120	91.46	0.01	$3.11	$0.01	$13.26	$16.38	$103.62
rtp-sa-fas8200-infra	NetApp	FAS8200	rtp-sa-fas8200-infra:ESX-NFS:NFSa	1,024.00	$389	88.47	2.16	$3.01	$2.60	$43.01	$48.62	$340.50
tawny	NetApp	FAS8060	tawny:tawny_ci_prod:vm_flexvol_prod02	8,192.00	$3,113	87.37	4.30	$2.97	$5.16	$344.06	$352.19	$2,760.77
osa4	NetApp	AFF-A220	osa4:zeus:mn_ds1	3,072.00	$1,167	85.81	0.89	$2.92	$1.07	$129.02	$133.01	$1,034.35
grenada	NetApp	AFF-A800	grenada:svm-esx:cbc_esxi_prod_win_ds_01	42,000.00	$15,960	85.37	2.64	$2.90	$3.16	$1,764.00	$1,770.06	$14,189.94

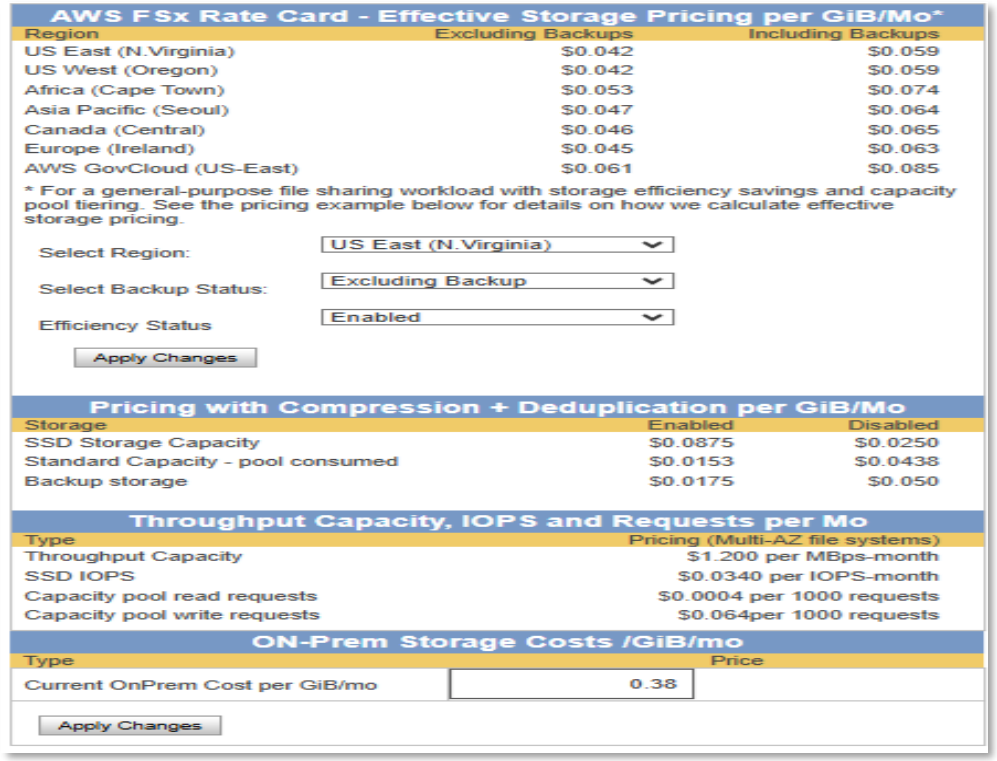
Description: This report shows OnPrem workloads and cost savings associated with migration to FSx.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 6.15 OnPrem ONTAP Workloads to AWS FSx Costs

6.15 OnPrem ONTAP Workloads to AWS FSx Costs Definitions

Metric/Attribute	Description
Array	Name of the storage device discovered and monitored by DII
Vendor	Manufacturer of the storage device
Model	Model name of the storage device
Volume	Name of the volume associated with the storage device
Allocated (GiB)	Allocated capacity in Gibibytes for the FSx volume derived from the internal_volume_capacity_fact table
Deployed Costs	Allocated (GiB) * Current OnPrem Cost per GiB/mo
Total IOPS	Measures the total number of I/O service requests (read+write) on the volume during the selected time period (measured in I/O per sec)
Total MBps	The Rate at which data is being transmitted in a fixed amount of time in response to I/O service requests (measured in MB per sec)
FSx Cost of IOPS	Total IOPS * 0.034 (From the report rate card: The AWS published cost per IOPS per month)
FSx Cost of MBps	Total MBps * 1.20
Effective Rate	The effective rate is derived from selection Region + Backup Status + Efficiency Status. Default Allocated capacity rate is .042 (US East N.Virginia, Excluding Backups, and no Efficiency



AWS FSx Rate Card - Effective Storage Pricing per GiB/Mo*

Region	Excluding Backups	Including Backups
US East (N.Virginia)	$0.042	$0.059
US West (Oregon)	$0.042	$0.059
Africa (Cape Town)	$0.053	$0.074
Asia Pacific (Seoul)	$0.047	$0.064
Canada (Central)	$0.046	$0.065
Europe (Ireland)	$0.045	$0.063
AWS GovCloud (US-East)	$0.061	$0.085

* For a general-purpose file sharing workload with storage efficiency savings and capacity pool tiering. See the pricing example below for details on how we calculate effective storage pricing.

Select Region: US East (N.Virginia)

Select Backup Status: Excluding Backup

Efficiency Status: Enabled

Apply Changes

Pricing with Compression + Deduplication per GiB/Mo

Storage	Enabled	Disabled
SSD Storage Capacity	$0.0875	$0.0250
Standard Capacity - pool consumed	$0.0153	$0.0438
Backup storage	$0.0175	$0.050

Throughput Capacity, IOPS and Requests per Mo

Type	Pricing (Multi-AZ file systems)
Throughput Capacity	$1.200 per MBps-month
SSD IOPS	$0.0340 per IOPS-month
Capacity pool read requests	$0.0004 per 1000 requests
Capacity pool write requests	$0.064per 1000 requests

ON-Prem Storage Costs /GiB/mo

Type	Price
Current OnPrem Cost per GiB/mo	0.38

Apply Changes

NetApp

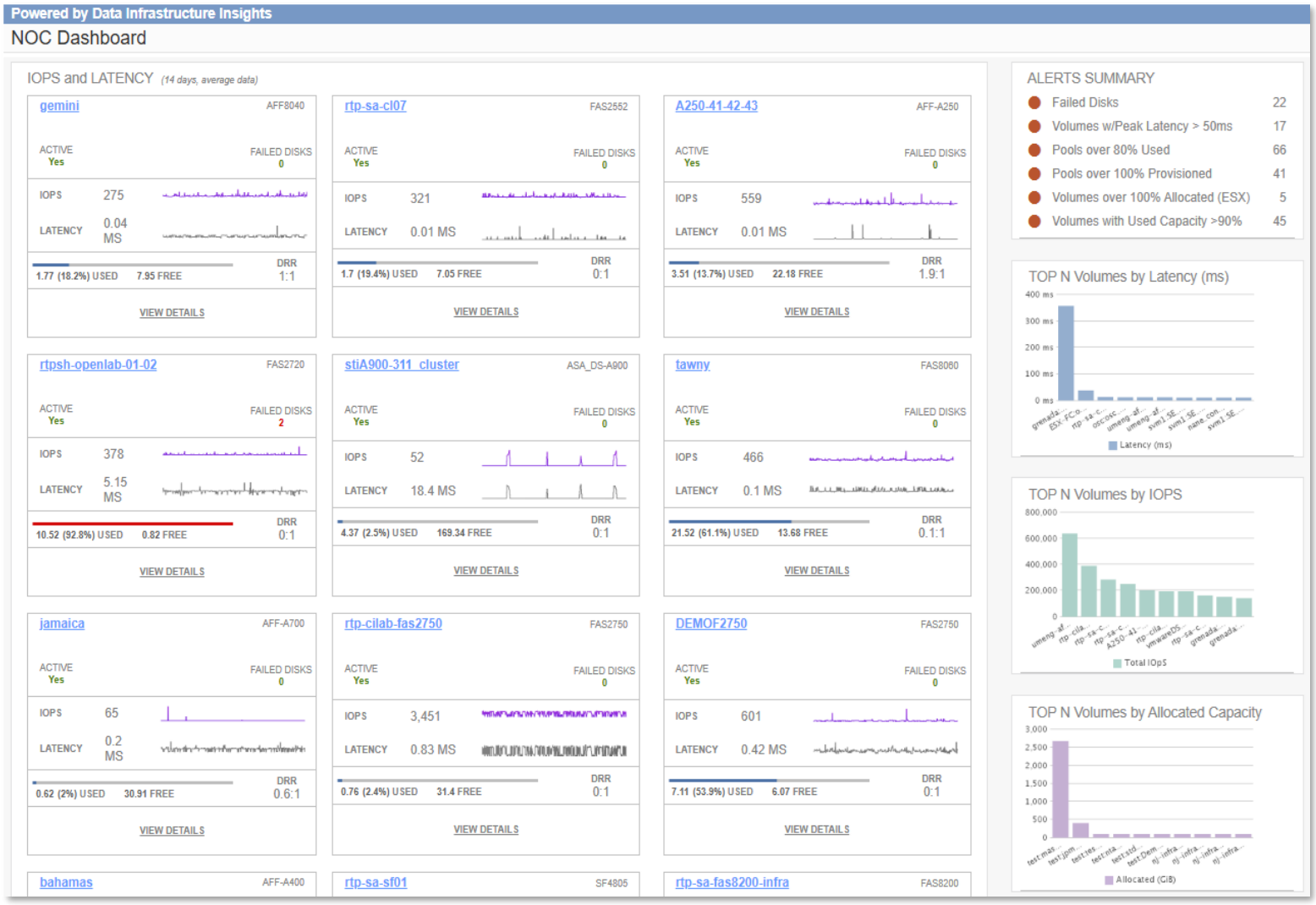
FSx Capacity Cost	Allocated (GiB) * Effective Rate
Total FSx Cost	[FSx Cost of IOPS]+[FSx Cost of MBps]+[FSx Capacity Cost]
FSx Cost Savings	WHEN [Deployed Costs] <= ([FSx Cost of IOPS]+[FSx Cost of MBps]+[FSx Capacity Cost]) THEN 0 ELSE [Deployed Costs]- ([FSx Cost of IOPS]+[FSx Cost of MBps]+[FSx Capacity Cost])

Info Tech Overview

These are some of the day-to-day and monthly Information Technology management tasks that can be addressed by leveraging the reports in this catalog. Here are some of the objectives met by this section.

- ❑ NOC Dashboard with Alerts
- ❑ Big Virtual Machines – Performance Metrics
- ❑ NetApp Node Capacity with Performance Forecast and Trends
- ❑ VMware Cluster Performance Capacity Utilization
- ❑ VMware Virtual Machine Performance Capacity Utilization

7.1 NOC Dashboard with Alerts



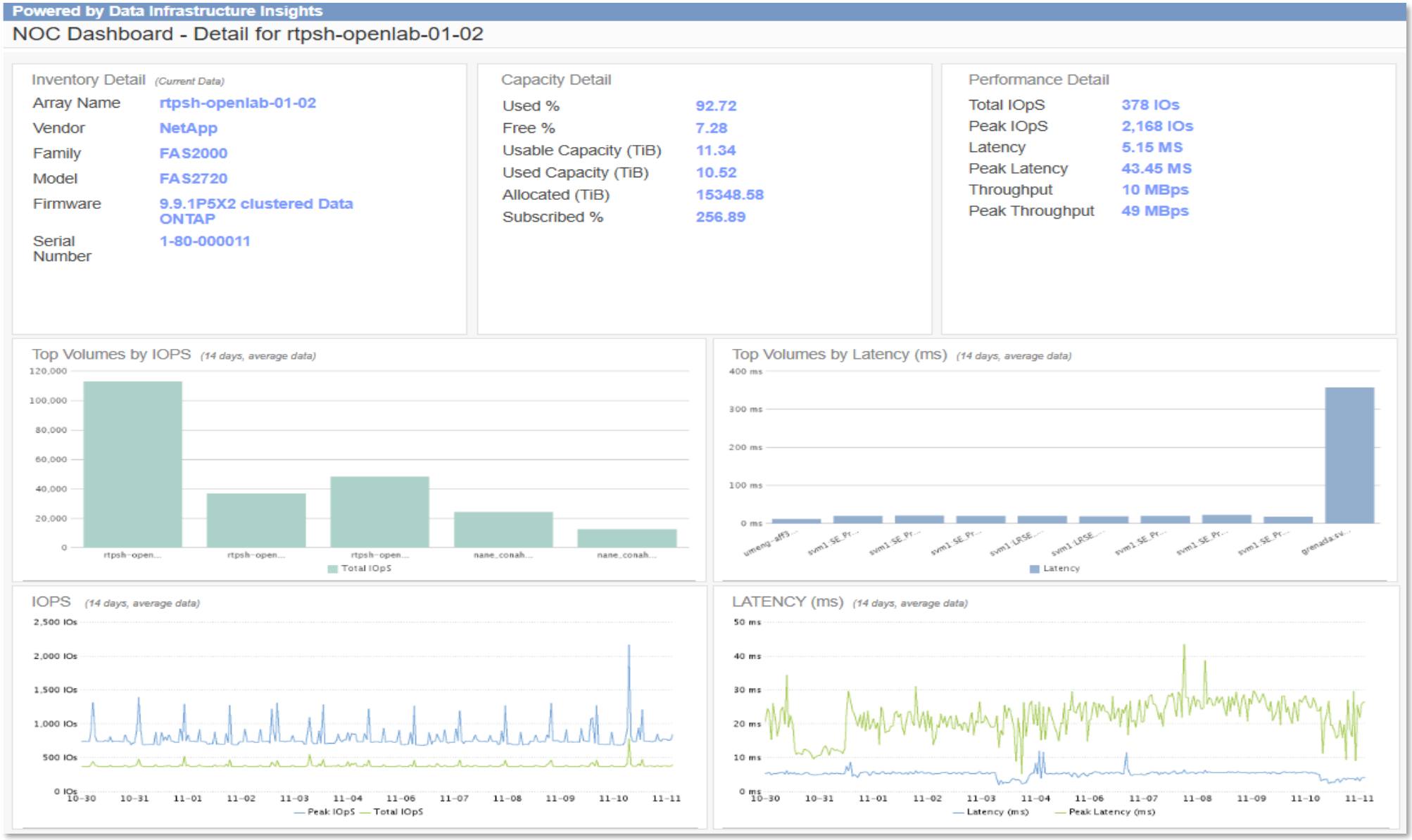
Description: This report shows IOPS, Latency and Capacity consumption plus data reduction ratios. Additionally, the user can click on USER DETAILS for more robust information for specific storage devices.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.
VIEW DETAILS drill report must be configured for each customer.

Report XML: 7.1 NOC Dashboard with Alerts

Report XML DRILL: 7.2 NOC Dashboard with Alerts DRILL

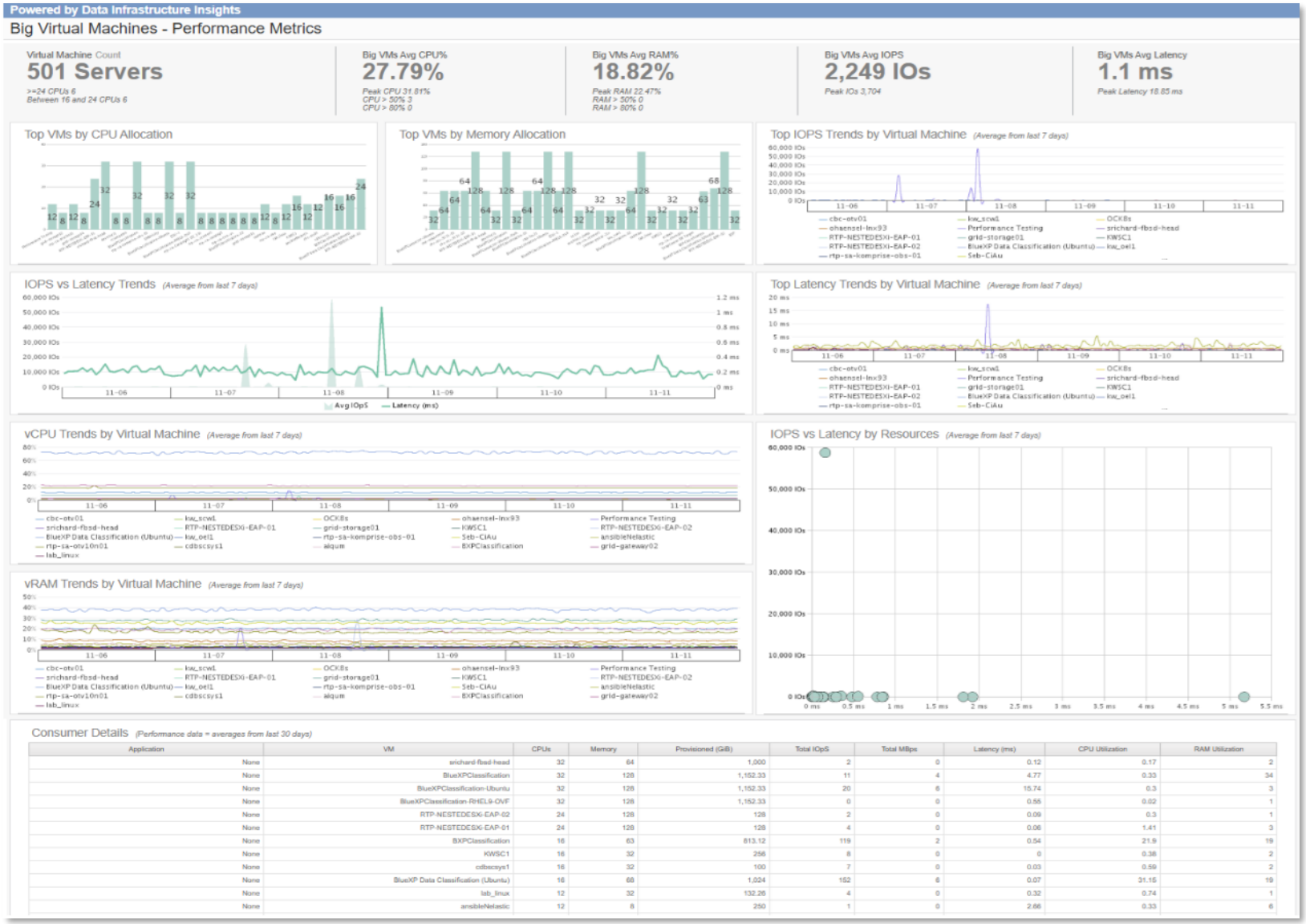
VIEW DETAILS result for selected storage device:



7.1 NOC Dashboard with Alerts Definitions

Metric/Attribute	Description
NOC Dashboard	
Storage	Name of the storage device discovered and monitored by DII
Model	Model name of the storage device
Active	Whether the storage device is active (True or False)
IOPS/Total IOPS	Measures the total number of I/O service requests (read+write) on the volume during the selected time period (measured in I/O per sec)
Latency	The time it takes from the moment a request for information arrives at the storage device to the time when the storage device begin to send the information back in response. This is the actual latency of the device in Milliseconds
Allocated (GiB)	Allocated capacity in Gibibytes from both Block and File based volumes
Usable	Usable capacity allocated for a storage-pool as reported by the storage-array in Tebibytes (Base 2 units)
Used	Capacity used in a storage-pool as reported by the storage-array in TiB
Used %	Used / Usable
Free	Usable – Used
Failed Disks	The number of failed disks in the storge device. Derived from the storage_dimension table where status LIKE '%Fail%'
Volumes w/Peak latency > 50ms	Total number of volumes both Block and File when peak latency > 50 milliseconds over a 14 day period
Pools over 80% Used	Total number of storage pools or aggregates when Used % > 80
Pools over 100% Provisioned	Total number of storage pools or aggregates when subscribed capacity % > 100
Volumes over 100% Allocated (ESX)	Total number of volumes allocated to ESX that are over 100% provisioned
Volumes with Used Capacity > 90%	Total number of volumes with Used % > 90

7.3 Big Virtual Machines – Performance Metrics



Description: This report shows performance and capacity behaviors for a sites largest virtual machines.

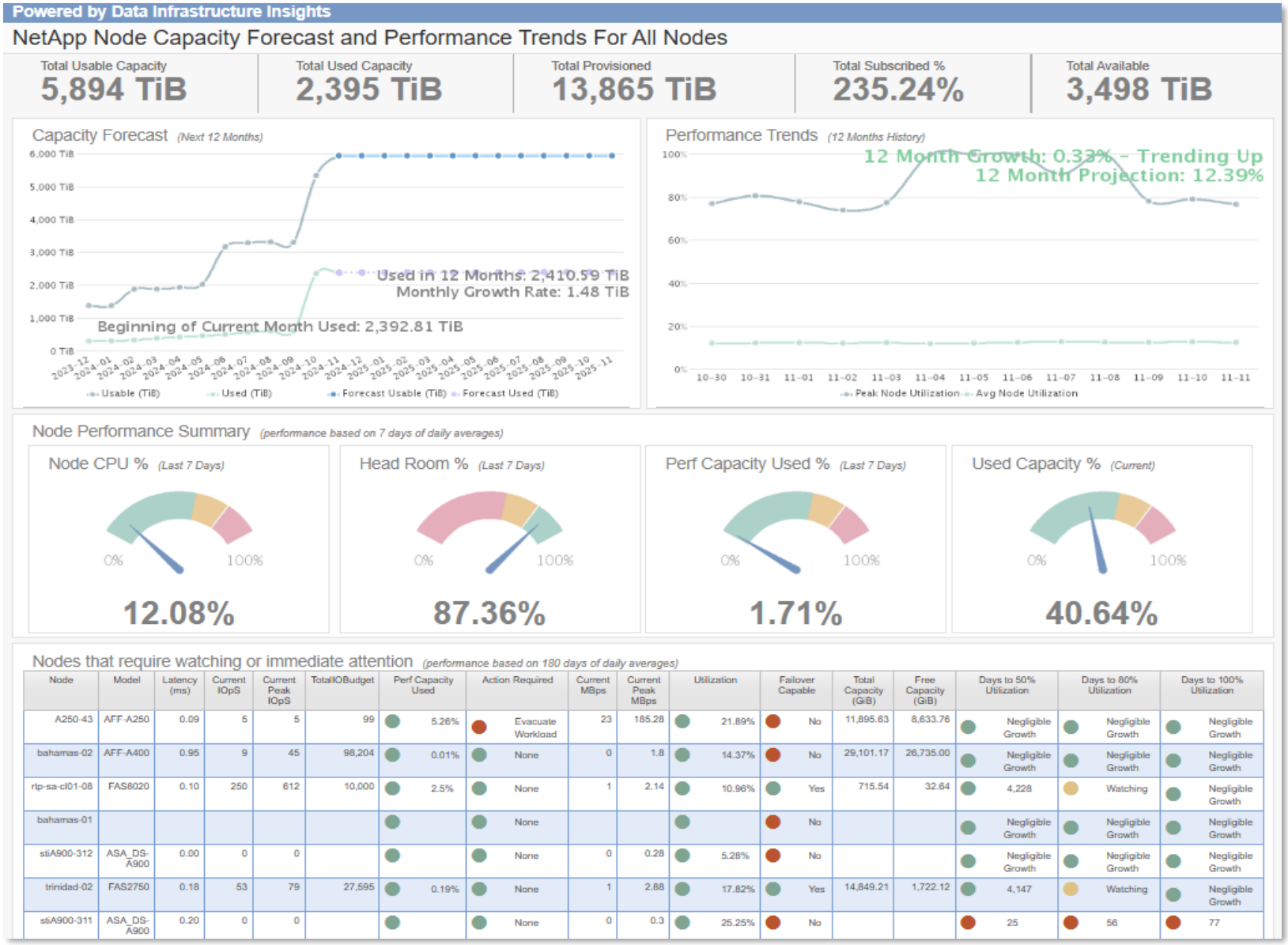
Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 7.3 Big Virtual Machines - Performance Metrics

7.3 Big Virtual Machines – Performance Metrics Definitions

Metric/Attribute	Description
Application	DII configured annotation. Defines the application associated with the virtual machine or backend storage capacity
What is a BIG VM?	These are virtual machines with a largest number of processors in the environment
VM / VM Guest	Name of the virtual machine discovered and monitored by DII
VM Count	Total number of virtual machines discovered
Big VMs Avg CPU%	The average percentage of a physical CPU's processing power that is currently being used by that virtual instance, essentially measuring how much of the allocated CPU resources are actively being consumed
Big VMs Avg RAM%	The average percentage of the allocated RAM that is currently being used by the virtual machine
Big VMs Avg IOPS	Measures the total number of I/O service requests (read+write) on the virtual instance during the selected time period (measured in I/O per sec)
Big VMs Avg Latency	The time it takes from the moment a request for information arrives at the instance to the time when the instance begins to send the information back in response. This is the actual latency of the device in milliseconds
vCPU	Total number of processors allocated to a virtual instance
vRAM	Total amount of Memory in Gibibytes allocated to a virtual instance
Provisioned (GiB)	Amount of capacity in Gibibytes allocated to the virtual instance
Date	Full Date field derived from the DateDimension table in the DWH
Time	Hourdatetime field derived from the Time Dimension table in the DWH

7.4 NetApp Node Capacity with Performance Forecast and Trends



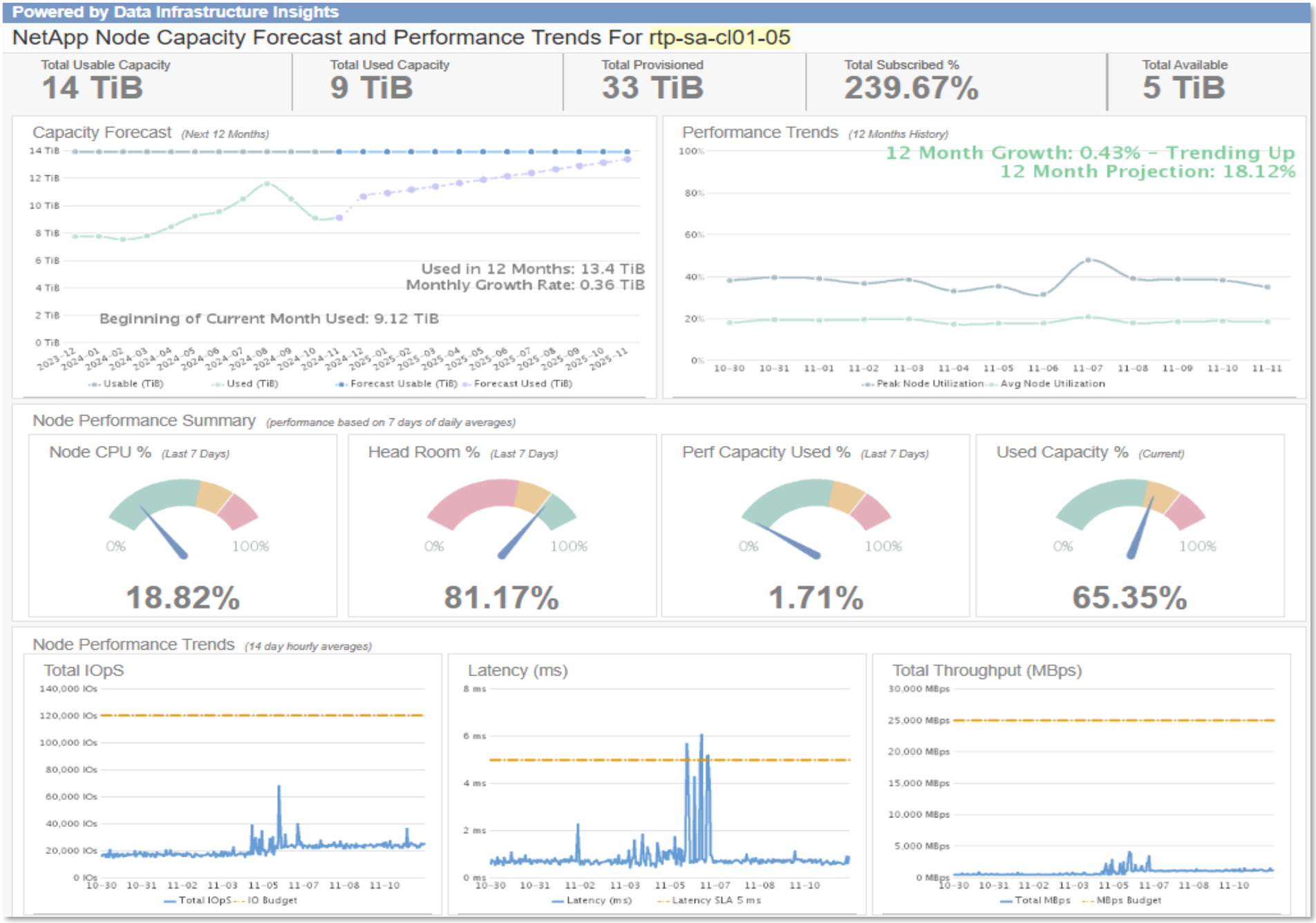
Node	Model	Latency (ms)	Current IOpS	Current Peak IOpS	TotalIOBudget	Perf Capacity Used	Action Required	Current MBps	Current Peak MBps	Utilization	Failover Capable	Total Capacity (GiB)	Free Capacity (GiB)	Days to 50% Utilization	Days to 80% Utilization	Days to 100% Utilization
A250-43	AFF-A250	0.09	5	5	99	5.26%	Evacuate Workload	23	185.28	21.89%	No	11,895.63	8,633.76	Negligible Growth	Negligible Growth	Negligible Growth
bahamas-02	AFF-A400	0.95	9	45	98,204	0.01%	None	0	1.8	14.37%	No	29,101.17	26,735.00	Negligible Growth	Negligible Growth	Negligible Growth
rtp-sa-cl01-08	FAS8020	0.10	250	612	10,000	2.5%	None	1	2.14	10.96%	Yes	715.54	32.64	4,228	Watching	Negligible Growth
bahamas-01							None				No			Negligible Growth	Negligible Growth	Negligible Growth
stiA900-312	ASA_DS-A900	0.00	0	0			None	0	0.28	5.28%	No			Negligible Growth	Negligible Growth	Negligible Growth
trinidad-02	FAS2750	0.18	53	79	27,595	0.19%	None	1	2.88	17.82%	Yes	14,849.21	1,722.12	4,147	Watching	Negligible Growth
stiA900-311	ASA_DS-A900	0.20	0	0			None	0	0.3	25.25%	No			25	56	77

Description: This report shows capcity and performance growth and projections for NetApp FAS and AFF nodes. You can select individual nodes after run-time for specific details.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled. NetApp FAS and AFF storage devices discovered by DII.

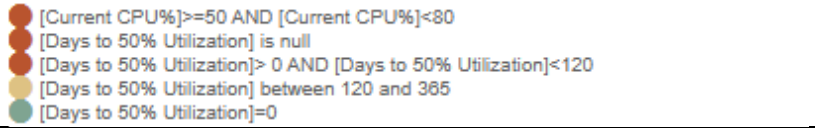
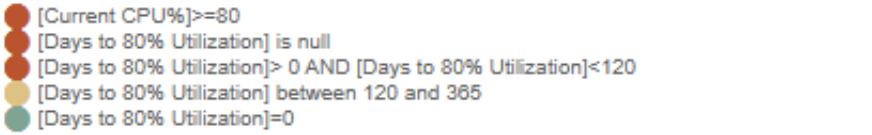
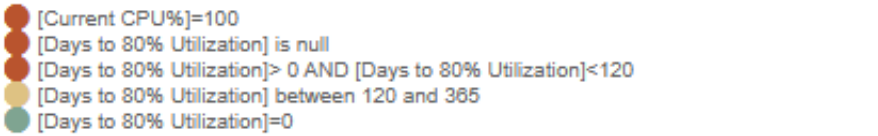
Report XML: 7.4 NetApp Node Capacity and Performance Forecast and Trends

Selecting a specific node shows the following result:



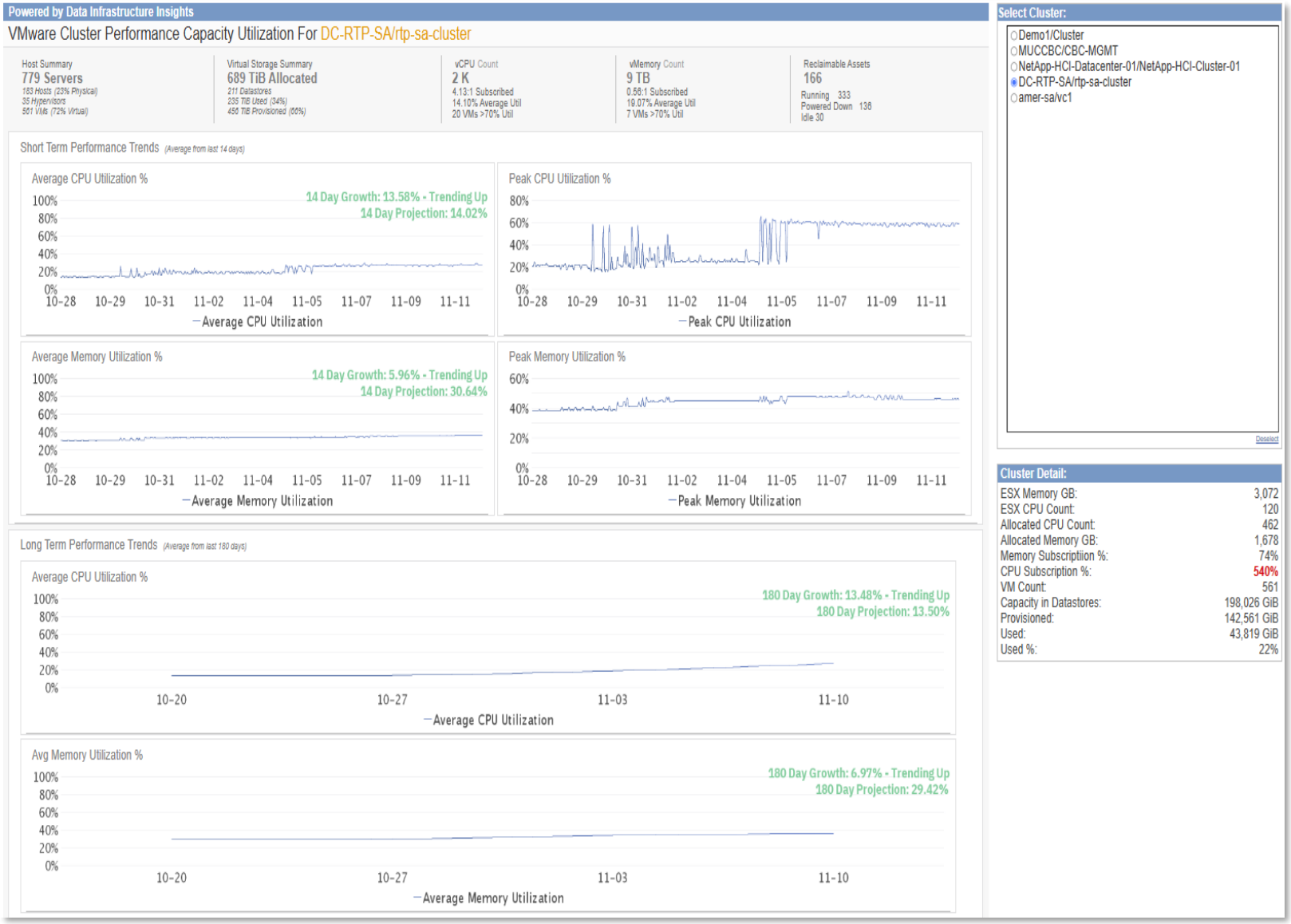
7.4 NetApp Node Capacity with Performance Forecast and Trends Definitions

Metric/Attribute	Description
All Nodes	
Node	Name of the node that is associated with the CDOT cluster discovered and monitored by DII
Model	Model name of the node
Latency (ms)	The average (frontend) response time in milliseconds (read+write) as reported by the NetApp node for the current DII collection period (180 Days)
Current IOPS	The maximum of average (frontend) IOpS as reported by the NetApp node for the current DII collection period
Current Peak IOPS	The max of max IOPS as reported by the NetApp node
TotalIOBudget	A model specific value published by NetApp. The IOBudget shows the theoretical IO limit e.g. 50% of max IOPS per node. For example, an AFF 8080 node will support 74,906 IOs.
Perf Capacity Used	([Current IOpS] / [TotalIOBudget]) * 100 Perf Capacity Used % <=50 Perf Capacity Used % between 50 and 80 Perf Capacity Used % >= 80
Action Required	Recommended action to take when KPI criteria has been exceeded "Evacuate workload" = Yes - Average IOPS 180 days from today will => 100% of node IO budget "Order more performance" = Yes - Average IOPS 180 days from today will be => 90% of node IO budget "Stop provisioning" = Yes - Average IOPS 180 days from today will be =>80% of node IO budget
Current MBps	The maximum of average (frontend) Throughput in Megabytes per second as reported by the NetApp node for the current DII collection period
Current Peak MBps	The max of max (frontend) Throughput in Megabytes per second
Utilization	The average (frontend) CPU utilization in % as reported by the NetApp node for the current OCI collection period. NetApp Node CPU Utilization is a combination of CPU core + WAFL_Ex (parallel WAFL processing) + Kahuna (serial WAFL processing) Current CPU% <= 50 Current CPU% between 50 and 80 Current CPU% >= 80
Failover Capable	Indicates whether or not the NetApp node is failover capable. HAPairPeakIOPS = The sum total IOPS of the Node pair. HAPairCPUPercent = The sum total CPU Utilization % of the Node pair. IF([HAPairPeakIOpS] <= ([TotalIOBudget]*2) AND [HAPairCPUPercent] <=95) THEN ('Yes') ELSE ('No') Yes No
Total Capacity (GiB)	Usable capacity allocated for a storage-pool as reported by the storage-array in Gibibytes (Base 2 units)
Used Capacity (GiB)	Capacity used in a storage-pool as reported by the storage-array in Gibibytes
Free Capacity (GiB)	Total Capacity (GiB) - Used Capacity (GiB)
CPU Daily Growth Rate	The CPU % Daily Simple Growth Rate (AVG(Current CPUpercent) - AVG(180 Days Ago - CPUpercent)) / TIMESTAMPDIFF(DAY, 180 Days Ago - Date, Current Date)

Days to 50% Utilization	This is the number of days until Node CPU Utilization reaches 50% WHEN [Current CPU%] >= 50 THEN null 'Reached' WHEN cast((50-[Current CPU%])/[CPU Daily Growth Rate], decimal(10,0)) < 0 THEN 0 WHEN cast((50-[Current CPU%])/[CPU Daily Growth Rate], decimal(10,0)) is null THEN 0 WHEN cast((50-[Current CPU%])/[CPU Daily Growth Rate], decimal(10,0)) > 5000 THEN 0 ELSE cast((50-[Current CPU%])/[CPU Daily Growth Rate], decimal(10,0)) 
Days to 80% Utilization	This is the number of days until Node CPU Utilization reaches 80% WHEN [Current CPU%] >= 80 THEN null 'Reached' WHEN cast((80-[Current CPU%])/[CPU Daily Growth Rate], decimal(10,0)) < 0 THEN 0 WHEN cast((80-[Current CPU%])/[CPU Daily Growth Rate], decimal(10,0)) is null THEN 0 WHEN cast((80-[Current CPU%])/[CPU Daily Growth Rate], decimal(10,0)) > 5000 THEN 0 ELSE cast((80-[Current CPU%])/[CPU Daily Growth Rate], decimal(10,0)) 
Days to 100% Utilization	This is the number of days until Node CPU Utilization reaches 100% WHEN [Current CPU%] = 100 THEN null 'Reached' WHEN cast((100-[Current CPU%])/[CPU Daily Growth Rate], decimal(10,0)) < 0 THEN 0 WHEN cast((100-[Current CPU%])/[CPU Daily Growth Rate], decimal(10,0)) is null THEN 0 WHEN cast((100-[Current CPU%])/[CPU Daily Growth Rate], decimal(10,0)) > 5000 THEN 0 ELSE cast((100-[Current CPU%])/[CPU Daily Growth Rate], decimal(10,0)) 
Usable (TiB)	Usable capacity allocated for a storage-pool as reported by the storage-array in Tebibytes (Base 2 units)
Used (TiB)	Capacity used in a storage-pool as reported by the storage-array in Tebibytes
Forecast Usable (TiB)	Usable Capacity in Tebibytes for the future 12 month period. This field is the basis for the intercept as a result of linear regression and projected used capacity. The field is contained in the Storage and Storage Pools Capacity FUTURE Fact table
Forecast Used (TiB)	Forecast Used Capacity in Tebibytes for the future 12 month period
Used in 12 Months	This is the amount of capacity that will be used 12 months into the future IF([MaxDate]=[Full Date]) THEN ([Forecast Used (TiB)]) ELSE (0)
Monthly Growth Rate	This is the simple monthly growth rate of used capacity ([Used (TiB) in 12 Months]-[Current for Report])/12

Avg Node Utilization	Average Node CPU Utilization shows the percentage of time that one or more CPUs were busy. In DII, this is based on the higher of CPU, WAFL_EX and Kahuna Processor Domain metrics. Details are as follows: • System – avg_processor_busy, cpu_elapsed_time1 • WAFL – total_cp_msecs, cp_phase_times.P2_FLUSH • Processor – domain_busy, processor_elapsed_time Overall node utilization then is displayed as the higher of the 3 (system, WAFL or processor domains) which all indicate a controller's ability (utilization) to process read/write requests
Peak Node Utilization	Max of max CPU Utilization as reported by the storage node for the collection period
Node CPU %	Same as Avg Node Utilization
Head Room %	Head Room refers to the remaining performance capacity of a storage node, essentially indicating how much additional workload can be placed on a node before its performance starts to degrade due to increased latency. Head Room formula in reporting: 100 – ((Avg Node Utilization/100 + Avg Throughput MBps) * 100) NOTE: Head room is derived from the Optimal Point calculation which is not currently available in the Data Warehouse.
Date	Full Date field available in the DWH Date Dimension table

7.5 VMware Cluster Performance Capacity Utilization



Description: This report shows capcity and performance growth and projections for VMware ESX servers. You can select individual nodes after run-time for specific details.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled. NetApp FAS and AFF storage devices discovered by DII.

Report XML: 7.5 VMware Cluster Performance Capacity Utilization

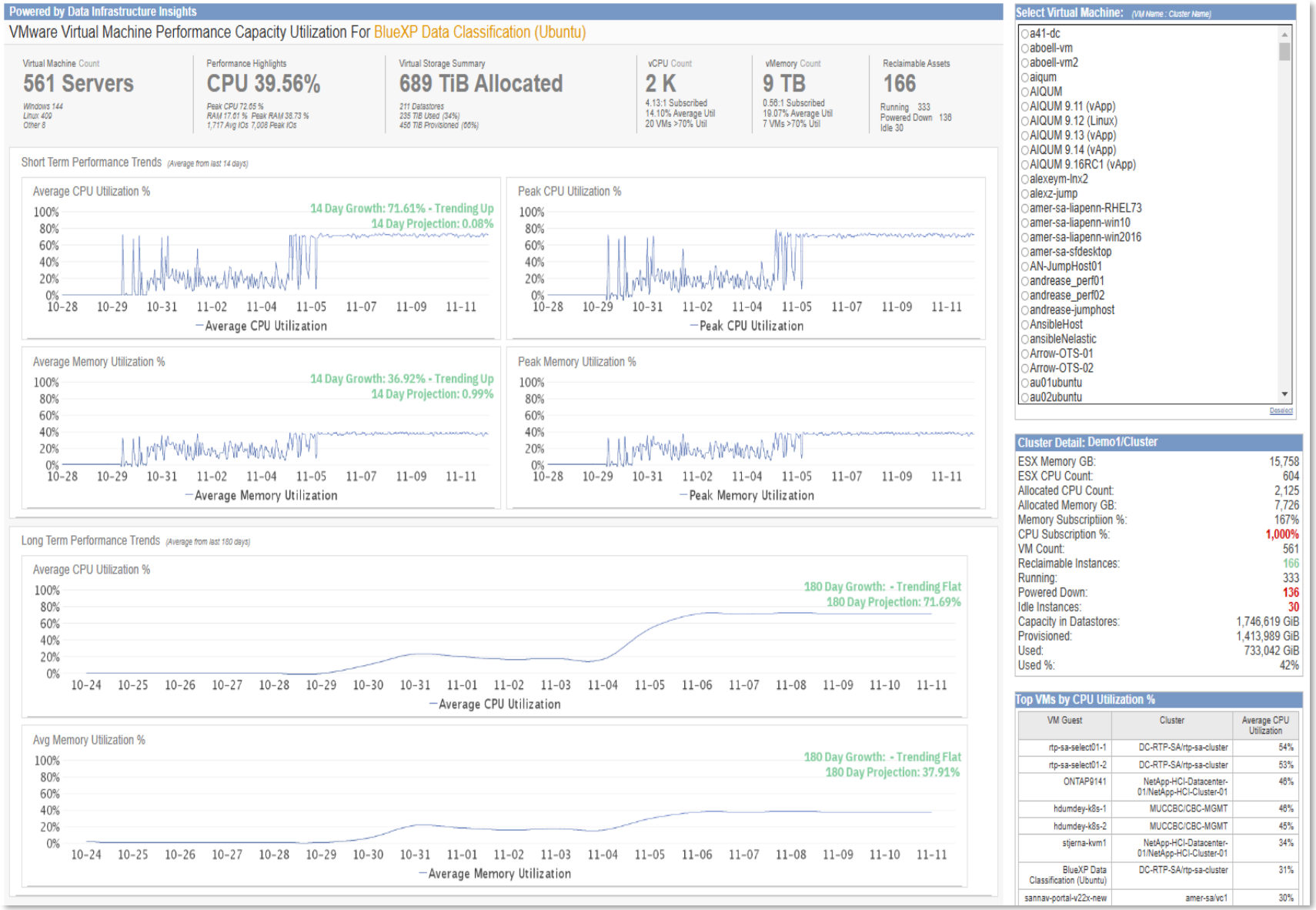
7.5 VMware Cluster Performance Capacity Utilization Definitions

Metric/Attribute	Description
Summary	
Virtual Machine Count	• Testing 561 Servers is the number of Virtual Machines discovered by DII via the Virtual Center Client API • 144 Windows is the number of VM's that are using Windows operating systems • 400 Linux is the number of VM's that are using Linux based operating systems • 8 Other is the number of VM's that are using proprietary operating systems like VMware Photon or Amazon AMI types
Performance Highlights	• CPU 39.56% is the average CPU utilization for all Virtual Machines • Peak CPU %, Average RAM %, Peak RAM %, Average IOPS and Peak IOPS values are also shown in subtext
Virtual Storage Summary	• 689 Tebibytes of Allocated Capacity to Datastores • 211 Datastores monitored by DII • 235 Tebibytes of Used Capacity by all Virtual Machines (34%) • 450 Tebibytes of Provisioned Capacity to all Virtual Machines (66%)
vCPU Count	• 2000 (2K) Virtual Processors (vCPUs) allocated to Virtual Machines • 4.13:1 Subscribed. Indicates that the ESX servers collectively are over-subscribed by 413% • 14.10% Average CPU Utilization for all ESX servers • 20 VMs > 70% Util - indicates the number of VM's that are peaking over 70% CPU utilization
vMemory Count	• 9 Terabytes of memory are allocated to Virtual Machines • 0.56:1 Subscribed. Indicates that the ESX servers collectively are under-subscribed at 56% • 19.07% Average Memory Utilization for all ESX servers • 7 VMs > 70% Util - indicates the number of VM's that are peaking over 70% Memory utilization
Reclaimable Assets	• 166 Reclaimable Assets refers to the number of Virtual Machines that are powered-off or idle • 333 Virtual Machines that are currently running • 136 Virtual Machines that are currently powered-down • 30 Virtual Machines that are idle (zero IOPS for 90 days)
Charts	
Average CPU Utilization %	Average hourly vCPU Utilization as reported by the ESX hypervisor for 14 days
Peak CPU Utilization %	Maximum vCPU Utilization as reported by the ESX hypervisor for 14 days
Average Memory Utilization %	Average hourly vRAM Utilization as reported by the ESX hypervisor for 14 days
Peak Memory Utilization %	Maximum vRAM Utilization as reported by the ESX hypervisor for 14 days
14/180 Day Growth	The difference between the Current Avg CPU – 180 Days Ago Avg CPU
14/180 Day Projection	WHEN [CPU Growth %] < 0 THEN average([Current Average CPU] for report) - ([CPU Growth %]*-1) WHEN [CPU Growth %] > 0 THEN average([Current Average CPU] for report) + ([CPU Growth %]*-1) ELSE average([Current Average CPU] for report)

NetApp

Date	Full Date field derived from the DateDimension table in the DWH
Time	Hourdatetime field derived from the Time Dimension table in the DWH
Cluster Detail	
ESX Memory GiB	Total amount of Memory in Gibibytes allocated to the selected ESX hypervisor
ESX CPU Count	Total number of CPUs allocated to the selected ESX hypervisor
Allocated CPU Count	Total number of vCPUs allocated to virtual machines
Allocated Memory GiB	Total amount of vRAM allocated to virtual machines
Memory Subscription %	The amount Allocated Memory in Gibibytes / ESX Memory in Gibibytes
CPU Subscription %	The number of Allocated CPUs / ESX CPU Count
VM Count	Total number of virtual machines discovered by DII
Reclaimable Instances	Total number of powered down or idle virtual instances
Running	Total number of running virtual instances
Powered Down	Total number of powered down virtual instances
Idle Instances	Total number of Idle virtual instances with zero IOPS for 90 days
Capacity in Datastores	Total amount of capacity in Gibibytes allocated to the datastore
Provisioned	Total amount of capacity in Gibibytes provisioned to virtual instances
Used	Total amount of used capacity in Gibibytes as reported by the datastore
Used %	Used / Capacity in Datastores

7.6 VMware Virtual Machine Performance Capacity Utilization



Description: This report shows capcity and performance growth and projections for VMware and Cloud based instances. You can select individual nodes after run-time for specific details.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled. NetApp FAS and AFF storage devices discovered by DII.

Report XML: 7.4 NetApp Node Capacity and Performance Forecast and Trends

7.6 VMware Virtual Machine Performance Capacity Utilization Definitions

Metric/Attribute	Description
Summary	
Virtual Machine Count	• Testing 561 Servers is the number of Virtual Machines discovered by DII via the Virtual Center Client API • 144 Windows is the number of VM's that are using Windows operating systems • 400 Linux is the number of VM's that are using Linux based operating systems • 8 Other is the number of VM's that are using proprietary operating systems like VMware Photon or Amazon AMI types
Performance Highlights	• CPU 39.56% is the average CPU utilization for all Virtual Machines • Peak CPU %, Average RAM %, Peak RAM %, Average IOPS and Peak IOPS values are also shown in subtext
Virtual Storage Summary	• 689 Tebibytes of Allocated Capacity to Datastores • 211 Datastores monitored by DII • 235 Tebibytes of Used Capacity by all Virtual Machines (34%) • 450 Tebibytes of Provisioned Capacity to all Virtual Machines (66%)
vCPU Count	• 2000 (2K) Virtual Processors (vCPUs) allocated to Virtual Machines • 4.13:1 Subscribed. Indicates that the ESX servers collectively are over-subscribed by 413% • 14.10% Average CPU Utilization for all ESX servers • 20 VMs > 70% Util - indicates the number of VM's that are peaking over 70% CPU utilization
vMemory Count	• 9 Terabytes of memory are allocated to Virtual Machines • 0.56:1 Subscribed. Indicates that the ESX servers collectively are under-subscribed at 56% • 19.07% Average Memory Utilization for all ESX servers • 7 VMs > 70% Util - indicates the number of VM's that are peaking over 70% Memory utilization
Reclaimable Assets	• 166 Reclaimable Assets refers to the number of Virtual Machines that are powered-off or idle • 333 Virtual Machines that are currently running • 136 Virtual Machines that are currently powered-down • 30 Virtual Machines that are idle (zero IOPS for 90 days)
Charts	
Average CPU Utilization %	Average hourly vCPU Utilization as reported by the ESX hypervisor for 14 days
Peak CPU Utilization %	Maximum vCPU Utilization as reported by the ESX hypervisor for 14 days
Average Memory Utilization %	Average hourly vRAM Utilization as reported by the ESX hypervisor for 14 days
Peak Memory Utilization %	Maximum vRAM Utilization as reported by the ESX hypervisor for 14 days
14/180 Day Growth	The difference between the Current Avg CPU – 180 Days Ago Avg CPU
14/180 Day Projection	WHEN [CPU Growth %] < 0 THEN average([Current Average CPU] for report) - ([CPU Growth %]*-1) WHEN [CPU Growth %] > 0 THEN average([Current Average CPU] for report) + ([CPU Growth %]*-1) ELSE average([Current Average CPU] for report)

NetApp

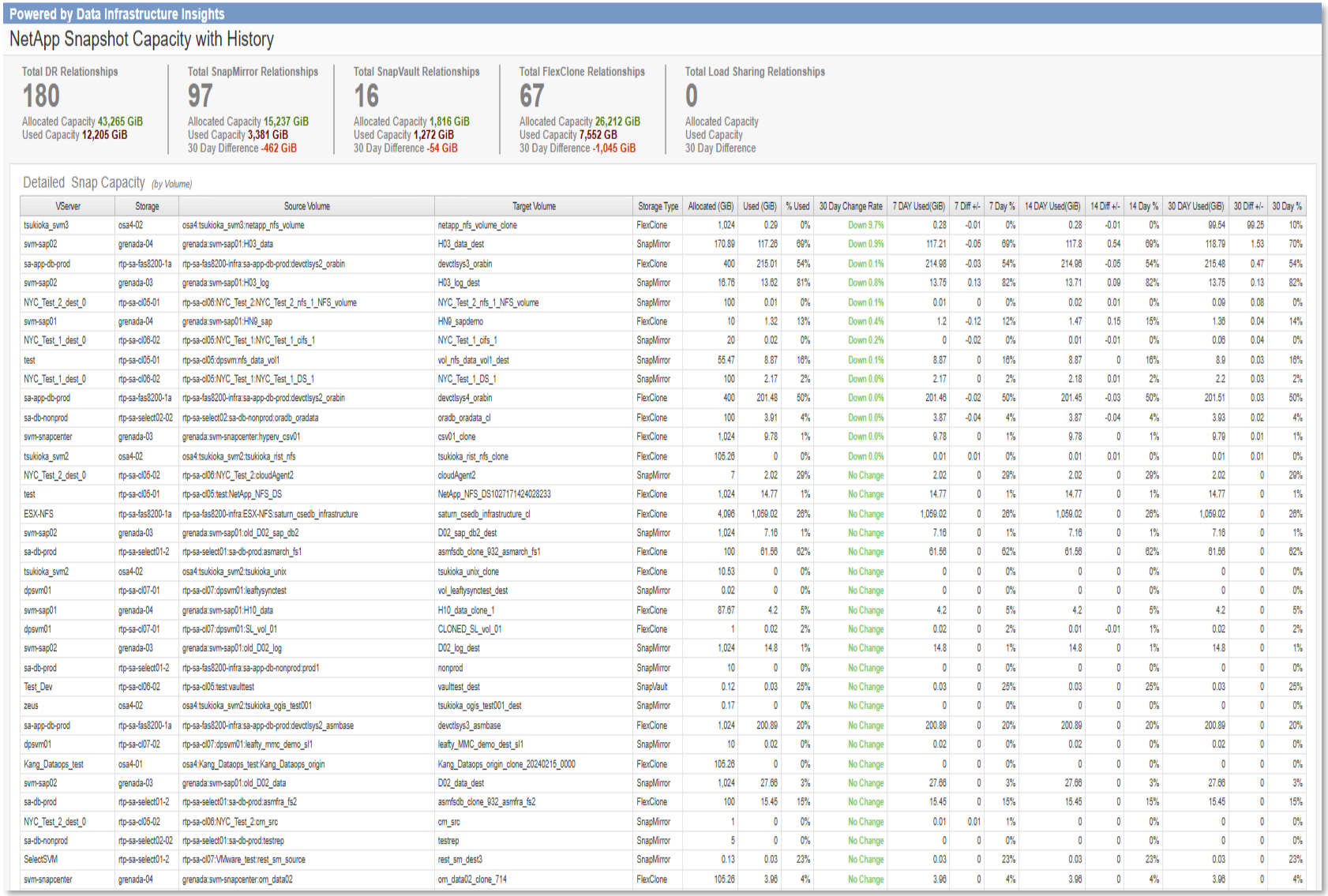
Date	Full Date field derived from the DateDimension table in the DWH
Time	Hourdatetime field derived from the Time Dimension table in the DWH
Cluster Detail	
ESX Memory GiB	Total amount of Memory in Gibibytes allocated to the selected ESX hypervisor
ESX CPU Count	Total number of CPUs allocated to the selected ESX hypervisor
Allocated CPU Count	Total number of vCPUs allocated to virtual machines
Allocated Memory GiB	Total amount of vRAM in Gibibytes allocated to virtual machines
Memory Subscription %	The amount Allocated Memory in Gibibytes / ESX Memory in Gibibytes
CPU Subscription %	The number of Allocated CPUs / ESX CPU Count
VM Count	Total number of virtual machines discovered by DII
Reclaimable Instances	Total number of powered down or idle virtual instances
Running	Total number of running virtual instances
Powered Down	Total number of powered down virtual instances
Idle Instances	Total number of Idle virtual instances with zero IOPS for 90 days
Capacity in Datastores	Total amount of capacity in Gibibytes allocated to the datastore
Provisioned	Total amount of capacity in Gibibytes provisioned to virtual instances
Used	Total amount of used capacity in Gibibytes as reported by the datastore
Used %	Used / Capacity in Datastores

NetApp and Multi-Vendor DR Overview

These are some of the disaster recovery and data protection management tasks that can be addressed by leveraging the reports in this catalog. Here are some of the objectives met by this section:

- ❑ NetApp Snapshot Capacity with History
- ❑ NetApp Snapshot Capacity
- ❑ Multi-Vendor Storage Replication Detail – SAN and NAS

9.1 NetApp Snapshot Capacity with History



Powered by Data Infrastructure Insights

NetApp Snapshot Capacity with History

Total DR Relationships	Total SnapMirror Relationships	Total SnapVault Relationships	Total FlexClone Relationships	Total Load Sharing Relationships
180	97	16	67	0
Allocated Capacity 43,265 GiB Used Capacity 12,205 GiB	Allocated Capacity 15,237 GiB Used Capacity 3,381 GiB 30 Day Difference -462 GiB	Allocated Capacity 1,816 GiB Used Capacity 1,272 GiB 30 Day Difference -54 GiB	Allocated Capacity 26,212 GiB Used Capacity 7,552 GB 30 Day Difference -1,045 GiB	Allocated Capacity Used Capacity 30 Day Difference

Detailed Snap Capacity *(by Volume)*

VServer	Storage	Source Volume	Target Volume	Storage Type	Allocated (GiB)	Used (GiB)	% Used	30 Day Change Rate	7 DAY Used(GiB)	7 Diff +/-	7 Day %	14 DAY Used(GiB)	14 Diff +/-	14 Day %	30 DAY Used(GiB)	30 Diff +/-	30 Day %
tsukioka_svm3	osa4-02	osa4:tsukioka_svm3:netapp_nfs_volume	netapp_nfs_volume_clone	FlexClone	1,024	0.29	0%	Down 9.7%	0.28	-0.01	0%	0.28	-0.01	0%	99.54	99.25	10%
svm-sap02	grenada-04	grenada:svm-sap01:H03_data	H03_data_dest	SnapMirror	170.89	117.26	69%	Down 0.9%	117.21	-0.05	69%	117.8	0.54	69%	118.79	1.53	70%
sa-app-db-prod	rtp-sa-fas8200-1a	rtp-sa-fas8200-infra:sa-app-db-prod:devctlsys2_orabin	devctlsys3_orabin	FlexClone	400	215.01	54%	Down 0.1%	214.98	-0.03	54%	214.96	-0.05	54%	215.48	0.47	54%
svm-sap02	grenada-03	grenada:svm-sap01:H03_log	H03_log_dest	SnapMirror	16.76	13.62	81%	Down 0.8%	13.75	0.13	82%	13.71	0.09	82%	13.75	0.13	82%
NYC_Test_2_dest_0	rtp-sa-ol05-01	rtp-sa-ol06:NYC_Test_2:NYC_Test_2_nfs_1_NFS_volume	NYC_Test_2_nfs_1_NFS_volume	SnapMirror	100	0.01	0%	Down 0.1%	0.01	0	0%	0.02	0.01	0%	0.09	0.08	0%
svm-sap01	grenada-04	grenada:svm-sap01:HN9_sap	HN9_sapdemo	FlexClone	10	1.32	13%	Down 0.4%	1.2	-0.12	12%	1.47	0.15	15%	1.36	0.04	14%
NYC_Test_1_dest_0	rtp-sa-ol08-02	rtp-sa-ol06:NYC_Test_1:NYC_Test_1_cifs_1	NYC_Test_1_cifs_1	SnapMirror	20	0.02	0%	Down 0.2%	0	-0.02	0%	0.01	-0.01	0%	0.06	0.04	0%
test	rtp-sa-ol05-01	rtp-sa-ol06:dpsvm:nfs_data_vol1	vol_nfs_data_vol1_dest	SnapMirror	55.47	8.87	16%	Down 0.1%	8.87	0	16%	8.87	0	16%	8.9	0.03	16%
NYC_Test_1_dest_0	rtp-sa-ol08-02	rtp-sa-ol05:NYC_Test_1:NYC_Test_1_DS_1	NYC_Test_1_DS_1	SnapMirror	100	2.17	2%	Down 0.0%	2.17	0	2%	2.18	0.01	2%	2.2	0.03	2%
sa-app-db-prod	rtp-sa-fas8200-1a	rtp-sa-fas8200-infra:sa-app-db-prod:devctlsys2_orabin	devctlsys4_orabin	FlexClone	400	201.48	50%	Down 0.0%	201.46	-0.02	50%	201.45	-0.03	50%	201.51	0.03	50%
sa-db-nonprod	rtp-sa-select02-02	rtp-sa-select02:sa-db-nonprod:oradb_oradata	oradb_oradata_cl	FlexClone	100	3.91	4%	Down 0.0%	3.87	-0.04	4%	3.87	-0.04	4%	3.93	0.02	4%
svm-snapcenter	grenada-03	grenada:svm-snapcenter:hyperv_csv01	csv01_clone	FlexClone	1,024	9.78	1%	Down 0.0%	9.78	0	1%	9.78	0	1%	9.79	0.01	1%
tsukioka_svm2	osa4-02	osa4:tsukioka_svm2:tsukioka_rist_nfs	tsukioka_rist_nfs_clone	FlexClone	105.26	0	0%	Down 0.0%	0.01	0.01	0%	0.01	0.01	0%	0.01	0.01	0%
NYC_Test_2_dest_0	rtp-sa-ol08-02	rtp-sa-ol06:NYC_Test_2:cloudAgent2	cloudAgent2	SnapMirror	7	2.02	29%	No Change	2.02	0	29%	2.02	0	29%	2.02	0	29%
test	rtp-sa-ol05-01	rtp-sa-ol05:test:NetApp_NFS_DS	NetApp_NFS_DS1027171424028233	FlexClone	1,024	14.77	1%	No Change	14.77	0	1%	14.77	0	1%	14.77	0	1%
ESX-NFS	rtp-sa-fas8200-1a	rtp-sa-fas8200-infra:ESX-NFS:saturn_csedb_infrastructure	saturn_csedb_infrastructure_cl	FlexClone	4,096	1,059.02	26%	No Change	1,059.02	0	26%	1,059.02	0	26%	1,059.02	0	26%
svm-sap02	grenada-03	grenada:svm-sap01:old_D02_sap_db2	D02_sap_db2_dest	SnapMirror	1,024	7.16	1%	No Change	7.16	0	1%	7.16	0	1%	7.16	0	1%
sa-db-prod	rtp-sa-select01-2	rtp-sa-select01:sa-db-prod:asmarch_fs1	asmfsdb_clone_932_asmarch_fs1	FlexClone	100	61.56	62%	No Change	61.56	0	62%	61.56	0	62%	61.56	0	62%
tsukioka_svm2	osa4-02	osa4:tsukioka_svm2:tsukioka_unix	tsukioka_unix_clone	FlexClone	10.53	0	0%	No Change	0	0	0%	0	0	0%	0	0	0%
dpsvm01	rtp-sa-ol07-01	rtp-sa-ol07:dpsvm01:leaftysynctest	vol_leaftysynctest_dest	SnapMirror	0.02	0	0%	No Change	0	0	0%	0	0	0%	0	0	0%
svm-sap01	grenada-04	grenada:svm-sap01:H10_data	H10_data_clone_1	FlexClone	87.67	4.2	5%	No Change	4.2	0	5%	4.2	0	5%	4.2	0	5%
dpsvm01	rtp-sa-ol07-01	rtp-sa-ol07:dpsvm01:SL_vol_01	CLONED_SL_vol_01	FlexClone	1	0.02	2%	No Change	0.02	0	2%	0.01	-0.01	1%	0.02	0	2%
svm-sap02	grenada-03	grenada:svm-sap01:old_D02_log	D02_log_dest	SnapMirror	1,024	14.8	1%	No Change	14.8	0	1%	14.8	0	1%	14.8	0	1%
sa-db-prod	rtp-sa-select01-2	rtp-sa-fas8200-infra:sa-app-db-nonprod:prod1	nonprod	SnapMirror	10	0	0%	No Change	0	0	0%	0	0	0%	0	0	0%
Test_Dev	rtp-sa-ol08-02	rtp-sa-ol05:test:vaulttest	vaulttest_dest	SnapVault	0.12	0.03	25%	No Change	0.03	0	25%	0.03	0	25%	0.03	0	25%
zeus	osa4-02	osa4:tsukioka_svm2:tsukioka_ogis_test001	tsukioka_ogis_test001_dest	SnapMirror	0.17	0	0%	No Change	0	0	0%	0	0	0%	0	0	0%
sa-app-db-prod	rtp-sa-fas8200-1a	rtp-sa-fas8200-infra:sa-app-db-prod:devctlsys2_asmbase	devctlsys3_asmbase	FlexClone	1,024	200.89	20%	No Change	200.89	0	20%	200.89	0	20%	200.89	0	20%
dpsvm01	rtp-sa-ol07-02	rtp-sa-ol07:dpsvm01:leafty_mmc_demo_sl1	leafty_MMC_demo_dest_sl1	SnapMirror	10	0.02	0%	No Change	0.02	0	0%	0.02	0	0%	0.02	0	0%
Kang_Dataops_test	osa4-01	osa4:Kang_Dataops_test:Kang_Dataops_origin	Kang_Dataops_origin_clone_20240215_0000	FlexClone	105.26	0	0%	No Change	0	0	0%	0	0	0%	0	0	0%
svm-sap02	grenada-03	grenada:svm-sap01:old_D02_data	D02_data_dest	SnapMirror	1,024	27.66	3%	No Change	27.66	0	3%	27.66	0	3%	27.66	0	3%
sa-db-prod	rtp-sa-select01-2	rtp-sa-select01:sa-db-prod:asmfra_fs2	asmfsdb_clone_932_asmfra_fs2	FlexClone	100	15.45	15%	No Change	15.45	0	15%	15.45	0	15%	15.45	0	15%
NYC_Test_2_dest_0	rtp-sa-ol05-02	rtp-sa-ol06:NYC_Test_2:cm_src	cm_src	SnapMirror	1	0	0%	No Change	0.01	0.01	1%	0	0	0%	0	0	0%
sa-db-nonprod	rtp-sa-select02-02	rtp-sa-select01:sa-db-prod:testrep	testrep	SnapMirror	5	0	0%	No Change	0	0	0%	0	0	0%	0	0	0%
SelectSVM	rtp-sa-select01-2	rtp-sa-ol07:VMware_test:rest_sm_source	rest_sm_dest3	SnapMirror	0.13	0.03	23%	No Change	0.03	0	23%	0.03	0	23%	0.03	0	23%
svm-snapcenter	grenada-04	grenada:svm-snapcenter:om_data02	om_data02_clone_714	FlexClone	105.26	3.96	4%	No Change	3.96	0	4%	3.96	0	4%	3.96	0	4%

Description: This report shows disaster recovery capacity and changes for all NetApp specific DR relationship types by source and target volumes.

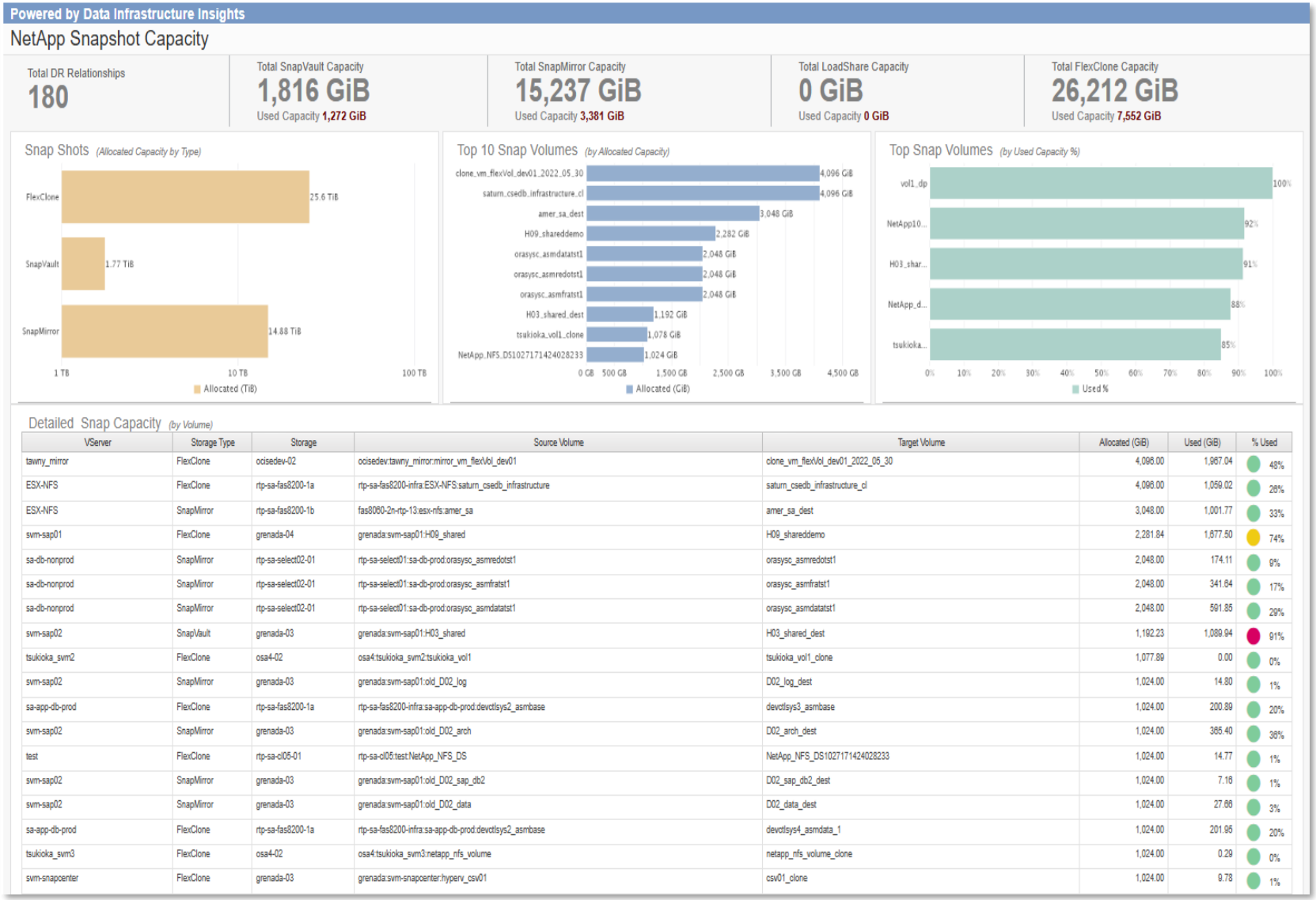
Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 9.1 NetApp Snapshot Capacity with History

9.1 NetApp Snapshot Capacity with History Definitions

Metric/Attribute	Description
Total DR Relationships	Sum of internal volumes with SnapMirror, FlexClone, SnapVault or LoadShareMirror relationship
Total SnapMirror Relationships	Sum of internal volumes with SnapMirror relationship
Total SnapVault Relationships	Sum of internal volumes with SnapVault relationship
Total FlexClone Relationships	Sum of internal volumes with FlexClone relationship
Total Load Sharing Relationships	Sum of internal volumes with LoadShareMirror relationship
Allocated Capacity	Allocated capacity on DR related internal volume in Gibibytes (Base 2 units)
Used Capacity	Used capacity on DR related internal volume in Gibibytes
VServer	The name of the NetApp storage virtual machine associated with the storage device
Storage	The name of the NetApp storage device discovered and monitored by DII
Source Volume	The name of the source volume associated with the NetApp storage device in a DR relationship
Target Volume	The name of the target volume associated with the NetApp storage device in a DR relationship
Storage Type	The DR storage type e.g. SnapMirror, FlexClone, SnapVault or LoadShare
Allocated (GiB)	Same as Allocated Capacity
Used (GiB)	Same as Used Capacity
% Used	Used (GiB) / Allocated (GiB)
7 DAY Used (GiB)	DR related capacity used in Gibibytes from 7 days ago for the internal volume
7 Diff +/-	The difference between current used capacity and 7 day used capacity - 7 DAY Used(GiB) - Used (GiB)
7 Day %	7 DAY Used(GiB) / Allocated (GiB)
14 DAY Used (GiB)	DR related capacity used in Gibibytes from 14 days ago for the internal volume
14 Diff +/-	The difference between current used capacity and 14 day used capacity - 14 DAY Used(GiB) - Used (GiB)
14 Day %	14 DAY Used(GiB) / Allocated (GiB)
30 DAY Used (GiB)	DR related capacity used in Gibibytes from 30 days ago for the internal volume
30 Diff +/-	The difference between current used capacity and 30 day used capacity - 30 DAY Used(GiB) - Used (GiB)
30 Day %	30 DAY Used(GiB) / Allocated (GiB)
30 Day Change Rate	The rate of change in Used Capacity % over 30 days. ([30 Day %]-[% Used])*100

9.2 NetApp Snapshot Capacity



Detailed Snap Capacity (by Volume)

VServer	Storage Type	Storage	Source Volume	Target Volume	Allocated (GiB)	Used (GiB)	% Used
tawny_mirror	FlexClone	ocisedev-02	ocisedev:tawny_mirror:mirror_vm_flexVol_dev01	clone_vm_flexVol_dev01_2022_05_30	4,096.00	1,967.04	48%
ESX-NFS	FlexClone	rtp-sa-fas8200-1a	rtp-sa-fas8200-infra:ESX-NFS:saturn_csedb_infrastructure	saturn_csedb_infrastructure_cl	4,096.00	1,059.02	26%
ESX-NFS	SnapMirror	rtp-sa-fas8200-1b	fas8060-2n-rtp-13:esx-nfs:amer_sa	amer_sa_dest	3,048.00	1,001.77	33%
svm-sap01	FlexClone	grenada-04	grenada:svm-sap01:H09_shared	H09_shareddemo	2,281.84	1,677.60	74%
sa-db-nonprod	SnapMirror	rtp-sa-select02-01	rtp-sa-select01:sa-db-prod:orasysc_asmredotst1	orasysc_asmredotst1	2,048.00	174.11	9%
sa-db-nonprod	SnapMirror	rtp-sa-select02-01	rtp-sa-select01:sa-db-prod:orasysc_asmfratst1	orasysc_asmfratst1	2,048.00	341.64	17%
sa-db-nonprod	SnapMirror	rtp-sa-select02-01	rtp-sa-select01:sa-db-prod:orasysc_asmdatatst1	orasysc_asmdatatst1	2,048.00	591.85	29%
svm-sap02	SnapVault	grenada-03	grenada:svm-sap01:H03_shared	H03_shared_dest	1,192.23	1,089.94	91%
tsukioka_svm2	FlexClone	osa4-02	osa4:tsukioka_svm2:tsukioka_vol1	tsukioka_vol1_clone	1,077.89	0.00	0%
svm-sap02	SnapMirror	grenada-03	grenada:svm-sap01:old_D02_log	D02_log_dest	1,024.00	14.80	1%
sa-app-db-prod	FlexClone	rtp-sa-fas8200-1a	rtp-sa-fas8200-infra:sa-app-db-prod:devctlsys2_asmbase	devctlsys3_asmbase	1,024.00	200.89	20%
svm-sap02	SnapMirror	grenada-03	grenada:svm-sap01:old_D02_arch	D02_arch_dest	1,024.00	365.40	36%
test	FlexClone	rtp-sa-cl05-01	rtp-sa-cl05:test:NetApp_NFS_DS	NetApp_NFS_DS1027171424028233	1,024.00	14.77	1%
svm-sap02	SnapMirror	grenada-03	grenada:svm-sap01:old_D02_sap_db2	D02_sap_db2_dest	1,024.00	7.16	1%
svm-sap02	SnapMirror	grenada-03	grenada:svm-sap01:old_D02_data	D02_data_dest	1,024.00	27.66	3%
sa-app-db-prod	FlexClone	rtp-sa-fas8200-1a	rtp-sa-fas8200-infra:sa-app-db-prod:devctlsys2_asmbase	devctlsys4_asmdata_1	1,024.00	201.95	20%
tsukioka_svm3	FlexClone	osa4-02	osa4:tsukioka_svm3:netapp_nfs_volume	netapp_nfs_volume_clone	1,024.00	0.29	0%
svm-snapcenter	FlexClone	grenada-03	grenada:svm-snapcenter:hyperv_csv01	csv01_clone	1,024.00	9.78	1%

Description: This report shows NetApp DR capacity relationships and allocated capacity. Top workloads are emphasized.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 9.2 NetApp Snapshot Capacity

9.2 NetApp Snapshot Capacity Definitions

Metric/Attribute	Description
VServer	The name of the NetApp storage virtual machine associated with the storage device
Storage Type	The DR storage type e.g. SnapMirror, FlexClone, SnapVault or LoadShare
Storage	The name of the NetApp storage device discovered and monitored by DII
Source Volume	The name of the source volume associated with the NetApp storage device in a DR relationship
Target Volume	The name of the target volume associated with the NetApp storage device in a DR relationship
Allocated (TiB)	Allocated capacity on DR related internal volume in Tebibytes (Base 2 units)
Allocated (GiB)	Allocated capacity on DR related internal volume in Gibibytes (Base 2 units)
Used (GiB)	Used capacity on DR related internal volume in Gibibytes
% Used	Used (GiB) / Allocated (GiB) ● % Used >.90 ● % Used Between .70 and .90
Total DR Relationships	Sum of internal volumes with SnapMirror, FlexClone, SnapVault or LoadShareMirror relationship
Total SnapVault Capacity	Sum of internal volumes with SnapMirror relationship
Total SnapMirror Capacity	Sum of internal volumes with SnapVault relationship
Total LoadShare Capacity	Sum of internal volumes with FlexClone relationship
Total FlexClone Capacity	Sum of internal volumes with LoadShareMirror relationship
Used Capacity	Same as Used (GiB)

9.3 Storage Replication Detail – SAN and NAS

Powered by Data Infrastructure Insights

Storage Replication Detail - SAN and NAS

Replication Details

Source Data Center	SourceArray	SourceNode	SourceModel	Source Manufacturer	Source SVM	Source Volume	Source CapacityGiB	Type	Target Data Center	TargetArray	Target Node	TargetModel	Target Manufacturer	Target SVM	Target Volume	Target CapacityGiB
MUCCBC	trinidad	trinidad-02	FAS2750	NetApp	svm_alexeym90_moa_01	AAEPR14	5	NAS	MUCCBC	trinidad	trinidad-01	FAS2750	NetApp	svm_alexeym91_moa_vault	AAEPR14_vault	0.13
MUCCBC	bahamas	bahamas-02	AFF-A400	NetApp	alexz_BM4X	trident_pvc_e934a716_5820_4f74_8204_4552dcd7119e	8	NAS	MUCCBC	bahamas	bahamas-02	AFF-A400	NetApp	alexz_BM4X	test	8
MUCCBC	bahamas	bahamas-01	AFF-A400	NetApp	alexz_BM4X	trident_pvc_e934a716_5820_4f74_8204_4552dcd7119e	8	NAS	MUCCBC	bahamas	bahamas-01	AFF-A400	NetApp	alexz_BM4X	test	8
N/A	umeng-aff300-01-02	umeng-aff300-01	AFF-A300	NetApp	astra_301	vol3	0.02	NAS	N/A	umeng-aff300-01-02	umeng-aff300-01	AFF-A300	NetApp	astra_301	vol3_dp	0.02
N/A	rtp-sa-ol05	rtp-sa-ol05-02	FAS2552	NetApp	NYC_Test_1	nyc_test_1_nfs_1	53	NAS	N/A	rtp-sa-ol06	rtp-sa-ol06-01	FAS2552	NetApp	NYC_Test_1_dest_0	nyc_test_1_nfs_1	53
N/A	rtp-sa-ol05	rtp-sa-ol05-01	FAS2552	NetApp	NYC_Test_1	NYC_Test_1_cifs_1	20	NAS	N/A	rtp-sa-ol06	rtp-sa-ol06-02	FAS2552	NetApp	NYC_Test_1_dest_0	NYC_Test_1_cifs_1	20
N/A	rtp-sa-ol01	rtp-sa-ol01-08	FAS8020	NetApp	rtp-demo-01	LEAFTYDEMO	1.05	NAS	N/A	rtp-sa-ol01	rtp-sa-ol01-08	FAS8020	NetApp	rtp-demo-01	LEAFTYDEMO_clone_835	1.05
MUCCBC	grenada	grenada-04	AFF-A800	NetApp	svm-sap01	H10_log	78.21	NAS	MUCCBC	grenada	grenada-04	AFF-A800	NetApp	svm-sap01	H10_log_clone_1	210.29
N/A	rtp-sa-ol06	rtp-sa-ol06-01	FAS2552	NetApp	Test_Dev	vaulttest_dest	0.12	NAS	N/A	rtp-sa-ol06	rtp-sa-ol06-01	FAS2552	NetApp	Test_Dev	vaulttest_dest_clone	0.12
N/A	rtp-sa-ol01	rtp-sa-ol01-07	FAS8020	NetApp	rtp-demo-01	leaftydemo01	0.1	NAS	N/A	rtp-sa-ol07	rtp-sa-ol07-02	FAS2552	NetApp	dpsvm01	LEAFTY_leaftydemo01_dest1	0.02
MUCCBC	grenada	grenada-04	AFF-A800	NetApp	svm-sap01	H09_log	11.62	NAS	MUCCBC	grenada	grenada-03	AFF-A800	NetApp	svm-sap01	H09_logdemo	199.52
N/A	rtp-sa-select01	rtp-sa-select01-1	FASDvM300	NetApp	sa-db-prod	asmdata_fs3	200	NAS	N/A	rtp-sa-select01	rtp-sa-select01-1	FASDvM300	NetApp	sa-db-prod	asmfsdb_clone_932_asmdata_fs3	200
N/A	umeng-aff300-01-02	umeng-aff300-02	AFF-A300	NetApp	astra_301	vol4	0.02	NAS	N/A	umeng-aff300-01-02	umeng-aff300-01	AFF-A300	NetApp	astra_301	vol4_dp	0.02
N/A	osa4	osa4-01	AFF-A220	NetApp	Kang_S3_Test	kang_vol1	100	NAS	N/A	osa4	osa4-02	AFF-A220	NetApp	Kang_S3_Test	vo1_clone	100
N/A	umeng-aff300-01-02	umeng-aff300-02	AFF-A300	NetApp	astra_301	vol2	0.02	NAS	N/A	umeng-aff300-01-02	umeng-aff300-02	AFF-A300	NetApp	astra_301	vol2_dp	0.02
N/A	osa4	osa4-02	AFF-A220	NetApp	Kang_S3_Test	kang_vol1_test_tamper	100	NAS	N/A	osa4	osa4-01	AFF-A220	NetApp	Kang_S3_Test	kang_vol1_test_tamper_clone_150	100
MUCCBC	grenada	grenada-03	AFF-A800	NetApp	svm-sap01	H03_data	200	NAS	MUCCBC	grenada	grenada-03	AFF-A800	NetApp	svm-sap02	H03_data_dest	170.89
N/A	rtp-sa-ol01	rtp-sa-ol01-07	FAS8020	NetApp	rtp-demo-01	LEAFTYDEMO	1.05	NAS	N/A	rtp-sa-ol01	rtp-sa-ol01-07	FAS8020	NetApp	rtp-demo-01	LEAFTYDEMO_clone_835	1.05
MUCCBC	grenada	grenada-04	AFF-A800	NetApp	svm-sap01	H03_shared	1,319.37	NAS	MUCCBC	grenada	grenada-04	AFF-A800	NetApp	svm-sap02	H03_shared_dest	1,192.23
N/A	rtp-sa-ol06	rtp-sa-ol06-02	FAS2552	NetApp	NYC_Test_2	cm_src	1	NAS	N/A	rtp-sa-ol05	rtp-sa-ol05-01	FAS2552	NetApp	NYC_Test_2_dest_0	cm_src	1
N/A	rtp-sa-ol01	rtp-sa-ol01-06	FAS8020	NetApp	rtp-demo-01	leaftydemo01	0.1	NAS	N/A	rtp-sa-ol07	rtp-sa-ol07-01	FAS2552	NetApp	dpsvm01	LEAFTY_leaftydemo01_dest1	0.02
MUCCBC	grenada	grenada-03	AFF-A800	NetApp	svm-snapcenter	kw_rac_ARC	60.86	NAS	MUCCBC	saba	saba-02	ASA-A800	NetApp	DmoESX_saba	kw_rac_ARC_dst3	100
MUCCBC	trinidad	trinidad-01	FAS2750	NetApp	svm_alexeym90_cse_01	AAEPR15	5	NAS	MUCCBC	trinidad	trinidad-01	FAS2750	NetApp	svm_alexeym91_cse_vault	AAEPR15_vault	0.13
N/A	rtp-sa-ol01	rtp-sa-ol01-07	FAS8020	NetApp	rtp-demo-01	leaftydemo01	0.1	NAS	N/A	rtp-sa-ol07	rtp-sa-ol07-01	FAS2552	NetApp	dpsvm01	rtp_demo_01_leaftydemo01_Asynchronous_Vault_001	0.1
N/A	rtp-sa-ol06	rtp-sa-ol06-01	FAS2552	NetApp	NYC_Test_2	ca3	5	NAS	N/A	rtp-sa-ol05	rtp-sa-ol05-02	FAS2552	NetApp	NYC_Test_2_dest_0	ca3	5
N/A	cluster2	cluster2-01	SIMBOX	NetApp	svm1_cluster2	NetApp	5,120	NAS	N/A	cluster2	cluster2-01	SIMBOX	NetApp	svm1_cluster2	NetApp1028240831161344 9	505.25
N/A	rtp-sa-ol01	rtp-sa-ol01-06	FAS8020	NetApp	rtp-demo-01	LEAFTYDEMO	1.05	NAS	N/A	rtp-sa-ol01	rtp-sa-ol01-06	FAS8020	NetApp	rtp-demo-01	LEAFTYDEMO_clone_835	1.05
N/A	rtp-sa-ol06	rtp-sa-ol06-01	FAS2552	NetApp	NYC_Test_2	cloudAgent2_clone_04052021_130402_67	7	NAS	N/A	rtp-sa-ol05	rtp-sa-ol05-02	FAS2552	NetApp	NYC_Test_2_dest_0	cloudAgent2_clone_04052021_130402_67	7
MUCCBC	trinidad	trinidad-02	FAS2750	NetApp	svm_alexeym40	unlucky_volume	1	NAS	MUCCBC	jamaica	jamaica-01	AFF-A700	NetApp	svm_alexeym20	lucky_volume	10
N/A	rtp-sa-ol01	rtp-sa-ol01-06	FAS8020	NetApp	nj-demo-01	samplesource1	1.05	NAS	N/A	rtp-sa-ol07	rtp-sa-ol07-02	FAS2552	NetApp	rtp-sa-ol07-svm-01	mirror_samplesource1_dest	0.13
N/A	osa4	osa4-01	AFF-A220	NetApp	Kang_S3_Test	kang_vol1	100	NAS	N/A	osa4	osa4-01	AFF-A220	NetApp	Kang_S3_Test	vo1_clone	100
N/A	rtp-sa-ol01	rtp-sa-ol01-05	FAS8020	NetApp	nj-demo-01	LEAFTYDEMOLUN01	1.05	NAS	N/A	rtp-sa-ol07	rtp-sa-ol07-02	FAS2552	NetApp	dpsvm01	vol_LEAFTYDEMOLUN01_dest	0.13
N/A	cluster1	cluster1-01	SIMBOX	NetApp	svm1_cluster1	oraclelog	51.5	NAS	N/A	cluster2	cluster2-02	SIMBOX	NetApp	svm1_cluster2	vol_oraclelog_dest	10.38
N/A	rtp-sa-ol01	rtp-sa-ol01-05	FAS8020	NetApp	rtp-demo-01	LEAFTYDEMO	1.05	NAS	N/A	rtp-sa-ol01	rtp-sa-ol01-05	FAS8020	NetApp	rtp-demo-01	LEAFTYDEMO_clone_835	1.05
N/A	osa4	osa4-01	AFF-A220	NetApp	tsukioka_svm2	tsukioka_largevolume	307,200	NAS	N/A	osa4	osa4-02	AFF-A220	NetApp	tsukioka_svm2	tsukioka_largevolume_dest	0.17
N/A	rtp-sa-select01	rtp-sa-select01-1	FASDvM300	NetApp	sa-db-prod	oradb_oradata	100	NAS	N/A	rtp-sa-select02	rtp-sa-select02-01	FASDvM300	NetApp	sa-db-nonprod	oradb_oradata	100
N/A	rtp-sa-fas8200-infra	rtp-sa-fas8200-1b	FAS8200	NetApp	sa-app-db-prod	devctlsys3_orabin	400	NAS	N/A	rtp-sa-fas8200-infra	rtp-sa-fas8200-1b	FAS8200	NetApp	sa-app-db-prod	devctlsys4a_orabin	400
MUCCBC	grenada	grenada-03	AFF-A800	NetApp	svm-snapcenter	kw_rac_ARC	60.86	NAS	MUCCBC	saba	saba-01	ASA-A800	NetApp	DmoESX_saba	kw_rac_ARC_dst3	100

Description: This report shows multi-vendor disaster recovery relationships at the volume level. Both source and target devices are visible. The example on the left is for NetApp SnapMirror.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 9.3 Storage Replication Detail - SAN and NAS

9.3 Storage Replication Detail – SAN and NAS Definitions

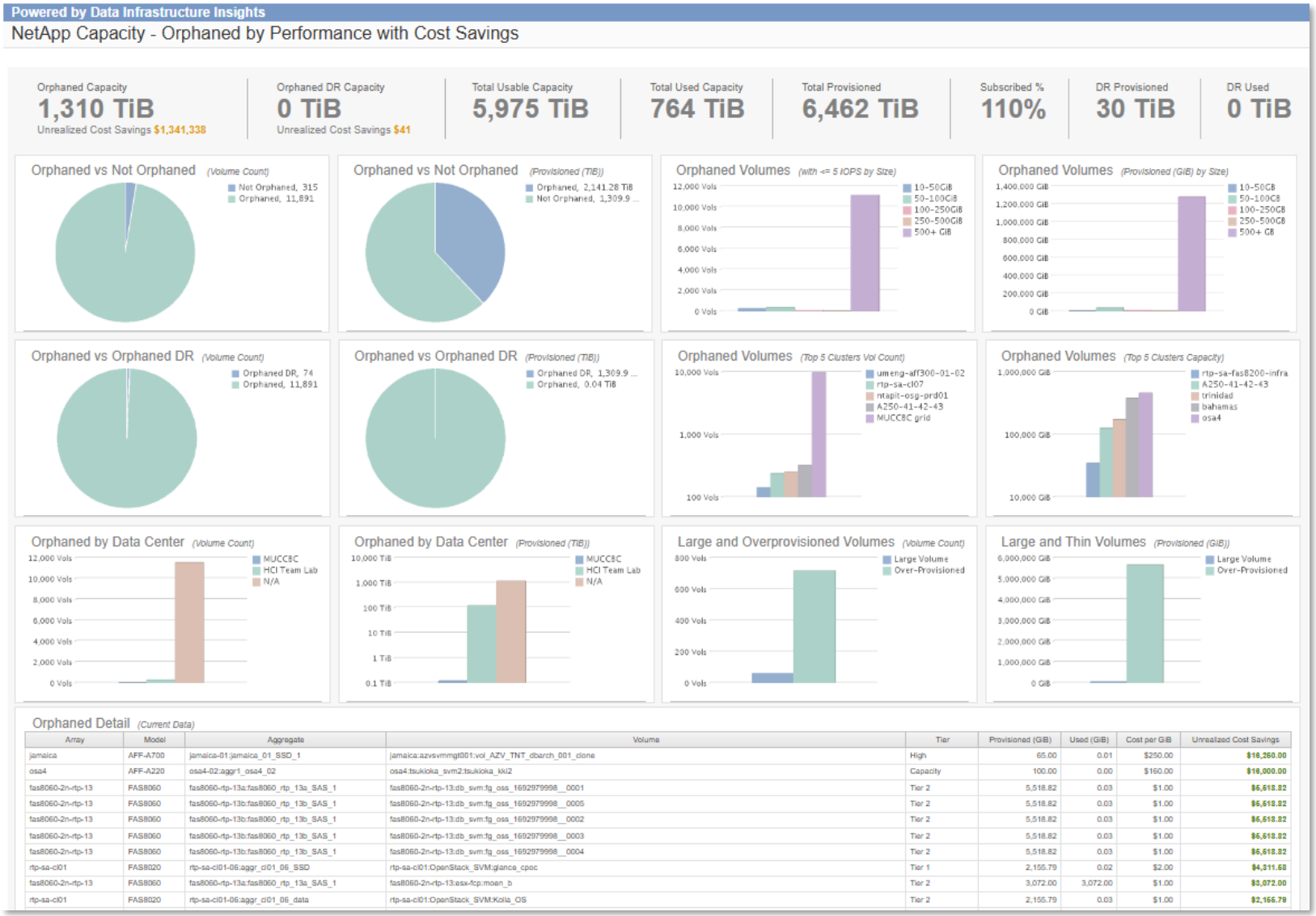
Metric/Attribute	Description
Source Data Center	DII configured annotation. Defines the location of the source device
Source Array	The name of the source storage device in a DR relationship discovered and monitored by DII
Source Node	The name of the source storage node in a DR relationship discovered and monitored by DII
Source Model	The model name of the source storage device
Source Manufacturer	The manufacturer of the source storage device
Source SVM	The name of the NetApp storage virtual machine associated with the source storage device
Source Volume	The name of the source volume associated with the storage device in a DR relationship
Source CapacityGiB	Allocated capacity on DR related source volume in Gibibytes (Base 2 units)
Type	The type of storage e.g. SAN or NAS
Target Data Center	DII configured annotation. Defines the location of the target device
Target Array	The name of the target storage device in a DR relationship discovered and monitored by DII
Target Node	The name of the target storage node in a DR relationship discovered and monitored by DII
Target Model	The model name of the target storage device
Target Manufacturer	The manufacturer of the target storage device
Target SVM	The name of the NetApp storage virtual machine associated with the target storage device
Target Volume	The name of the target volume associated with the storage device in a DR relationship
Target CapacityGiB	Allocated capacity on DR related target volume in Gibibytes (Base 2 units)

Performance Overview

These are some of the day-to-day performance management tasks that can be addressed by leveraging the reports in this catalog. Here are some of the objectives met by this section.

- ❑ NetApp Orphaned by Performance with Cost Savings
- ❑ Storage at Rest
- ❑ All Node Performance Inventory
- ❑ NetApp Workload Re-Balance Dashboard
- ❑ Storage Health
- ❑ NetApp Node Head Room
- ❑ VM Remediation
- ❑ SAN Switch – Slow Drain Analysis
- ❑ Performance by Array
- ❑ Capacity, Performance and Costs – Virtual Machines
- ❑ NetApp Node Performance with SLA-SLO Thresholds
- ❑ Service Path Performance – Resource Correlation
- ❑ K8s Infrastructure Capacity and Performance – Advanced Metrics
- ❑ K8s Overview
- ❑ Workloads with Zero IOPS
- ❑ Host Environment Live Optics Report

10.1 NetApp Orphaned by Performance with Costs



Array	Model	Aggregate	Volume	Tier	Provisioned (GiB)	Used (GiB)	Cost per GiB	Unrealized Cost Savings
jamaica	AFF-A700	jamaica-01:jamaica_01_SSD_1	jamaica:azvsvmmgt001:vol_AZV_TNT_dbarch_001_clone	High	65.00	0.01	$250.00	$16,250.00
osa4	AFF-A220	osa4-02:aggr1_osa4_02	osa4:tsukioka_svm2:tsukioka_kkl2	Capacity	100.00	0.00	$160.00	$16,000.00
fas8060-2n-rtp-13	FAS8060	fas8060-rtp-13a:fas8060_rtp_13a_SAS_1	fas8060-2n-rtp-13:db_svm:fg_oss_1692979998__0001	Tier 2	5,518.82	0.03	$1.00	$5,518.82
fas8060-2n-rtp-13	FAS8060	fas8060-rtp-13b:fas8060_rtp_13b_SAS_1	fas8060-2n-rtp-13:db_svm:fg_oss_1692979998__0005	Tier 2	5,518.82	0.03	$1.00	$5,518.82
fas8060-2n-rtp-13	FAS8060	fas8060-rtp-13b:fas8060_rtp_13b_SAS_1	fas8060-2n-rtp-13:db_svm:fg_oss_1692979998__0002	Tier 2	5,518.82	0.03	$1.00	$5,518.82
fas8060-2n-rtp-13	FAS8060	fas8060-rtp-13b:fas8060_rtp_13b_SAS_1	fas8060-2n-rtp-13:db_svm:fg_oss_1692979998__0003	Tier 2	5,518.82	0.03	$1.00	$5,518.82
fas8060-2n-rtp-13	FAS8060	fas8060-rtp-13b:fas8060_rtp_13b_SAS_1	fas8060-2n-rtp-13:db_svm:fg_oss_1692979998__0004	Tier 2	5,518.82	0.03	$1.00	$5,518.82
rtp-sa-cl01	FAS8020	rtp-sa-cl01-06:aggr_cl01_06_SSD	rtp-sa-cl01:OpenStack_SVM:glance_cpoc	Tier 1	2,155.79	0.02	$2.00	$4,311.58
fas8060-2n-rtp-13	FAS8060	fas8060-rtp-13a:fas8060_rtp_13a_SAS_1	fas8060-2n-rtp-13:esx-fcp:moen_b	Tier 2	3,072.00	3,072.00	$1.00	$3,072.00
rtp-sa-cl01	FAS8020	rtp-sa-cl01-06:aggr_cl01_06_data	rtp-sa-cl01:OpenStack_SVM:Kolla_OS	Tier 2	2,155.79	0.03	$1.00	$2,155.79

Description: This report shows orphaned capacity by performance for NetApp specific storage devices. Unrealized cost savings is included for workloads that meet orphaned criteria.

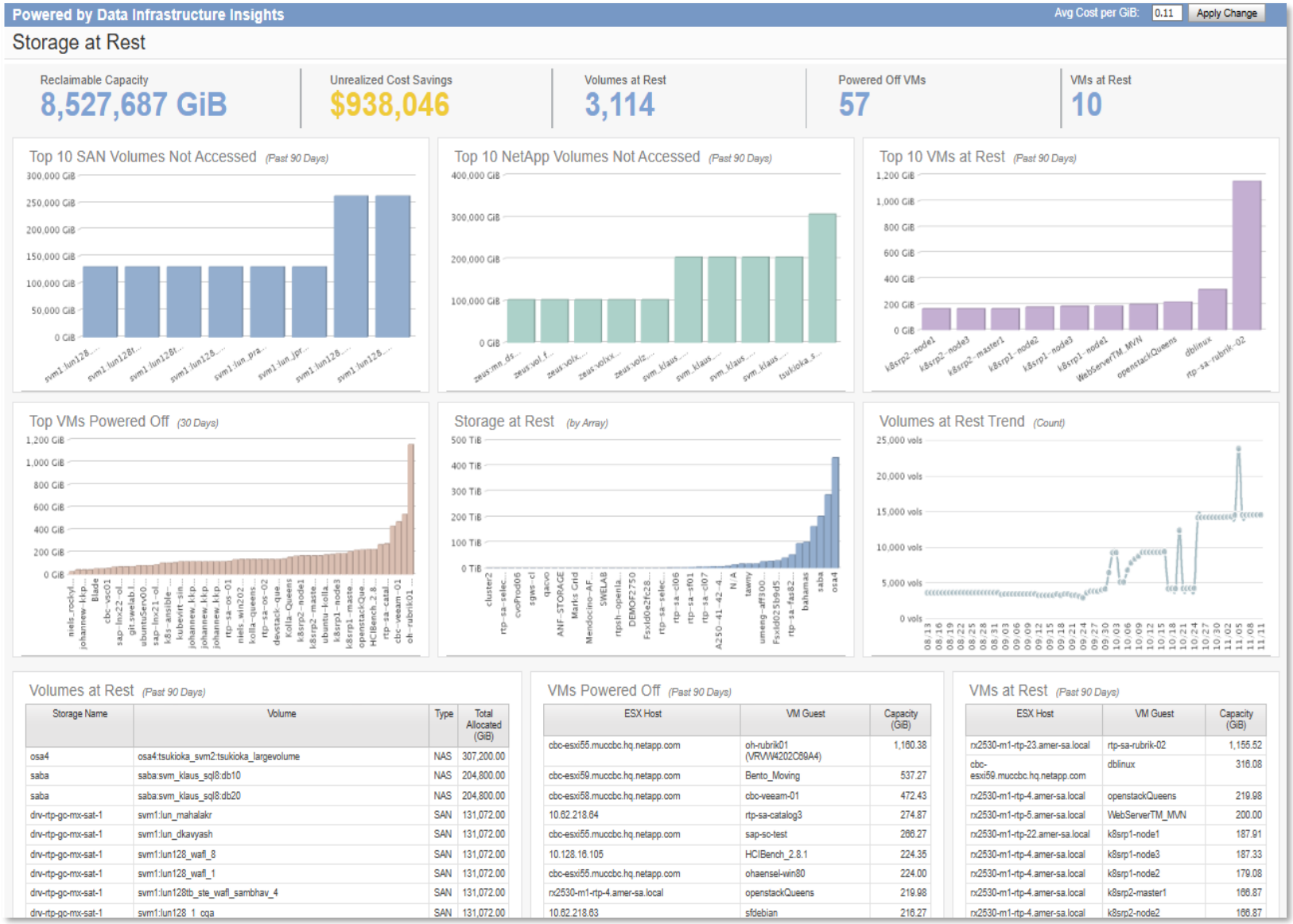
Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 10.1 NetApp Capacity Orphaned by Performance with Cost Savings

10.1 NetApp Orphaned by Performance with Costs Definitions

Metric/Attribute	Description
Data Center	DII configured annotation. Defines the location of the device
Tier	DII configured annotation. Defines tiers of storage based on disk type, disk speed, etc.
Cost per GiB	DII configured annotation. Defines cost of each storage tier per Gibibyte
Cluster / Array	Name of the CDOT cluster discovered and monitored by DII
Model	Model name associated with the CDOT cluster
Aggregate	Name of the aggregate associated with the CDOT cluster
Volume	Name of the volume associated with the aggregate
Type	The custom volume type e.g. Over-provisioned, Large Volume
Provisioned (GiB) / Orphaned (GiB)	Total allocated capacity in Gibibytes that is orphaned e.g. with totalIOPSmax < 5
Used (GiB)	Used capacity on DR related internal volume in Gibibytes
Unrealized Cost Savings	Provisioned (GiB) * Cost per GiB
Capacity Range	WHEN orphanedGiB BETWEEN 10 AND 50 THEN '10-50GiB' WHEN orphanedGiB BETWEEN 50 AND 100 THEN '50-100GiB WHEN orphanedGiB BETWEEN 100 AND 250 THEN '100-250GiB' WHEN orphanedGiB BETWEEN 250 AND 500 THEN '250-500GiB' ELSE '500+ GiB'

10.2 Storage at Rest



Description: This report shows SAN Volume, NetApp Volume, and VMs at rest. Top N VMs, VMs powered off, Storage Arrays at Rest Capacity and Top N SAN/NAS volumes at rest. 'At Rest' is defined as devices with 0 IOpS

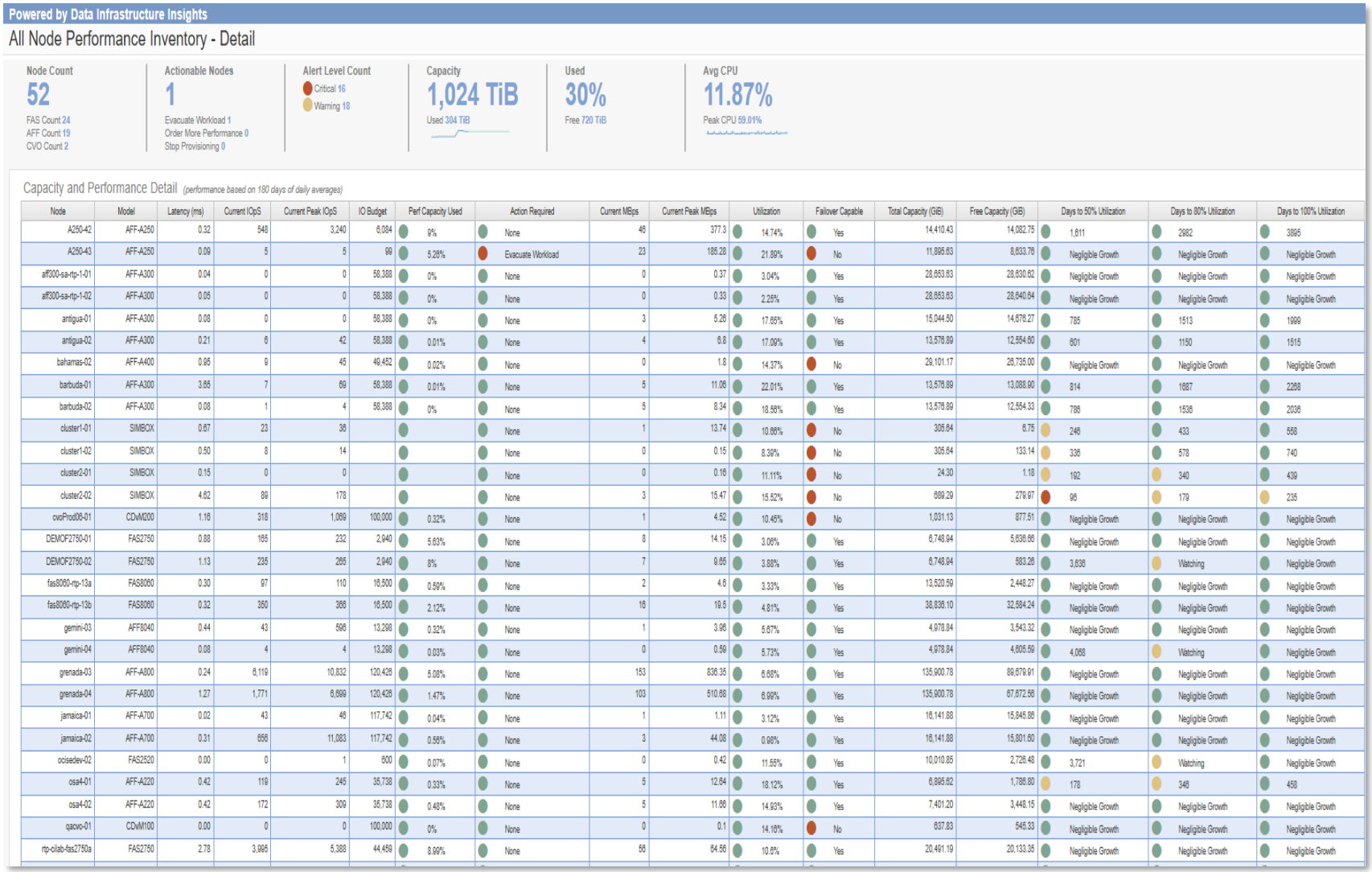
Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 10.2 Storage at Rest

10.2 Storage at Rest Definitions

Metric/Attribute	Description
Storage Name	Name of the storage device discovered and monitored by DII
Pool Name	Name of the storage pool or aggregate associated with the storage device
Volume / Volume Name	Name of the volume associated with the storage pool or aggregate
ESX Host	Name of the ESX host or hypervisor discovered and monitored by DII
VM Guest	Name of the virtual machine or VM Guest associated with the hypervisor
Reclaimable Capacity	At Rest Allocated Capacity in TiB as reported by each SAN Volume and/or Internal Volume (Flexvol) as contained the dwh_inventory.volume table or dwh_inventory.internal_volume table. This capacity metric is combined with associated performance tables where Total IOpS = 0 for a 90-day period
Capacity (GiB)	Usable Capacity in TB as reported by the storage pool and contained in the dwh_inventory.storage_pool table. This capacity metric is combined with associated performance tables where Total IOpS = 0 for a 90-day period
Total Allocated (TiB)	Allocated capacity on the block or file based volume in Tebibytes (Base 2 units)
Total Allocated (GiB)	Same as above only in Gibibytes
Avg Cost per GiB	As selected from the prompt at the top right of the report, Avg Cost per GiB is an estimate for all storage resources. Currently the default is .11 cents. You can add a more accurate cost per GiB using tier annotations or rate cards. Please discuss this with your sales representative.
Unrealized Cost Savings	Total Allocated (GiB) * Avg Cost per GiB

10.3 All Node Performance Inventory



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All Node Performance Inventory - Detail

Node Count	Actionable Nodes	Alert Level Count	Capacity	Used	Avg CPU
52	1	Critical 16	1,024 TiB	30%	11.87%
FAS Count 24	Evacuate Workload 1	Warning 18	Used 304 TiB	Free 720 TiB	Peak CPU 59.01%
AFF Count 19	Order More Performance 0				
CVO Count 2	Stop Provisioning 0				

Capacity and Performance Detail *(performance based on 180 days of daily averages)*

Node	Model	Latency (ms)	Current IOpS	Current Peak IOpS	IO Budget	Perf Capacity Used	Action Required	Current MBps	Current Peak MBps	Utilization	Failover Capable	Total Capacity (GiB)	Free Capacity (GiB)	Days to 50% Utilization	Days to 80% Utilization	Days to 100% Utilization
A250-42	AFF-A250	0.32	548	3,240	6,084	9%	None	46	377.3	14.74%	Yes	14,410.43	14,082.75	1,611	2982	3895
A250-43	AFF-A250	0.09	5	5	99	5.28%	Evacuate Workload	23	185.28	21.89%	No	11,895.63	8,633.76	Negligible Growth	Negligible Growth	Negligible Growth
aff300-sa-rtp-1-01	AFF-A300	0.04	0	0	58,388	0%	None	0	0.37	3.04%	Yes	28,653.63	28,630.62	Negligible Growth	Negligible Growth	Negligible Growth
aff300-sa-rtp-1-02	AFF-A300	0.05	0	0	58,388	0%	None	0	0.33	2.25%	Yes	28,653.63	28,640.64	Negligible Growth	Negligible Growth	Negligible Growth
antigua-01	AFF-A300	0.08	0	0	58,388	0%	None	3	5.26	17.65%	Yes	15,044.50	14,676.27	785	1513	1999
antigua-02	AFF-A300	0.21	6	42	58,388	0.01%	None	4	6.8	17.09%	Yes	13,578.89	12,554.60	601	1150	1515
bahamas-02	AFF-A400	0.95	9	45	49,452	0.02%	None	0	1.8	14.37%	No	29,101.17	28,736.00	Negligible Growth	Negligible Growth	Negligible Growth
barbuda-01	AFF-A300	3.65	7	69	58,388	0.01%	None	5	11.06	22.01%	Yes	13,578.89	13,088.90	814	1687	2268
barbuda-02	AFF-A300	0.08	1	4	58,388	0%	None	5	8.34	18.58%	Yes	13,578.89	12,554.33	786	1536	2036
cluster1-01	SIMBOX	0.67	23	36			None	1	13.74	10.66%	No	305.64	6.75	246	433	558
cluster1-02	SIMBOX	0.50	8	14			None	0	0.15	8.39%	No	305.64	133.14	336	578	740
cluster2-01	SIMBOX	0.15	0	0			None	0	0.16	11.11%	No	24.30	1.18	192	340	439
cluster2-02	SIMBOX	4.62	89	178			None	3	15.47	15.52%	No	689.29	279.97	96	179	235
cvoProd06-01	CDW200	1.16	318	1,069	100,000	0.32%	None	1	4.52	10.45%	No	1,031.13	877.51	Negligible Growth	Negligible Growth	Negligible Growth
DEMOF2750-01	FAS2750	0.88	165	232	2,940	5.63%	None	8	14.15	3.06%	Yes	6,749.84	5,836.66	Negligible Growth	Negligible Growth	Negligible Growth
DEMOF2750-02	FAS2750	1.13	235	265	2,940	8%	None	7	9.65	3.88%	Yes	6,749.84	583.28	3,836	Watching	Negligible Growth
fas8060-rtp-13a	FAS8060	0.30	97	110	16,500	0.59%	None	2	4.6	3.33%	Yes	13,520.59	2,448.27	Negligible Growth	Negligible Growth	Negligible Growth
fas8060-rtp-13b	FAS8060	0.32	350	366	16,500	2.12%	None	16	19.5	4.81%	Yes	38,836.10	32,884.24	Negligible Growth	Negligible Growth	Negligible Growth
gemini-03	AFF8040	0.44	43	598	13,298	0.32%	None	1	3.96	5.67%	Yes	4,978.84	3,543.32	Negligible Growth	Negligible Growth	Negligible Growth
gemini-04	AFF8040	0.08	4	4	13,298	0.03%	None	0	0.59	5.73%	Yes	4,978.84	4,805.59	4,088	Watching	Negligible Growth
grenada-03	AFF-A800	0.24	6,119	10,832	120,426	5.08%	None	153	836.35	6.68%	Yes	135,900.78	89,679.91	Negligible Growth	Negligible Growth	Negligible Growth
grenada-04	AFF-A800	1.27	1,771	6,699	120,426	1.47%	None	103	510.68	6.99%	Yes	135,900.78	67,672.56	Negligible Growth	Negligible Growth	Negligible Growth
jamaica-01	AFF-A700	0.02	43	46	117,742	0.04%	None	1	1.11	3.12%	Yes	16,141.88	15,845.86	Negligible Growth	Negligible Growth	Negligible Growth
jamaica-02	AFF-A700	0.31	656	11,083	117,742	0.56%	None	3	44.08	0.98%	Yes	16,141.88	15,801.80	Negligible Growth	Negligible Growth	Negligible Growth
ocisedev-02	FAS2520	0.00	0	1	600	0.07%	None	0	0.42	11.55%	Yes	10,010.85	2,726.46	3,721	Watching	Negligible Growth
osa4-01	AFF-A220	0.42	119	245	35,738	0.33%	None	5	12.64	18.12%	Yes	6,895.62	1,786.80	178	346	458
osa4-02	AFF-A220	0.42	172	309	35,738	0.48%	None	5	11.66	14.93%	Yes	7,401.20	3,448.15	Negligible Growth	Negligible Growth	Negligible Growth
qacvo-01	CDW100	0.00	0	0	100,000	0%	None	0	0.1	14.16%	No	637.83	545.33	Negligible Growth	Negligible Growth	Negligible Growth
rtp-cilab-fas2750a	FAS2750	2.78	3,995	5,388	44,459	8.99%	None	56	64.56	10.8%	Yes	20,491.19	20,133.35	Negligible Growth	Negligible Growth	Negligible Growth

Description: This report shows performance capacity for NetApp nodes. Areas of focus are Perf Capacity Used, Action Required and Failover Capability.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 10.3 All Node Performance Inventory

10.3 All Node Performance Inventory Definitions

Metric/Attribute	Description
Node	The node name associated with the NetApp cluster that is being monitored by DII
Model	The model type of the NetApp Node
Current IOpS	The maximum of average (frontend) IOpS as reported by the NetApp node for the current DII collection period (180 Days)
Latency (ms)	The average (frontend) responsetime (both read and write) as reported by the NetApp node for the current DII collection period (180 Days)
Total IO Budget	See break down below. IO Budget is derived from either the underlying disk infrastructure that supports the storage device or its derived from the storage model type. Formula: (Disk Type + Disk Speed = supported IOpS divided by Block Size)
Perf Capacity Used	([Current IOpS]/[TotalIOBudget])*100 Perf Capacity Used % <=50 Perf Capacity Used % between 50 and 80 Perf Capacity Used % >= 80
Action Required	"Evacuate workload" = Yes - Average IOPS 180 days from today will => 100% of node IO budget "Order more performance" = Yes - Average IOPS 180 days from today will be => 90% of node IO budget "Stop provisioning" = Yes - Average IOPS 180 days from today will be =>80% of node IO budget

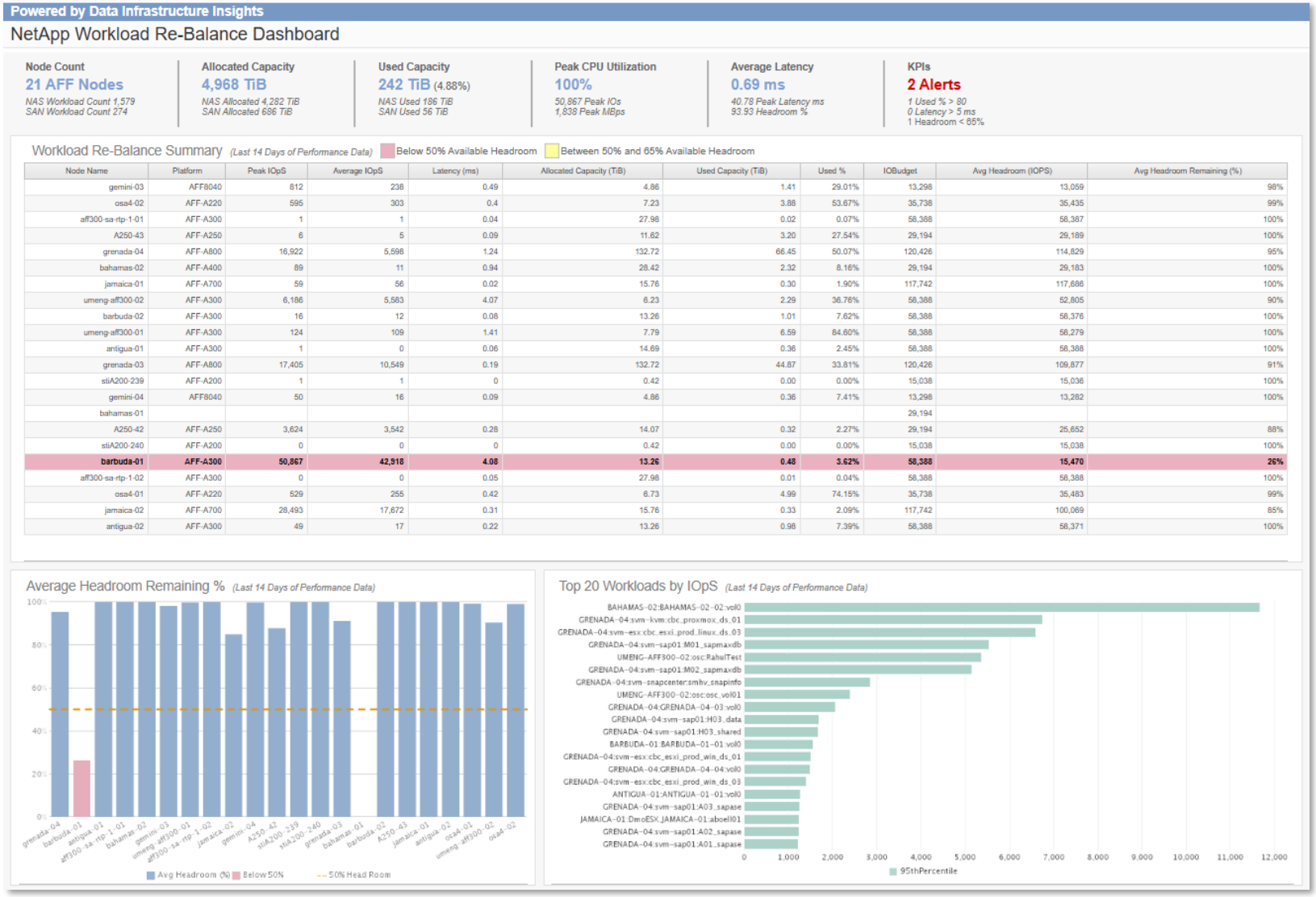
Action Required Formula	IF([IOpS Daily Growth Rate]>0) THEN (
	CASE
	WHEN ((180*([IOpS Daily Growth Rate]))+[Current IOpS]) >= [TotalIOBudget] THEN 'Evacuate Workload'
	WHEN ((180*([IOpS Daily Growth Rate]))+[Current IOpS]) >= ([TotalIOBudget]*.9) THEN 'Order More Performance'
	WHEN ((180*([IOpS Daily Growth Rate]))+[Current IOpS]) >= ([TotalIOBudget]*.8) THEN 'Stop Provisioning'
	ELSE
	
	IF(((180*[IOpS Daily Growth Rate])+[HAPairIOpS]) >= (([TotalIOBudget]*2)*.8) OR [Current IOpS] >= (([TotalIOBudget]*2)*.8))
	
	THEN(
	CASE
	WHEN ((180*([IOpS Daily Growth Rate]))+[HAPairIOpS]) >= ([TotalIOBudget]*2) THEN 'Evacuate Workload'
	WHEN ((180*([IOpS Daily Growth Rate]))+[HAPairIOpS]) >= (([TotalIOBudget]*2)*.9) THEN 'Order More Performance'
	WHEN ((180*([IOpS Daily Growth Rate]))+[HAPairIOpS]) >= (([TotalIOBudget]*2)*.8) THEN 'Stop Provisioning'
	ELSE 'None'
	END
	)
	ELSE ('None')
	END)
	
	ELSE
	(
	CASE
	WHEN [Current IOpS] >= [TotalIOBudget] THEN 'Evacuate Workload'
	WHEN [Current IOpS] >= ([TotalIOBudget]*.9) THEN 'Order More Performance'
	WHEN [Current IOpS] >= ([TotalIOBudget]*.8) THEN 'Stop Provisioning'
	ELSE
	
	IF([HAPairIOpS] >= (([TotalIOBudget]*2)*.8) OR [Current IOpS] >= (([TotalIOBudget]*2)*.8))
	
	THEN(
	CASE
	WHEN [HAPairIOpS] >= ([TotalIOBudget]*2) THEN 'Evacuate Workload'
	WHEN [HAPairIOpS] >= (([TotalIOBudget]*2)*.9) THEN 'Order More Performance'
	WHEN [HAPairIOpS] >= (([TotalIOBudget]*2)*.8) THEN 'Stop Provisioning'
	ELSE 'None'
	END
	)
	ELSE ('None')
	END
	)

Current MBps	The maximum of average (frontend) Throughput in MB/second as reported by the NetApp node for the current DII collection period

Metric/Attribute	Description
Current MBps	The maximum of average (frontend) Throughput in MB/second as reported by the NetApp node for the current DII collection period
Utilization	The average (frontend) CPU utilization in % as reported by the NetApp node for the current OCI collection period. NetApp Node CPU Utilization is a combination of CPU core + WAFL_Ex (parallel WAFL processing) + Kahuna (serial WAFL processing) Current CPU% <= 50 Current CPU% between 50 and 80 Current CPU% >= 80
Failover Capable	IF([HAPairPeakIOpS] <= ([TotalIOBudget]*2) AND [HAPairCPUPercent] <=95) THEN ('Yes') ELSE ('No') Yes No
Total Capacity	Total post RAID, usable capacity in gigabytes as reported by the aggregate associated with the Storage Node as discovered by DII
Free Capacity	Total free capacity in gigabytes (Total Capacity - Used Capacity) as reported by the aggregate associated with the Storage Node as discovered by DII
Days to 50% Utilization	CASE WHEN [Current CPU%] >= 50 THEN null 'Reached' WHEN cast((50-[Current CPU%])/[CPU Daily Growth Rate], decimal(10,0)) < 0 THEN 0 WHEN cast((50-[Current CPU%])/[CPU Daily Growth Rate], decimal(10,0)) is null THEN 0 WHEN cast((50-[Current CPU%])/[CPU Daily Growth Rate], decimal(10,0)) > 5000 THEN 0 ELSE cast((50-[Current CPU%])/[CPU Daily Growth Rate], decimal(10,0)) END [Current CPU%]>=50 AND [Current CPU%]<80 [Days to 50% Utilization] is null [Days to 50% Utilization]> 0 AND [Days to 50% Utilization]<120 [Days to 50% Utilization] between 120 and 365 [Days to 50% Utilization]=0
Days to 80% Utilization	CASE WHEN [Current CPU%] >= 80 THEN null 'Reached' WHEN cast((80-[Current CPU%])/[CPU Daily Growth Rate], decimal(10,0)) < 0 THEN 0 WHEN cast((80-[Current CPU%])/[CPU Daily Growth Rate], decimal(10,0)) is null THEN 0 WHEN cast((80-[Current CPU%])/[CPU Daily Growth Rate], decimal(10,0)) > 5000 THEN 0 ELSE cast((80-[Current CPU%])/[CPU Daily Growth Rate], decimal(10,0)) END [Current CPU%]>=80 [Days to 80% Utilization] is null [Days to 80% Utilization]> 0 AND [Days to 80% Utilization]<120 [Days to 80% Utilization] between 120 and 365 [Days to 80% Utilization]=0
Days to 100% Utilization	CASE WHEN [Current CPU%] = 100 THEN null 'Reached' WHEN cast((100-[Current CPU%])/[CPU Daily Growth Rate], decimal(10,0)) < 0 THEN 0 WHEN cast((100-[Current CPU%])/[CPU Daily Growth Rate], decimal(10,0)) is null THEN 0 WHEN cast((100-[Current CPU%])/[CPU Daily Growth Rate], decimal(10,0)) > 5000 THEN 0 ELSE cast((100-[Current CPU%])/[CPU Daily Growth Rate], decimal(10,0)) END [Current CPU%]=100 [Days to 80% Utilization] is null [Days to 80% Utilization]> 0 AND [Days to 80% Utilization]<120 [Days to 80% Utilization] between 120 and 365 [Days to 80% Utilization]=0

Metric/Attribute	Description
IO Budget per node is 50% of max IOPS of that node to allow non-disruptive failover	CASE WHEN Model LIKE 'A700' AND Model LIKE '6250' AND Model LIKE 'FAS8080' THEN 235483+ROUND(cap.SSDBudget/(((END.AvgMBps * 1024)/END.AvgIOpS)/4),0)+cap.SAS15KBudget+cap.FC15KBudget+cap.SAS10KBudget+cap.FC10KBudget+cap.SATABudget+cap.SAS7200Budget+cap.Other10KBudget+cap.Other72Budget+ROUND(cap.OtherSSDBudget/(((END.AvgMBps * 1024)/END.AvgIOpS)/4),0) WHEN Model LIKE 'A700' AND Model LIKE '8080' THEN 235483+74906 WHEN Model LIKE 'A200' THEN 30075 WHEN Model LIKE 'A220' THEN 71476 WHEN Model LIKE 'A300' THEN 116776 WHEN Model LIKE 'A320' THEN 92635 WHEN Model LIKE 'A700' THEN 235483 WHEN Model LIKE 'A700s' THEN 235483 WHEN Model LIKE 'A800' THEN 240853 WHEN Model LIKE 'AFF8040' THEN 26595 WHEN Model LIKE 'AFF8080' THEN 74906 WHEN Model LIKE 'FAS8040' THEN 26595 WHEN Model LIKE 'FAS8080' THEN 74906 WHEN Model LIKE 'FAS2720' THEN 55190 WHEN Model LIKE 'FAS8020' THEN 20000 WHEN Model LIKE 'FAS8060' THEN 33000 WHEN Model LIKE 'FAS8200' THEN 129891 WHEN Model LIKE 'FAS9000' THEN195629 ELSE ROUND(cap.SSDBudget/(((AvgMBps * 1024)/AvgIOpS)/4),0)+cap.SAS15KBudget+cap.FC15KBudget+cap.SAS10KBudget+cap.FC10KBudget+cap.SATABudget+cap.SAS7200Budget+cap.Other10KBudget+cap.Other72Budget+ROUND(cap.OtherSSDBudget/(((AvgMBps * 1024)/AvgIOpS)/4),0) END 'TotalIOBudget'

10.4 NetApp Workload Re-Balance Dashboard



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NetApp Workload Re-Balance Dashboard

Node Count	Allocated Capacity	Used Capacity	Peak CPU Utilization	Average Latency	KPIs
21 AFF Nodes	4,968 TiB	242 TiB (4.88%)	100%	0.69 ms	2 Alerts
NAS Workload Count 1,579 SAN Workload Count 274	NAS Allocated 4,282 TiB SAN Allocated 686 TiB	NAS Used 186 TiB SAN Used 56 TiB	50,867 Peak IOs 1,838 Peak MBps	40.78 Peak Latency ms 93.93 Headroom %	1 Used % > 80 0 Latency > 5 ms 1 Headroom < 65%

Workload Re-Balance Summary *(Last 14 Days of Performance Data)* Below 50% Available Headroom Between 50% and 65% Available Headroom

Node Name	Platform	Peak IOpS	Average IOpS	Latency (ms)	Allocated Capacity (TiB)	Used Capacity (TiB)	Used %	IOBudget	Avg Headroom (IOPS)	Avg Headroom Remaining (%)
gemini-03	AFF8040	812	238	0.49	4.86	1.41	29.01%	13,298	13,059	98%
osa4-02	AFF-A220	595	303	0.4	7.23	3.88	53.67%	35,738	35,435	99%
aff300-sa-rtp-1-01	AFF-A300	1	1	0.04	27.98	0.02	0.07%	58,388	58,387	100%
A250-43	AFF-A250	6	5	0.09	11.62	3.20	27.54%	29,194	29,189	100%
grenada-04	AFF-A800	16,922	5,598	1.24	132.72	66.45	50.07%	120,426	114,829	95%
bahamas-02	AFF-A400	89	11	0.94	28.42	2.32	8.16%	29,194	29,183	100%
jamaica-01	AFF-A700	59	56	0.02	15.76	0.30	1.90%	117,742	117,686	100%
umeng-aff300-02	AFF-A300	6,186	5,583	4.07	6.23	2.29	36.76%	58,388	52,805	90%
barbuda-02	AFF-A300	16	12	0.08	13.26	1.01	7.62%	58,388	58,376	100%
umeng-aff300-01	AFF-A300	124	109	1.41	7.79	6.59	84.60%	58,388	58,279	100%
antigua-01	AFF-A300	1	0	0.06	14.69	0.36	2.45%	58,388	58,388	100%
grenada-03	AFF-A800	17,405	10,549	0.19	132.72	44.87	33.81%	120,426	109,877	91%
stiA200-239	AFF-A200	1	1	0	0.42	0.00	0.00%	15,038	15,036	100%
gemini-04	AFF8040	50	16	0.09	4.86	0.36	7.41%	13,298	13,282	100%
bahamas-01								29,194		
A250-42	AFF-A250	3,624	3,542	0.28	14.07	0.32	2.27%	29,194	25,652	88%
stiA200-240	AFF-A200	0	0	0	0.42	0.00	0.00%	15,038	15,038	100%
barbuda-01	**AFF-A300**	**50,867**	**42,918**	**4.08**	**13.26**	**0.48**	**3.62%**	**58,388**	**15,470**	**26%**
aff300-sa-rtp-1-02	AFF-A300	0	0	0.05	27.98	0.01	0.04%	58,388	58,388	100%
osa4-01	AFF-A220	529	255	0.42	6.73	4.99	74.15%	35,738	35,483	99%
jamaica-02	AFF-A700	28,493	17,672	0.31	15.76	0.33	2.09%	117,742	100,069	85%
antigua-02	AFF-A300	49	17	0.22	13.26	0.98	7.39%	58,388	58,371	100%

Average Headroom Remaining % *(Last 14 Days of Performance Data)*

Top 20 Workloads by IOpS *(Last 14 Days of Performance Data)*

Description: This report shows NetApp node performance metrics that identify nodes with limited IOPS headroom.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Note: This report does not use Optimal point to calculate headroom because the metric is not available in the Data Warehouse.

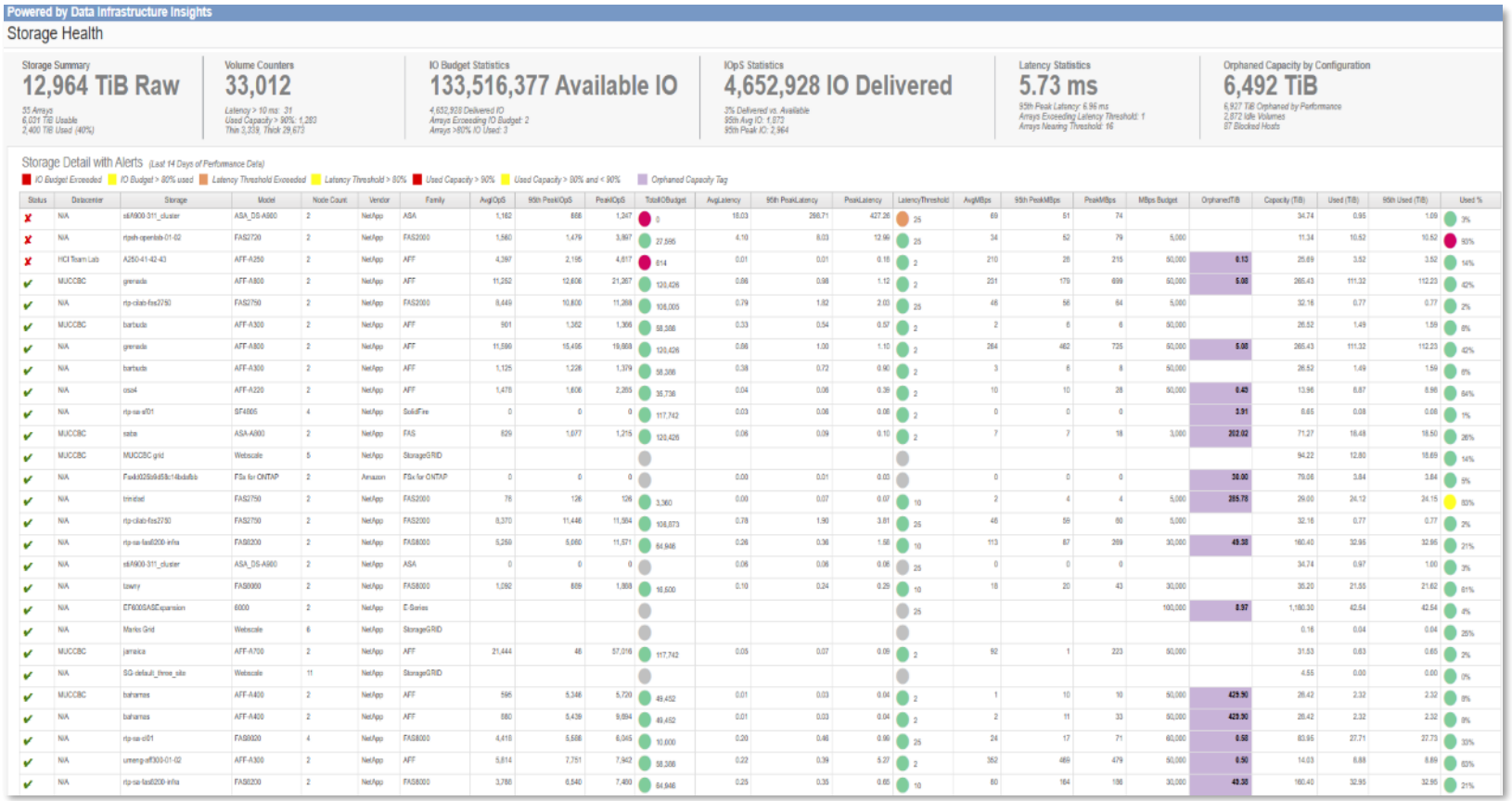
Report XML: 10.4 NetApp Workload Re-Balance Dashboard

10.4 NetApp Workload Re-Balance Dashboard Definitions

Metric/Attribute	Description
Node Name	Name of the storage node discovered and monitored by DII
Platform	Model name of the storage node
Average IOPS	Measures the average number of I/O service requests (read+write) on the node for 14 days hourly data collection (measured in I/O per sec). Consists of front-end protocol IOpS (NFS, CIFS, FC, iSCSI) for NetApp nodes
Peak IOPS	Maximum of I/O service requests on the node for 14 days hourly. Consists of front-end protocol Peak IOpS (NFS, CIFS, FC, iSCSI) for NetApp nodes
Latency (ms)	The time it takes from the moment a request for information arrives at the storage device to the time when the storage device begin to send the information back in response. This is the actual latency of the device in milliseconds over 14 days hourly. Consists of front-end protocol total response time (read+write) for NetApp nodes
Allocated Capacity (TiB)	Total allocated capacity in Tebibytes as reported by the storage pool or aggregate
Used Capacity (TiB)	Total used capacity in Tebibytes as reported by the storage pool or aggregate
Used %	Used Capacity (TiB) / Allocated Capacity (TiB)
IO Budget	IO Budget is derived from either the underlying disk infrastructure that supports the storage device or from the storage model type. Formula: (Disk Type + Disk Speed = supported IOpS divided by Block Size). IO Budget per node is 50% of max IOPS of that node to allow non-disruptive failover. WHEN [Model] contains 'A700' AND [Model] contains '8080' THEN (235483+74906)/2 WHEN [Model] contains 'A200' THEN 30075/2 WHEN [Model] contains 'A220' THEN 71476/2 WHEN [Model] contains 'A300' THEN 116776/2 WHEN [Model] contains 'A320' THEN 92635/2 WHEN [Model] contains 'A700' THEN 235483/2 WHEN [Model] contains 'A700s' THEN 235483/2 WHEN [Model] contains 'A800' THEN 240853/2 WHEN [Model] contains 'AFF8040' THEN 26595/2 WHEN [Model] contains 'AFF8080' THEN 74906/2 WHEN [Model] contains 'FAS8040' THEN 26595/2 WHEN [Model] contains 'FAS8080' THEN 74906/2 WHEN [Model] contains 'FAS2720' THEN 55190/2 WHEN [Model] contains 'FAS8020' THEN 20000/2 WHEN [Model] contains 'FAS8060' THEN 33000/2 WHEN [Model] contains 'FAS8200' THEN 129891/2 WHEN [Model] contains 'FAS9000' THEN 195629/2 WHEN [Model] contains 'CDv' THEN 100000 ELSE 58388/2
Avg Headroom (IOPS)	IOBudget - Average IOPS
Avg Head Room Remaining %	Avg Headroom (IOPS) / IOBudget
Peak CPU Utilization	Maximum Node CPU Utilization shows the percentage of time that one or more CPUs were busy. In DII, this is based on the higher of CPU, WAFL_EX and Kahuna Processor Domain metrics. Details are as follows: • System – avg_processor_busy, cpu_elapsed_time1

	• WAFL – total_cp_msecs, cp_phase_times.P2_FLUSH • Processor – domain_busy, processor_elapsed_time Overall node utilization then is displayed as the higher of the 3 (system, WAFL or processor domains) which all indicate a controller's ability (utilization) to process read/write requests
Headroom %	Head Room refers to the remaining performance capacity of a storage node, essentially indicating how much additional workload can be placed on a node before its performance starts to degrade due to increased latency. Head Room formula in reporting: 100 – ((Avg Node Utilization/100 + Avg Throughput MBps) * 100) NOTE: Head room is derived from the Optimal Point calculation which is not currently available in the Data Warehouse.
KPIs	Used % > 80 Latency > 5 ms Headroom < 65%

10.5 Storage Health



Powered by Data Infrastructure Insights

Storage Health

Storage Summary
12,964 TiB Raw
55 Arrays
6,031 TiB Usable
2,400 TiB Used (40%)

Volume Counters
33,012
Latency > 10 ms: 31
Used Capacity > 90%: 1,283
Thin 3,339, Thick 29,673

IO Budget Statistics
133,516,377 Available IO
4,652,928 Delivered IO
Arrays Exceeding IO Budget: 2
Arrays >80% IO Used: 3

IOpS Statistics
4,652,928 IO Delivered
3% Delivered vs. Available
95th Avg IO: 1,873
95th Peak IO: 2,964

Latency Statistics
5.73 ms
95th Peak Latency: 6.96 ms
Arrays Exceeding Latency Threshold: 1
Arrays Nearing Threshold: 16

Orphaned Capacity by Configuration
6,492 TiB
6,927 TiB Orphaned by Performance
2,872 Idle Volumes
87 Blocked Hosts

Storage Detail with Alerts (Last 14 Days of Performance Data)

IO Budget Exceeded | IO Budget > 80% used | Latency Threshold Exceeded | Latency Threshold > 80% | Used Capacity > 90% | Used Capacity > 80% and < 90% | Orphaned Capacity Tag

Status	Datacenter	Storage	Model	Node Count	Vendor	Family	Avg IOpS	95th Peak IOpS	Peak IOpS	Total IO Budget	Avg Latency	95th Peak Latency	Peak Latency	Latency Threshold	Avg MBps	95th Peak MBps	Peak MBps	MBps Budget	Orphaned TiB	Capacity (TiB)	Used (TiB)	95th Used (TiB)	Used %
✘	N/A	sti/4900-311_cluster	ASA_DS-A900	2	NetApp	ASA	1,162	868	1,047	0	18.03	266.71	427.26	25	69	51	74			34.74	0.95	1.09	3%
✘	N/A	rtpsh-openlab-01-02	FAS2720	2	NetApp	FAS2000	1,560	1,479	3,997	27,595	4.10	8.03	12.99	25	34	52	79	5,000		11.34	10.52	10.52	93%
✘	HCI Team Lab	A250-41-42-43	AFF-A250	2	NetApp	AFF	4,397	2,195	4,817	814	0.01	0.01	0.18	2	210	28	215	50,000	0.13	25.69	3.52	3.52	14%
✔	MJCCBC	grenada	AFF-A800	2	NetApp	AFF	11,262	12,606	21,267	120,426	0.06	0.98	1.12	2	231	179	699	50,000	5.00	265.43	111.32	112.23	42%
✔	N/A	rtp-clab-fas2750	FAS2750	2	NetApp	FAS2000	8,449	10,800	11,268	106,005	0.79	1.82	2.03	25	46	56	64	5,000		32.16	0.77	0.77	2%
✔	MJCCBC	barbuda	AFF-A300	2	NetApp	AFF	501	1,302	1,306	58,308	0.33	0.54	0.57	2	2	6	6	50,000		26.52	1.49	1.59	6%
✔	N/A	grenada	AFF-A800	2	NetApp	AFF	11,590	15,495	19,868	120,426	0.06	1.00	1.10	2	264	462	725	50,000	5.00	265.43	111.32	112.23	42%
✔	N/A	barbuda	AFF-A300	2	NetApp	AFF	1,125	1,226	1,379	58,308	0.38	0.72	0.90	2	3	6	8	50,000		26.52	1.49	1.59	6%
✔	N/A	oss4	AFF-A220	2	NetApp	AFF	1,478	1,606	2,265	36,738	0.04	0.06	0.39	2	10	10	28	50,000	0.43	13.96	8.67	8.96	64%
✔	N/A	rtp-sa-sf01	SF4805	4	NetApp	SolidFire	0	0	0	117,742	0.03	0.06	0.08	2	0	0	0		3.91	8.65	0.08	0.08	1%
✔	MJCCBC	saba	ASA-A900	2	NetApp	FAS	829	1,677	1,215	120,426	0.06	0.09	0.10	2	7	7	18	3,000	202.02	71.27	18.48	18.50	26%
✔	MJCCBC	MJCCBC grid	Webscale	5	NetApp	StorageGRID														94.22	12.80	18.69	14%
✔	N/A	Fsxdd029b9d53c14bdafbb	FSx for ONTAP	2	Amazon	FSx for ONTAP	0	0	0		0.00	0.01	0.03		0	0	0		30.00	79.06	3.84	3.84	5%
✔	N/A	trinidad	FAS2750	2	NetApp	FAS2000	78	126	126	3,360	0.00	0.07	0.07	10	2	4	4	5,000	265.78	29.00	24.12	24.15	83%
✔	N/A	rtp-clab-fas2750	FAS2750	2	NetApp	FAS2000	8,370	11,446	11,564	106,573	0.78	1.90	3.81	25	46	59	60	5,000		32.16	0.77	0.77	2%
✔	N/A	rtp-sa-fas8200-infra	FAS8200	2	NetApp	FAS8000	5,250	5,060	11,571	64,946	0.26	0.36	1.58	10	113	87	269	30,000	49.38	160.40	32.95	32.95	21%
✔	N/A	sti/4900-311_cluster	ASA_DS-A900	2	NetApp	ASA	0	0	0		0.06	0.06	0.06	25	0	0	0			34.74	0.97	1.00	3%
✔	N/A	tawny	FAS8000	2	NetApp	FAS8000	1,292	869	1,808	16,500	0.10	0.24	0.29	10	18	20	43	30,000		35.20	21.55	21.62	61%
✔	N/A	EF600SASExpansion	6000	2	NetApp	E-Series								25				100,000	0.97	1,180.30	42.54	42.54	4%
✔	N/A	Marks Grid	Webscale	6	NetApp	StorageGRID														0.16	0.04	0.04	25%
✔	MJCCBC	jamaica	AFF-A700	2	NetApp	AFF	21,444	46	57,016	117,742	0.05	0.07	0.09	2	92	1	223	50,000		31.53	0.63	0.65	2%
✔	N/A	SG-default_three_site	Webscale	11	NetApp	StorageGRID														4.55	0.00	0.00	0%
✔	MJCCBC	bahamas	AFF-A400	2	NetApp	AFF	595	5,346	5,720	49,452	0.01	0.03	0.04	2	1	10	10	50,000	429.90	26.42	2.32	2.32	9%
✔	N/A	bahamas	AFF-A400	2	NetApp	AFF	880	5,439	9,894	49,452	0.01	0.03	0.04	2	2	11	33	50,000	429.90	26.42	2.32	2.32	9%
✔	N/A	rtp-sa-sf01	FAS9020	4	NetApp	FAS8000	4,418	5,508	6,045	10,000	0.20	0.46	0.99	25	24	17	71	60,000	0.58	83.95	27.71	27.73	33%
✔	N/A	umeng-aff300-01-02	AFF-A300	2	NetApp	AFF	5,814	7,751	7,942	58,308	0.22	0.39	5.27	2	362	469	479	50,000	0.50	14.03	8.88	8.89	63%
✔	N/A	rtp-sa-fas8200-infra	FAS8200	2	NetApp	FAS8000	3,788	6,540	7,490	64,946	0.25	0.35	0.65	10	80	164	186	30,000	49.38	160.40	32.95	32.95	21%

Description: This report shows the overall health of the entire multi-vendor storage estate.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 10.5 Storage Health

10.5 Storage Health Definitions

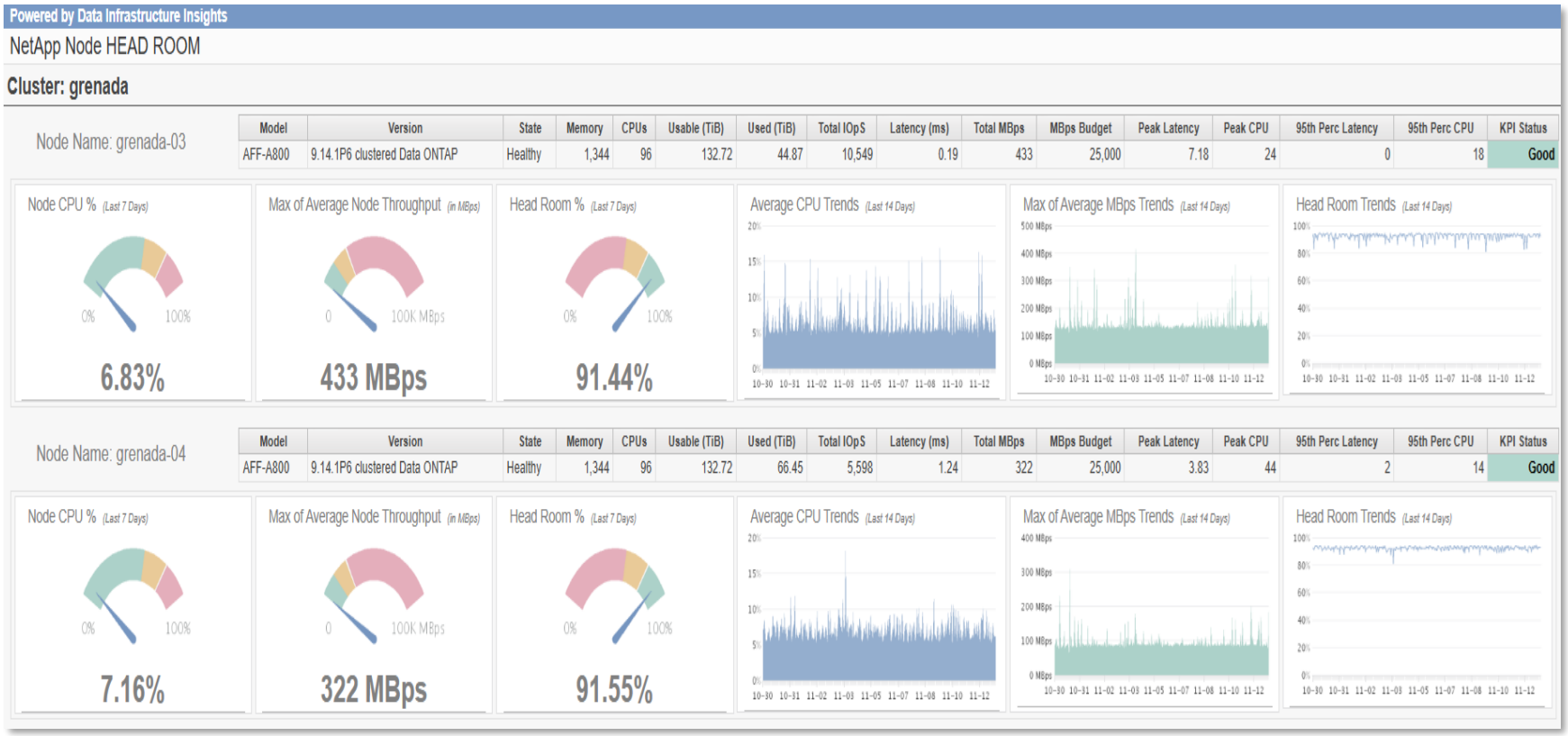
Metric/Attribute	Description
Status	CASE WHEN [IO Budget Exceeded] = 1 THEN '✗' WHEN [Latency Threshold Exceeded]=1 THEN '✗' WHEN [% Used]>.90 THEN '✗' ELSE '✓' END
Data Center	DII configured annotation. Defines the location of the device
Storage	Name of the storage device discovered and monitored by DII
Model	Model name associated with the storage device
Node Count	Total number of nodes associated with the storage device
Vendor	Manufacturer of the storage device
Family	Family name of the storage device
AvgIOPS	Measures the total number of I/O service requests (read+write) on the volume during the collection period (measured in I/O per sec)
95th Peak IOPS	95th percentile of maximum IOPS. The 95th percentile says that 95% of the time, the usage is at or below this amount. Conversely, 5% of the samples may be bursting above this rate but are ignored
Peak IOPS	Maximum IOPS on the volume during the collection period
TotalIOBudget	⚪ TotalIOBudget is null 🟢 IO Budget Exceeded = 0 (IF([95th PeakIOpS]>[TotalIOBudget]) THEN (1) ELSE (0)) 🟡 IO Budget Near Exceeded >= .8 AND IO Budget Near Exceeded < = 1 (_round([95th AvgIOpS] / [TotalIOBudget],0)) 🔴 IO Budget Exceeded = 1
AvgLatency	The time it takes (total response time) from the moment a request for information arrives at the storage device to the time when the storage device begins to send the information back in response. This is the actual latency of the device in milliseconds
95th Peak Latency	95th percentile of Maximum Latency in milliseconds
Peak Latency	Maximum response time in milliseconds for the collection period
Latency Threshold	WHEN disk.disktype='SSD' THEN 2 WHEN disk.disktype='SAS' and disk.diskspeed='15000' THEN 5 WHEN disk.disktype='FC' and disk.diskspeed='15000' THEN 5 WHEN disk.disktype='SAS' and disk.diskspeed='10000' THEN 10 WHEN disk.disktype='FC' and disk.diskspeed='10000' THEN 10 WHEN disk.disktype='OTHER' and disk.diskspeed='10000' THEN 10 ELSE 25
AvgMBps	Average throughput (read+write). This is the Rate at which data is being transmitted in a fixed amount of time in response to I/O service requests (measured in Megabytes per sec)
95th Peak MBps	95th percentile of Maximum throughput in MB/sec for the collection period
Peak MBps	Maximum throughput in MB/sec for the collection period

OrphanedTiB	Total amount of capacity in Tebibytes that is orphaned by configuration. Derived from the volume_history_capacity_fact table
Capacity (TiB)	Usable capacity allocated for a storage-pool as reported by the storage-array in Tebibytes (Base 2 units)
Used (TiB)	Used capacity for a storage-pool as reported by the storage-array in Tebibytes
95th Used (TiB)	95th percentile of Used (TiB)
Used %	🟡 [Used%] BETWEEN .8 and .9 🔴 [Used%] > .9
IO Budget	IO Budget is derived from either the underlying disk infrastructure that supports the storage device or from the storage model type. Formula: (Disk Type + Disk Speed = supported IOpS divided by Block Size)

10.8 NetApp Node Head Room

Description: This dashboard shows the amount of head room (available performance) for each individual NetApp node grouped by Cluster. The objective is to isolate Node CPU % and Node Latency then provide a comparison of Node CPU % vs Disk Utilization %. Node operational analysis appears in the form of a bubble chart comparing CPU % with Latency (ms) with a threshold of 2ms latency and 80% CPU utilization. Nodes that fall outside of the range (green) will have reduced available performance. A summary for each node is available above the charts with a KPI Status

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.



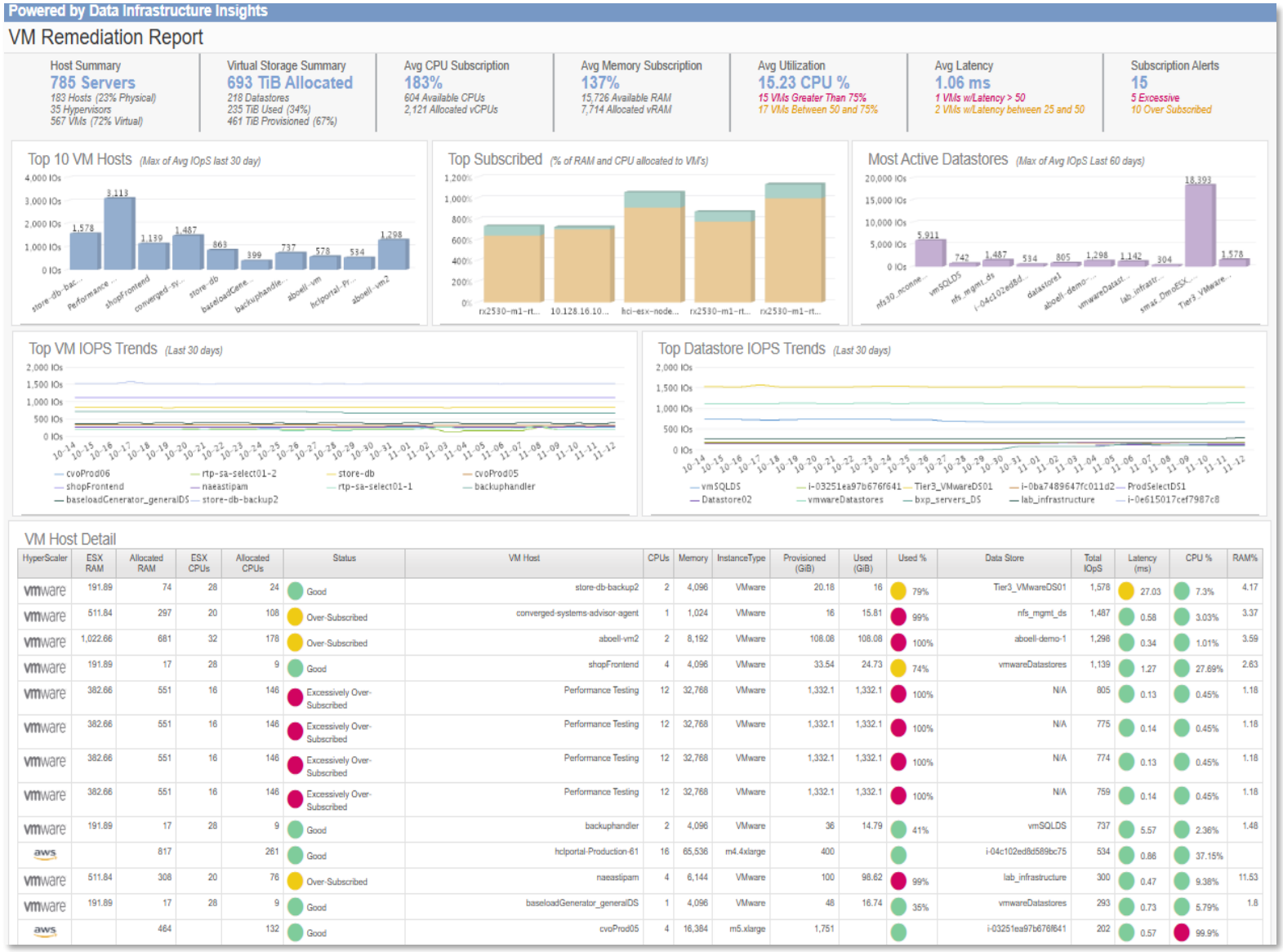
Report XML: 10.8 NetApp Node Head Room

10.8 NetApp Node Head Room Definitions

Metric/Attribute	Description
Node Name	Name of the NetApp node discovered and monitored by DII
Model	Model name of the node
Version	Microcode or firmware version of the node
State	The operational state of the NetApp node e.g. Healthy or Unhealthy
Memory	Amount of Memory in Gibibytes allocated to the node
CPUs	Number of CPUs allocated to the node
Usable (TiB)	Usable capacity allocated for a storage-pool as reported by the storage-array in Tebibytes (Base 2 units)
Used (TiB)	Used capacity for a storage-pool as reported by the storage-array in Tebibytes
Total IOPS	Measures the total number of I/O service requests (read+write) on the volume during the collection period (measured in I/O per sec)
Latency (ms)	The time it takes (total response time) from the moment a request for information arrives at the storage device to the time when the storage device begins to send the information back in response. This is the actual latency of the device in milliseconds
Total MBps	Average throughput (read+write). This is the Rate at which data is being transmitted in a fixed amount of time in response to I/O service requests (measured in Megabytes per sec)
Peak Latency	Maximum response time in milliseconds for the collection period
Peak CPU	Maximum Node CPU Utilization shows the percentage of time that one or more CPUs were busy. In DII, this is based on the higher of CPU, WAFL_EX and Kahuna Processor Domain metrics. Details are as follows: • System – avg_processor_busy, cpu_elapsed_time1 • WAFL – total_cp_msecs, cp_phase_times.P2_FLUSH • Processor – domain_busy, processor_elapsed_time Overall node utilization then is displayed as the higher of the 3 (system, WAFL or processor domains) which all indicate a controller's ability (utilization) to process read/write request
95th Perc Latency	95th percentile of maximum response time in milliseconds. The 95th percentile says that 95% of the time, the usage is at or below this amount. Conversely, 5% of the samples may be bursting above this rate but are ignored
95th Perc CPU	95th percentile of Maximum CPU Utilization % for the collection period
Head Room %	Head Room refers to the remaining performance capacity of a storage node, essentially indicating how much additional workload can be placed on a node before its performance starts to degrade due to increased latency. Head Room formula in reporting: 100 – ((Avg Node Utilization/100 + Avg Throughput MBps) * 100) NOTE: Head room is derived from the Optimal Point calculation which is not currently available in the Data Warehouse.
KPI Status	CASE WHEN [CPU %] <=50 AND [Total MBps] <=25000 THEN 'Good' WHEN [CPU %] between 50 and 80 AND [Total MBps] <=25000 THEN '**Watching**'

	WHEN [CPU %] <= 50 AND [Total MBps] >25000 THEN '**Watching**' WHEN [CPU %] between 50 and 80 AND [Total MBps] >25000 THEN '**Alert**' WHEN [CPU %] > 80 AND [Total MBps] >25000 THEN '**Warning**' END
Average CPU	Maximum response time in milliseconds for the collection period

10.9 VM Remediation



HyperScaler	ESX RAM	Allocated RAM	ESX CPUs	Allocated CPUs	Status	VM Host	CPUs	Memory	InstanceType	Provisioned (GiB)	Used (GiB)	Used %	Data Store	Total IOpS	Latency (ms)	CPU %	RAM%
vmware	191.89	74	28	24	Good	store-db-backup2	2	4,096	VMware	20.18	16	79%	Tier3_VMwareDS01	1,578	27.03	7.3%	4.17
vmware	511.84	297	20	108	Over-Subscribed	converged-systems-advisor-agent	1	1,024	VMware	16	15.81	99%	nfs_mgmt_ds	1,487	0.58	3.03%	3.37
vmware	1,022.66	681	32	178	Over-Subscribed	aboell-vm2	2	8,192	VMware	108.08	108.08	100%	aboell-demo-1	1,298	0.34	1.01%	3.59
vmware	191.89	17	28	9	Good	shopFrontend	4	4,096	VMware	33.54	24.73	74%	vmwareDatastores	1,139	1.27	27.69%	2.63
vmware	382.66	551	16	146	Excessively Over-Subscribed	Performance Testing	12	32,768	VMware	1,332.1	1,332.1	100%	N/A	805	0.13	0.45%	1.18
vmware	382.66	551	16	146	Excessively Over-Subscribed	Performance Testing	12	32,768	VMware	1,332.1	1,332.1	100%	N/A	775	0.14	0.45%	1.18
vmware	382.66	551	16	146	Excessively Over-Subscribed	Performance Testing	12	32,768	VMware	1,332.1	1,332.1	100%	N/A	774	0.13	0.45%	1.18
vmware	382.66	551	16	146	Excessively Over-Subscribed	Performance Testing	12	32,768	VMware	1,332.1	1,332.1	100%	N/A	759	0.14	0.45%	1.18
vmware	191.89	17	28	9	Good	backuphandler	2	4,096	VMware	36	14.79	41%	vmSQLDS	737	5.57	2.36%	1.48
aws		817		261	Good	hclportal-Production-61	16	65,536	m4.4xlarge	400			i-04c102ed8d589bc75	534	0.86	37.15%	
vmware	511.84	308	20	76	Over-Subscribed	naeastipam	4	6,144	VMware	100	98.62	99%	lab_infrastructure	300	0.47	9.38%	11.53
vmware	191.89	17	28	9	Good	baseloadGenerator_generalDS	1	4,096	VMware	48	16.74	35%	vmwareDatastores	293	0.73	5.79%	1.8
aws		464		132	Good	cvoProd05	4	16,384	m5.xlarge	1,751			i-03251ea97b676f641	202	0.57	99.9%	

Description: This report shows VM Capacity and Performance Remediation metrics with overall status.

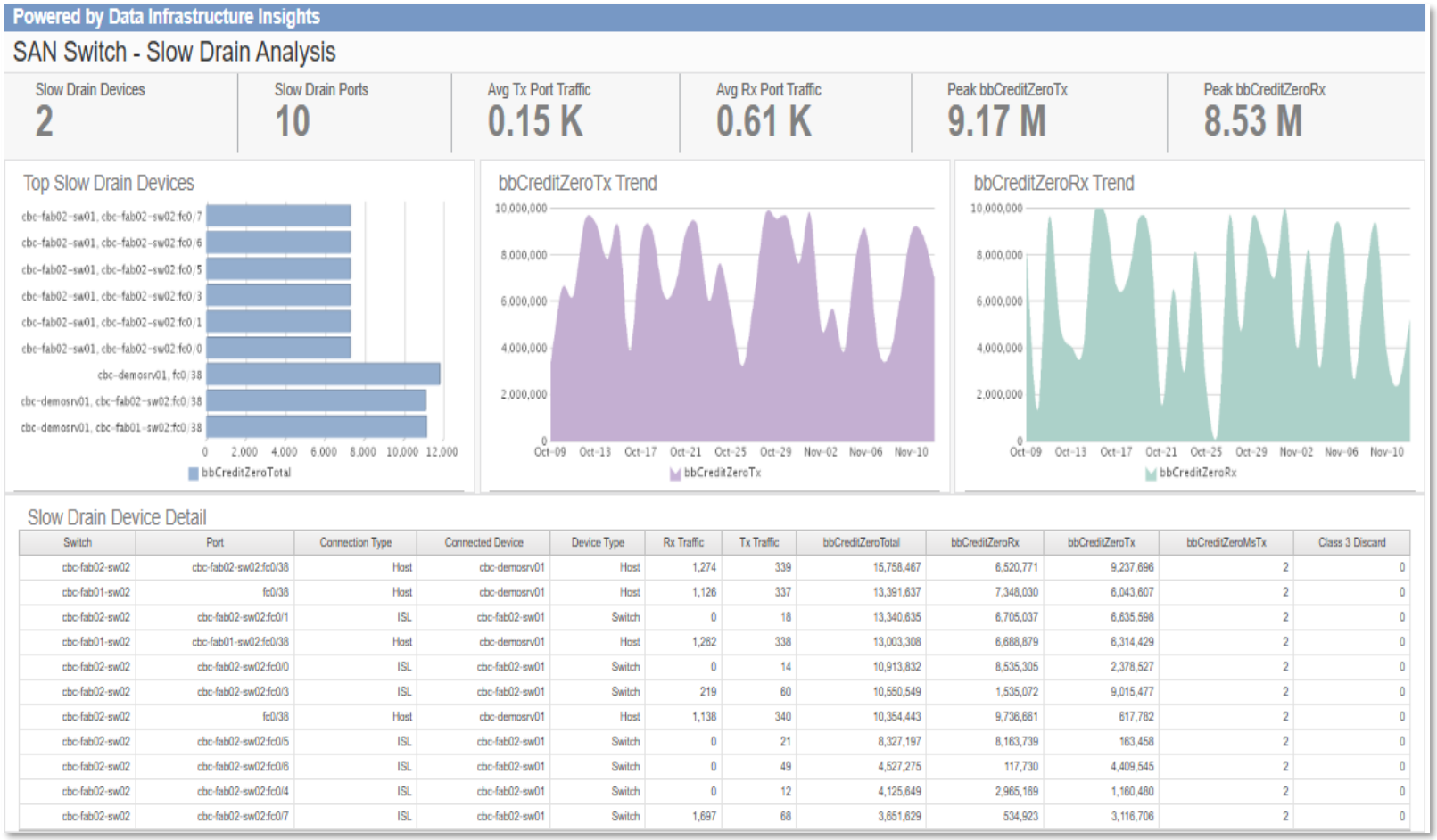
Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 10.9 VM Remediation

10.9 VM Remediation Definitions

Metric/Attribute	Description
HyperScaler	Name of the hyperscaler e.g. AWS, AZURE or Google Cloud
Hypervisor / ESX Server	Name of the hypervisor discovered and monitored by DII
ESX RAM	The amount of RAM in Gibibytes associated with the hypervisor
Allocated RAM	Total amount of vRAM allocated to virtual machines
ESX CPUs	The CPU count associated with the hypervisor
Allocated CPUs	Total number of vCPUs allocated to virtual machines
CPU Subscription	Allocated CPUs / ESX CPU
RAM Subscription	Allocated RAM / ESX RAM
Avg IOPS	Measures the total number of I/O service requests (read+write) on the volume during the selected time period (measured in I/O per sec)
Date	Full Date field derived from the Date Dimension table in the DWH
Status	WHEN [CPU Subscription %]>6 OR [RAM Subscription %]>6 THEN 'Excessively Over-Subscribed' WHEN [CPU Subscription %]>3 OR [RAM Subscription %]>3 THEN 'Over-Subscribed' ELSE 'Good'
VM Host / VM	Name of the virtual machine associated with the hypervisor
CPUs	Number of vCPUs allocated to individual virtual machines
Memory	Amount of vRAM in Gibibytes allocated to individual virtual machines
InstanceType	The configuration type associated with the virtual instance e.g. for AWS, a1.medium, a1.large, a1.xlarge etc.
Provisioned (GiB)	Amount of capacity in Gibibytes allocated to the virtual instance
Used (GiB)	Amount of capacity used in Gibibytes by the virtual instance
Used %	Used (GiB) / Provisioned (GiB) Used % >= .90 Used % Between .70 and .90
Data Store	Name of the datastore associated with the hypervisor
Total IOPS	Measures the total number of I/O service requests (read+write) on the virtual instance during the selected time period (measured in I/O per sec)
Latency (ms)	The time it takes (total response time) from the moment a request for information arrives at the storage device to the time when the storage device begins to send the information back in response. This is the actual latency of the device in milliseconds Latency (ms) > 50 Latency (ms) > 25
CPU %	The average percentage of a physical CPU's processing power that is currently being used by that virtual instance, essentially measuring how much of the allocated CPU resources are actively being consumed CPU % > 75 CPU % Between 50 and 75
RAM %	The average percentage of the allocated RAM that is currently being used by the virtual machine

10.11 SAN Switch – Slow Drain Analysis



Switch	Port	Connection Type	Connected Device	Device Type	Rx Traffic	Tx Traffic	bbCreditZeroTotal	bbCreditZeroRx	bbCreditZeroTx	bbCreditZeroMsTx	Class 3 Discard
cbc-fab02-sw02	cbc-fab02-sw02:fc0/38	Host	cbc-demosrv01	Host	1,274	339	15,758,467	6,520,771	9,237,696	2	0
cbc-fab01-sw02	fc0/38	Host	cbc-demosrv01	Host	1,126	337	13,391,637	7,348,030	6,043,607	2	0
cbc-fab02-sw02	cbc-fab02-sw02:fc0/1	ISL	cbc-fab02-sw01	Switch	0	18	13,340,635	6,705,037	6,635,598	2	0
cbc-fab01-sw02	cbc-fab01-sw02:fc0/38	Host	cbc-demosrv01	Host	1,262	338	13,003,308	6,688,879	6,314,429	2	0
cbc-fab02-sw02	cbc-fab02-sw02:fc0/0	ISL	cbc-fab02-sw01	Switch	0	14	10,913,832	8,535,305	2,378,527	2	0
cbc-fab02-sw02	cbc-fab02-sw02:fc0/3	ISL	cbc-fab02-sw01	Switch	219	60	10,550,549	1,535,072	9,015,477	2	0
cbc-fab02-sw02	fc0/38	Host	cbc-demosrv01	Host	1,138	340	10,354,443	9,736,661	617,782	2	0
cbc-fab02-sw02	cbc-fab02-sw02:fc0/5	ISL	cbc-fab02-sw01	Switch	0	21	8,327,197	8,163,739	163,458	2	0
cbc-fab02-sw02	cbc-fab02-sw02:fc0/6	ISL	cbc-fab02-sw01	Switch	0	49	4,527,275	117,730	4,409,545	2	0
cbc-fab02-sw02	cbc-fab02-sw02:fc0/4	ISL	cbc-fab02-sw01	Switch	0	12	4,125,649	2,965,169	1,160,480	2	0
cbc-fab02-sw02	cbc-fab02-sw02:fc0/7	ISL	cbc-fab02-sw01	Switch	1,697	68	3,651,629	534,923	3,116,706	2	0

Description: This report shows SAN devices and ports that are impacted by slow drain. Slow drain is derived from the bbCreditZero metric along with port latency or bbCreditZeroMsTx. For devices to qualify for slow drain, bbCreditZeroRx and Tx must be greater than 1,000,000 and bbCreditZeroMsTx must be >=1.

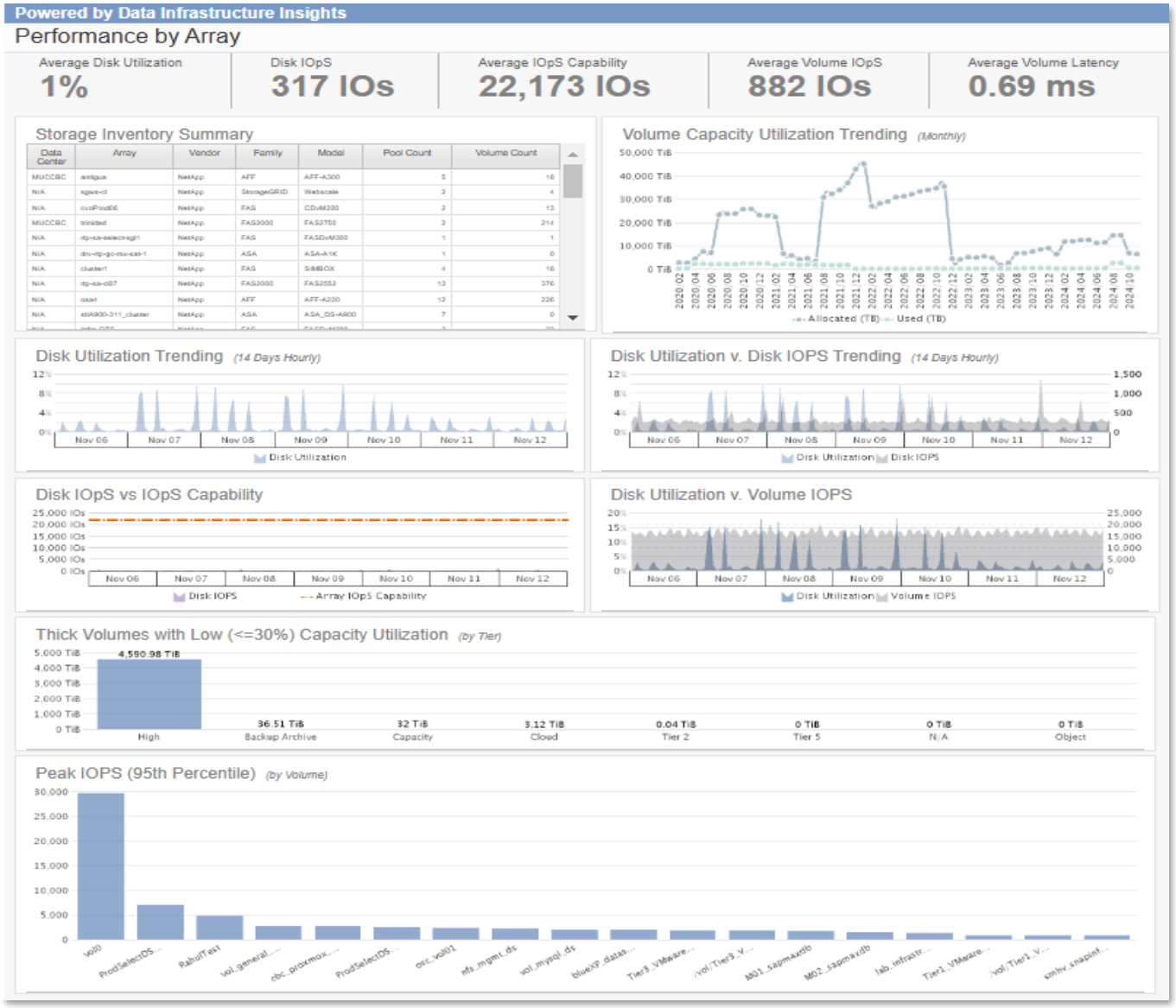
Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 10.11 SAN Switch - Slow Drain Analysis

10.11 SAN Switch – Slow Drain Analysis

Metric/Attribute	Description
Switch	Name of the SAN switch monitored by DII
Port	Name of the switch port associated with the switch monitored by DII
Connection Type	Type of device the switch port is connected to…e.g. Host, Storage, ISL, Tape, or Generic Device (a device not resolved to an IP in DII)
Connected Device	Name of the device (e.g. Host, Storage, etc.) that is connected to the switch port
Device Type	Type of the device (e.g., Host, Storage, etc.) that is connected to the switch port
Avg Rx Traffic	Average traffic received in MB/sec collected hourly for 14 days
Avg Tx Traffic	Average traffic transmitted in MB/sec collected hourly for 14 days
bbCreditZeroTotal	bbCreditZeroRx + bbCreditZeroTx
bbCreditZeroRx	Each time a port receives a frame that port's BB Credit is decremented by one; for each R_RDY received, that port's BB Credit is incremented by one. If the BB Credit is zero the corresponding node cannot transmit until an R_RDY is received back.
bbCreditZeroTx	Same as above only for transmitted frames
bbCreditZeroMsTx	Port latency detected in milliseconds and used to support the reason for a slow drain condition
Class 3 Discard	Class-3 is essentially a datagram service based on frame switching. They main advantage comes from not giving an acknowledgement that a frame has been rejected or busied by a destination device or Fabric
Date	Hourdatetime and/or fulldate fields derived from the Time Dimension and Date Dimension tables in the DWH
Slow Drain Device Count	

10.16 Performance by Array



Description: This report shows VM Capacity and Performance Remediation metrics with overall status.

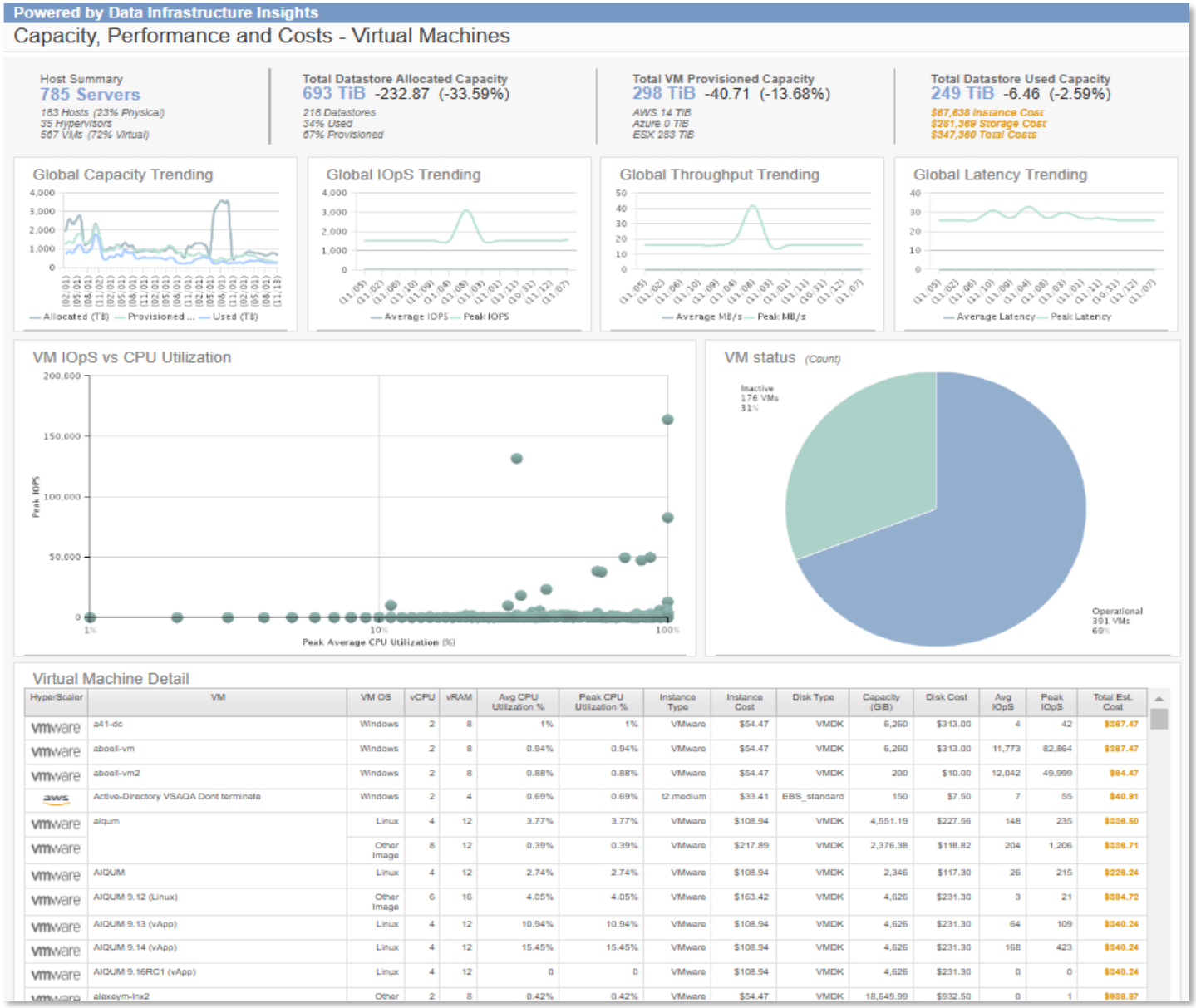
Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 10.16 Performance by Array

10.16 Performance by Array Definitions

Metric/Attribute	Description
Data Center	DII configured annotation. Defines the location of the device
Tier	DII configured annotation. Defines tiers of storage based on disk type, disk speed, etc.
Array	Name of the storage device discovered and monitored by DII
Vendor	Manufacturer of the storage device
Family	Family name of the storage device
Model	Model name associated with the storage device
Volume	Name of the volume associated with the storage pool or aggregate
Disk Utilization	The percentage % of post-cache service time used for requests out of the available sample time. This metric indicates what portion of the time the disk is busy servicing requests
Disk IOPS	Measures the total number of I/O service requests on the physical disk during the selected time period (measured in I/O per sec
IOPS Capability	The estimated IOPS capability of the storage pool or aggregate. The typical IO that can be supported by a 15K SAS disk is approximately 200. The typical IO that can be supported by SSD disks is 3000-12000.
Volume IOPS	Measures the total number of I/O service requests (read+write) on the volume during the selected time period (measured in I/O per sec)
Volume Latency	The time it takes from the moment a request for information arrives at the storage device to the time when the storage device begin to send the information back in response. This is the actual latency of the device in milliseconds
Capacity (TiB)	Usable capacity allocated for a storage-pool as reported by the storage-array in Tebibytes (Base 2 units)
Allocated (TiB)	Total allocated capacity in Tebibytes as reported by the storage pool or aggregate
Used (TiB)	Total used capacity in Tebibytes as reported by the storage pool or aggregate
95th Percentile IOPS	95th percentile of maximum IOPS. The 95th percentile says that 95% of the time, the usage is at or below this amount. Conversely, 5% of the samples may be bursting above this rate but are ignored
Date	Full Date field derived from the DateDimension table in the DWH
Time	Hourdatetime field derived from the Time Dimension table in the DWH

10.17 Capacity, Performance and Costs – Virtual Machines



HyperScaler	VM	VM OS	vCPU	vRAM	Avg CPU Utilization %	Peak CPU Utilization %	Instance Type	Instance Cost	Disk Type	Capacity (GiB)	Disk Cost	Avg IOpS	Peak IOpS	Total Est. Cost
vmware	a41-dc	Windows	2	8	1%	1%	VMware	$54.47	VMDK	6,260	$313.00	4	42	$367.47
vmware	aboell-vm	Windows	2	8	0.94%	0.94%	VMware	$54.47	VMDK	6,260	$313.00	11,773	82,864	$367.47
vmware	aboell-vm2	Windows	2	8	0.88%	0.88%	VMware	$54.47	VMDK	200	$10.00	12,042	49,999	$64.47
aws	Active-Directory VSAQA Dont terminate	Windows	2	4	0.69%	0.69%	t2.medium	$33.41	EBS_standard	150	$7.50	7	55	$40.91
vmware	aiqum	Linux	4	12	3.77%	3.77%	VMware	$108.94	VMDK	4,551.19	$227.56	148	235	$336.50
vmware		Other Image	8	12	0.39%	0.39%	VMware	$217.89	VMDK	2,376.38	$118.82	204	1,206	$336.71
vmware	AIQUM	Linux	4	12	2.74%	2.74%	VMware	$108.94	VMDK	2,346	$117.30	26	215	$226.24
vmware	AIQUM 9.12 (Linux)	Other Image	6	16	4.05%	4.05%	VMware	$163.42	VMDK	4,626	$231.30	3	21	$394.72
vmware	AIQUM 9.13 (vApp)	Linux	4	12	10.94%	10.94%	VMware	$108.94	VMDK	4,626	$231.30	64	109	$340.24
vmware	AIQUM 9.14 (vApp)	Linux	4	12	15.45%	15.45%	VMware	$108.94	VMDK	4,626	$231.30	168	423	$340.24
vmware	AIQUM 9.16RC1 (vApp)	Linux	4	12	0	0	VMware	$108.94	VMDK	4,626	$231.30	0	0	$340.24
vmware	alexeym-lnx2	Other	2	8	0.42%	0.42%	VMware	$54.47	VMDK	18,649.99	$932.50	0	1	$986.97

Description: This report shows VM Capacity, performance metrics and monthly costs associated with each instance. VMware and cloud hyperscalers are visible.

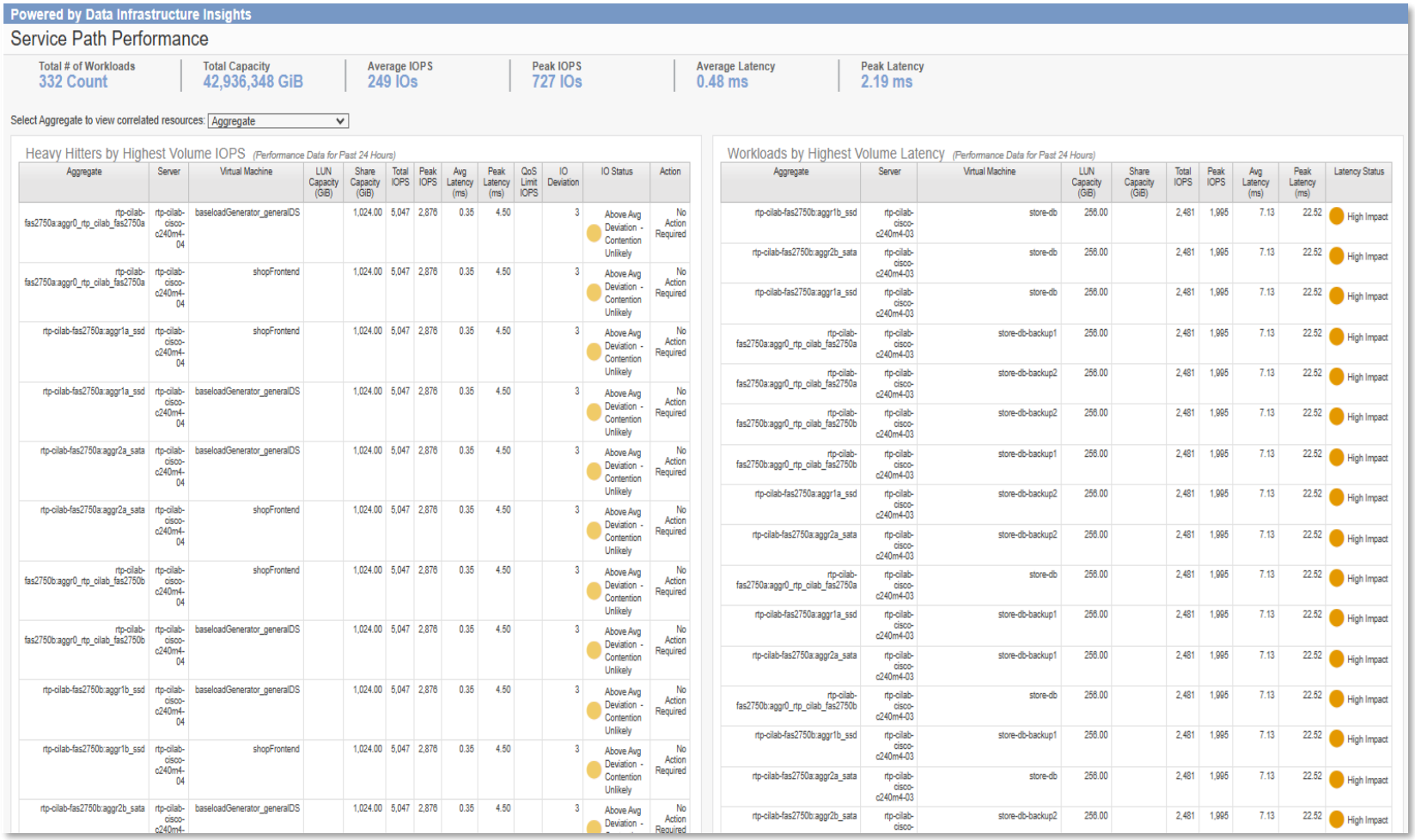
Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 10.17 Capacity, Performance and Costs - Virtual Machines

10.17 Capacity, Performance and Costs – Virtual Machine Definitions

Metric/Attribute	Description
HyperScaler	Name of the hyperscaler e.g. AWS, AZURE or Google Cloud
VM	Name of the virtual machine or instance associated with the hypervisor
VM OS	The operating system associated with the virtual machine or instance
vCPU	Number of vCPUs allocated to individual virtual machines
vRAM	Amount of vRAM in Gibibytes allocated to individual virtual machines
Avg CPU Utilization %	The average percentage of a physical CPU's processing power that is currently being used by that virtual instance, essentially measuring how much of the allocated CPU resources are actively being consumed
Peak CPU Utilization %	The maximum CPU Utilization % for the collection period
Instance Type	The configuration type associated with the virtual instance e.g. for AWS, a1.medium, a1.large, a1.xlarge etc.
Billable Hours	The number of billable hours for the current month. E.g. (DAY(LAST_DAY(NOW()))*24)
Instance Hourly Pricing	Instance cost per hour based on the published hyperscaler rate card. Example: WHEN [Instance Type]='a1.medium' THEN 0.0255 WHEN [Instance Type]='a1.large' THEN 0.051 WHEN [Instance Type]='a1.xlarge' THEN 0.102 WHEN [Instance Type]='a1.2xlarge' THEN 0.204 WHEN [Instance Type]='a1.4xlarge' THEN 0.408 WHEN [Instance Type]='a1.metal' THEN 0.408
Instance Cost	Billable Hours * Instance Hourly Pricing
Disk Type	The disk type e.g. for AWS, EBS_gp2, EBS_gp3 etc..
Disk Cost	Disk cost per month based on the published hyperscaler rate card. Example: WHEN Disk Type contains 'gp' THEN .1 WHEN Disk Type contains 'io' THEN .125 WHEN Disk Type contains 'st1' THEN .045 WHEN Disk Type contains 'sc1' THEN .025 WHEN Disk Type contains 'standard' THEN .05 WHEN Disk Type contains 'snap' THEN .05 WHEN Disk Type contains 'Standard_LRS' THEN .045 WHEN Disk Type contains 'Premium_LRS' THEN .12
Avg IOPS	Measures the total number of I/O service requests (read+write) on the virtual instance during the selected time period (measured in I/O per sec)
Peak IOPS	Maximum IOPS on the virtual instance for the collection period
Total Est. Cost	[Instance Cost] + [Disk Cost]
State	WHEN instance.powerState = 'poweredOn' AND instance.guestState = 'running' THEN 'Operational' WHEN instance.powerState = 'poweredOn' AND instance.guestState = 'notRunning' THEN 'Idle' ELSE 'Inactive

10.19 Service Path Performance



Powered by Data Infrastructure Insights

Service Path Performance

Total # of Workloads	Total Capacity	Average IOPS	Peak IOPS	Average Latency	Peak Latency
332 Count	42,936,348 GiB	249 IOs	727 IOs	0.48 ms	2.19 ms

Select Aggregate to view correlated resources: Aggregate

Heavy Hitters by Highest Volume IOPS *(Performance Data for Past 24 Hours)*

Aggregate	Server	Virtual Machine	LUN Capacity (GiB)	Share Capacity (GiB)	Total IOPS	Peak IOPS	Avg Latency (ms)	Peak Latency (ms)	QoS Limit IOPS	IO Deviation	IO Status	Action
rtp-cilab-fas2750a:aggr0_rtp_cilab_fas2750a	rtp-cilab-cisco-c240m4-04	baseloadGenerator_generalDS		1,024.00	5,047	2,876	0.35	4.50		3	Above Avg Deviation - Contention Unlikely	No Action Required
rtp-cilab-fas2750a:aggr0_rtp_cilab_fas2750a	rtp-cilab-cisco-c240m4-04	shopFrontend		1,024.00	5,047	2,876	0.35	4.50		3	Above Avg Deviation - Contention Unlikely	No Action Required
rtp-cilab-fas2750a:aggr1a_ssd	rtp-cilab-cisco-c240m4-04	shopFrontend		1,024.00	5,047	2,876	0.35	4.50		3	Above Avg Deviation - Contention Unlikely	No Action Required
rtp-cilab-fas2750a:aggr1a_ssd	rtp-cilab-cisco-c240m4-04	baseloadGenerator_generalDS		1,024.00	5,047	2,876	0.35	4.50		3	Above Avg Deviation - Contention Unlikely	No Action Required
rtp-cilab-fas2750a:aggr2a_sata	rtp-cilab-cisco-c240m4-04	baseloadGenerator_generalDS		1,024.00	5,047	2,876	0.35	4.50		3	Above Avg Deviation - Contention Unlikely	No Action Required
rtp-cilab-fas2750a:aggr2a_sata	rtp-cilab-cisco-c240m4-04	shopFrontend		1,024.00	5,047	2,876	0.35	4.50		3	Above Avg Deviation - Contention Unlikely	No Action Required
rtp-cilab-fas2750b:aggr0_rtp_cilab_fas2750b	rtp-cilab-cisco-c240m4-04	shopFrontend		1,024.00	5,047	2,876	0.35	4.50		3	Above Avg Deviation - Contention Unlikely	No Action Required
rtp-cilab-fas2750b:aggr0_rtp_cilab_fas2750b	rtp-cilab-cisco-c240m4-04	baseloadGenerator_generalDS		1,024.00	5,047	2,876	0.35	4.50		3	Above Avg Deviation - Contention Unlikely	No Action Required
rtp-cilab-fas2750b:aggr1b_ssd	rtp-cilab-cisco-c240m4-04	baseloadGenerator_generalDS		1,024.00	5,047	2,876	0.35	4.50		3	Above Avg Deviation - Contention Unlikely	No Action Required
rtp-cilab-fas2750b:aggr1b_ssd	rtp-cilab-cisco-c240m4-04	shopFrontend		1,024.00	5,047	2,876	0.35	4.50		3	Above Avg Deviation - Contention Unlikely	No Action Required
rtp-cilab-fas2750b:aggr2b_sata	rtp-cilab-cisco-c240m4-	baseloadGenerator_generalDS		1,024.00	5,047	2,876	0.35	4.50		3	Above Avg Deviation -	No Action Required

Workloads by Highest Volume Latency *(Performance Data for Past 24 Hours)*

Aggregate	Server	Virtual Machine	LUN Capacity (GiB)	Share Capacity (GiB)	Total IOPS	Peak IOPS	Avg Latency (ms)	Peak Latency (ms)	Latency Status
rtp-cilab-fas2750b:aggr1b_ssd	rtp-cilab-cisco-c240m4-03	store-db	256.00		2,481	1,995	7.13	22.52	High Impact
rtp-cilab-fas2750b:aggr2b_sata	rtp-cilab-cisco-c240m4-03	store-db	256.00		2,481	1,995	7.13	22.52	High Impact
rtp-cilab-fas2750a:aggr1a_ssd	rtp-cilab-cisco-c240m4-03	store-db	256.00		2,481	1,995	7.13	22.52	High Impact
rtp-cilab-fas2750a:aggr0_rtp_cilab_fas2750a	rtp-cilab-cisco-c240m4-03	store-db-backup1	256.00		2,481	1,995	7.13	22.52	High Impact
rtp-cilab-fas2750a:aggr0_rtp_cilab_fas2750a	rtp-cilab-cisco-c240m4-03	store-db-backup2	256.00		2,481	1,995	7.13	22.52	High Impact
rtp-cilab-fas2750b:aggr0_rtp_cilab_fas2750b	rtp-cilab-cisco-c240m4-03	store-db-backup2	256.00		2,481	1,995	7.13	22.52	High Impact
rtp-cilab-fas2750b:aggr0_rtp_cilab_fas2750b	rtp-cilab-cisco-c240m4-03	store-db-backup1	256.00		2,481	1,995	7.13	22.52	High Impact
rtp-cilab-fas2750a:aggr1a_ssd	rtp-cilab-cisco-c240m4-03	store-db-backup2	256.00		2,481	1,995	7.13	22.52	High Impact
rtp-cilab-fas2750a:aggr2a_sata	rtp-cilab-cisco-c240m4-03	store-db-backup2	256.00		2,481	1,995	7.13	22.52	High Impact
rtp-cilab-fas2750a:aggr0_rtp_cilab_fas2750a	rtp-cilab-cisco-c240m4-03	store-db	256.00		2,481	1,995	7.13	22.52	High Impact
rtp-cilab-fas2750a:aggr1a_ssd	rtp-cilab-cisco-c240m4-03	store-db-backup1	256.00		2,481	1,995	7.13	22.52	High Impact
rtp-cilab-fas2750a:aggr2a_sata	rtp-cilab-cisco-c240m4-03	store-db-backup1	256.00		2,481	1,995	7.13	22.52	High Impact
rtp-cilab-fas2750b:aggr0_rtp_cilab_fas2750b	rtp-cilab-cisco-c240m4-03	store-db	256.00		2,481	1,995	7.13	22.52	High Impact
rtp-cilab-fas2750b:aggr1b_ssd	rtp-cilab-cisco-c240m4-03	store-db-backup1	256.00		2,481	1,995	7.13	22.52	High Impact
rtp-cilab-fas2750a:aggr2a_sata	rtp-cilab-cisco-c240m4-03	store-db	256.00		2,481	1,995	7.13	22.52	High Impact
rtp-cilab-fas2750b:aggr2b_sata	rtp-cilab-cisco-	store-db-backup2	256.00		2,481	1,995	7.13	22.52	High Impact

Description: This report shows VM Capacity, performance metrics and monthly costs associated with each instance. VMware and cloud hyperscalers are visible.

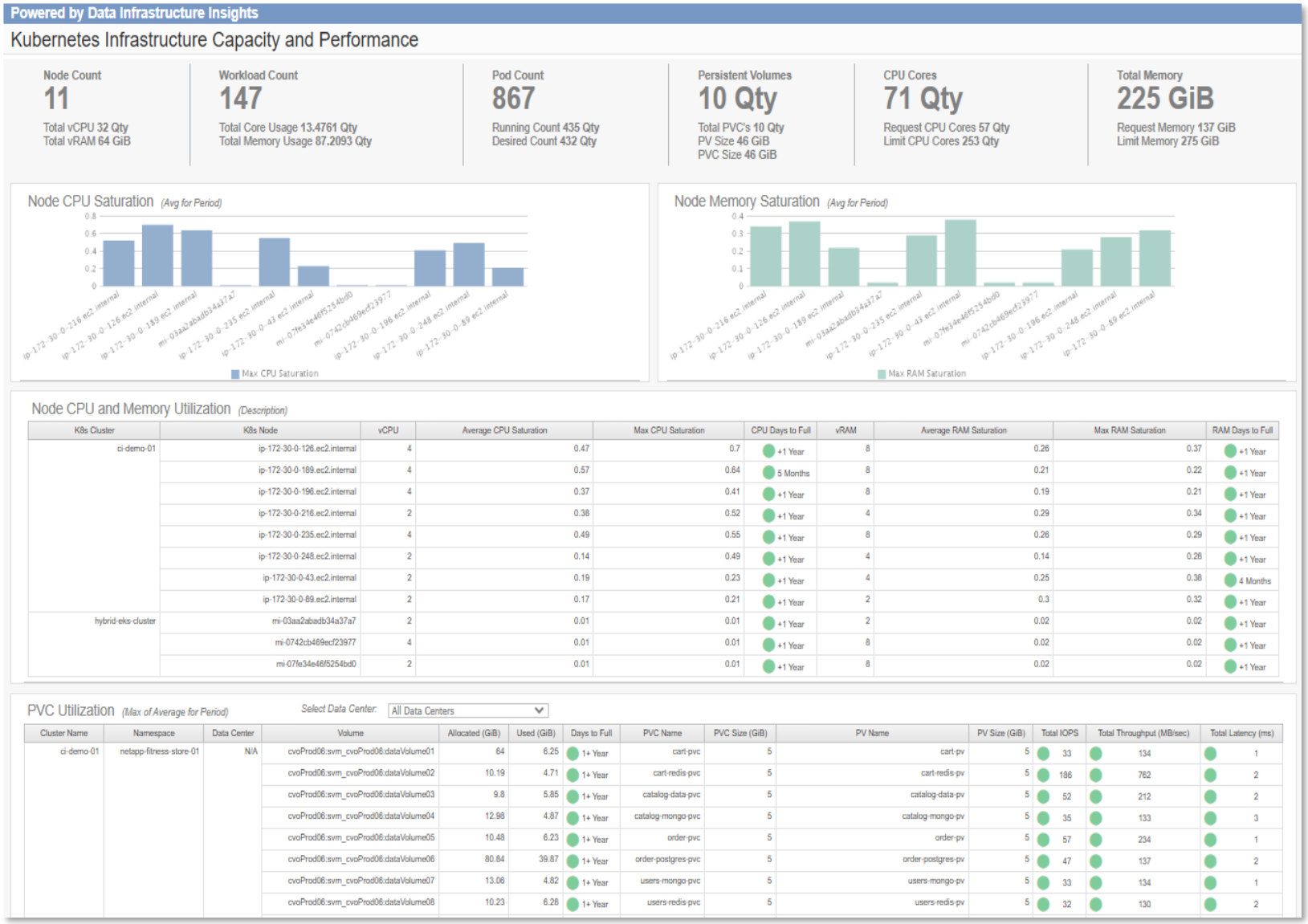
Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 10.19 Service Path Performance

10.19 Service Path Performance

Metric/Attribute	Description
Summary	
Total # of Workloads	Total number of volumes supported by the storage pool or aggregate
Total Capacity	Sum of LUN Capacity (GiB) + Share Capacity (GiB) for the report
Average IOPS	The average to Total IOPS for the report
Peak IOs	The average of Peak IOPS for the report
Average Latency	The average Latency for the report
Peak Latency	The average Peak Latency for the report
Heavy Hitters by Highest Volume IOPS	
Aggregate	Name of the storage pool or aggregate discovered by DII
Server	Name of the ESX Server or hypervisor discovered by DII
Virtual Machine	Name of the virtual machine associated with the hypervisor
LUN Capacity (GiB)	Allocated block volume capacity in Gibibytes associated with the storage pool or aggregate
Share Capacity (GiB)	NFS or CIFS allocated capacity in Gibibytes associated with the internal volume or Flexvol
Total IOPS	Measures the total number of I/O service requests (read+write) on the volume during the selected time period (measured in I/O per sec)
Peak IOPS	Maximum number of I/O service requests for the collection period
Avg Latency (ms)	The time it takes (total response time) from the moment a request for information arrives at the storage device to the time when the storage device begin to send the information back in response. This is the actual latency of the device in milliseconds
Peak Latency (ms)	Maximum response time in milliseconds for the collection period
QoS Limit IOPS	IOPS limits associated with the QoS Policy
IO Deviation	IF([Total IOPS]>[Average IOPS for Aggregate]) THEN (([Total IOPS]/[Average IOPS for Aggregate])) ELSE (1)
IO Status	WHEN [IO Deviation] > 10 THEN 'Extreme Deviation - Contention Likely' WHEN [IO Deviation] BETWEEN 5 AND 10 THEN 'High Deviation - Possible Contention' WHEN [IO Deviation] BETWEEN 1 AND 5 THEN 'Above Avg Deviation - Contention Unlikely' ELSE 'No Contention'
Action	WHEN [Peak IOPS]/[QoS Limit IOPS] > .95 THEN 'At QoS Limit' WHEN [Peak IOPS]/[QoS Limit IOPS] BETWEEN .85 AND .95 THEN 'Nearing QoS Limit' WHEN [Peak IOPS]/[QoS Limit IOPS] BETWEEN .70 AND .85 THEN 'Check Correlation Engine' ELSE 'No Action Required'
Latency Status	WHEN [Avg Latency (ms)] > 15 THEN 'Extreme Impact' WHEN [Avg Latency (ms)] BETWEEN 10 AND 15 THEN 'Very High Impact' WHEN [Avg Latency (ms)] BETWEEN 5 AND 10 THEN 'High Impact' WHEN [Avg Latency (ms)] BETWEEN 2 AND 5 THEN 'Moderate Impact' WHEN [Avg Latency (ms)] < 2 THEN 'Low Impact'

10.20 K8s Infrastructure Capacity and Performance – Advanced Metrics



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Kubernetes Infrastructure Capacity and Performance

Node Count	Workload Count	Pod Count	Persistent Volumes	CPU Cores	Total Memory
11	147	867	10 Qty	71 Qty	225 GiB
Total vCPU 32 Qty Total vRAM 64 GiB	Total Core Usage 13.4761 Qty Total Memory Usage 87.2093 Qty	Running Count 435 Qty Desired Count 432 Qty	Total PVC's 10 Qty PV Size 46 GiB PVC Size 46 GiB	Request CPU Cores 57 Qty Limit CPU Cores 253 Qty	Request Memory 137 GiB Limit Memory 275 GiB

Node CPU Saturation *(Avg for Period)*

Node Memory Saturation *(Avg for Period)*

Node CPU and Memory Utilization *(Description)*

K8s Cluster	K8s Node	vCPU	Average CPU Saturation	Max CPU Saturation	CPU Days to Full	vRAM	Average RAM Saturation	Max RAM Saturation	RAM Days to Full
ci-demo-01	ip-172-30-0-126.ec2.internal	4	0.47	0.7	+1 Year	8	0.26	0.37	+1 Year
	ip-172-30-0-189.ec2.internal	4	0.57	0.64	5 Months	8	0.21	0.22	+1 Year
	ip-172-30-0-196.ec2.internal	4	0.37	0.41	+1 Year	8	0.19	0.21	+1 Year
	ip-172-30-0-216.ec2.internal	2	0.38	0.52	+1 Year	4	0.29	0.34	+1 Year
	ip-172-30-0-235.ec2.internal	4	0.49	0.55	+1 Year	8	0.26	0.29	+1 Year
	ip-172-30-0-248.ec2.internal	2	0.14	0.49	+1 Year	4	0.14	0.26	+1 Year
	ip-172-30-0-43.ec2.internal	2	0.19	0.23	+1 Year	4	0.25	0.38	4 Months
	ip-172-30-0-89.ec2.internal	2	0.17	0.21	+1 Year	2	0.3	0.32	+1 Year
hybrid-eks-cluster	mi-03aa2abadb34a37a7	2	0.01	0.01	+1 Year	2	0.02	0.02	+1 Year
	mi-0742cb469ecf23977	4	0.01	0.01	+1 Year	8	0.02	0.02	+1 Year
	mi-07fe34e46f5254bd0	2	0.01	0.01	+1 Year	8	0.02	0.02	+1 Year

PVC Utilization *(Max of Average for Period)* Select Data Center: All Data Centers

Cluster Name	Namespace	Data Center	Volume	Allocated (GiB)	Used (GiB)	Days to Full	PVC Name	PVC Size (GiB)	PV Name	PV Size (GiB)	Total IOPS	Total Throughput (MB/sec)	Total Latency (ms)
ci-demo-01	netapp-fitness-store-01	N/A	cvoProd06:svm_cvoProd06:dataVolume01	64	6.25	1+ Year	cart-pvc	5	cart-pv	5	33	134	1
			cvoProd06:svm_cvoProd06:dataVolume02	10.19	4.71	1+ Year	cart-redis-pvc	5	cart-redis-pv	5	186	762	2
			cvoProd06:svm_cvoProd06:dataVolume03	9.8	5.85	1+ Year	catalog-data-pvc	5	catalog-data-pv	5	52	212	2
			cvoProd06:svm_cvoProd06:dataVolume04	12.98	4.87	1+ Year	catalog-mongo-pvc	5	catalog-mongo-pv	5	35	133	3
			cvoProd06:svm_cvoProd06:dataVolume05	10.48	6.23	1+ Year	order-pvc	5	order-pv	5	57	234	1
			cvoProd06:svm_cvoProd06:dataVolume06	80.84	39.87	1+ Year	order-postgres-pvc	5	order-postgres-pv	5	47	137	2
			cvoProd06:svm_cvoProd06:dataVolume07	13.06	4.82	1+ Year	users-mongo-pvc	5	users-mongo-pv	5	33	134	1
			cvoProd06:svm_cvoProd06:dataVolume08	10.23	6.26	1+ Year	users-redis-pvc	5	users-redis-pv	5	32	130	2

Description: This report shows Kubernetes infrastructure breakdown for Node, PVCs and Workloads.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

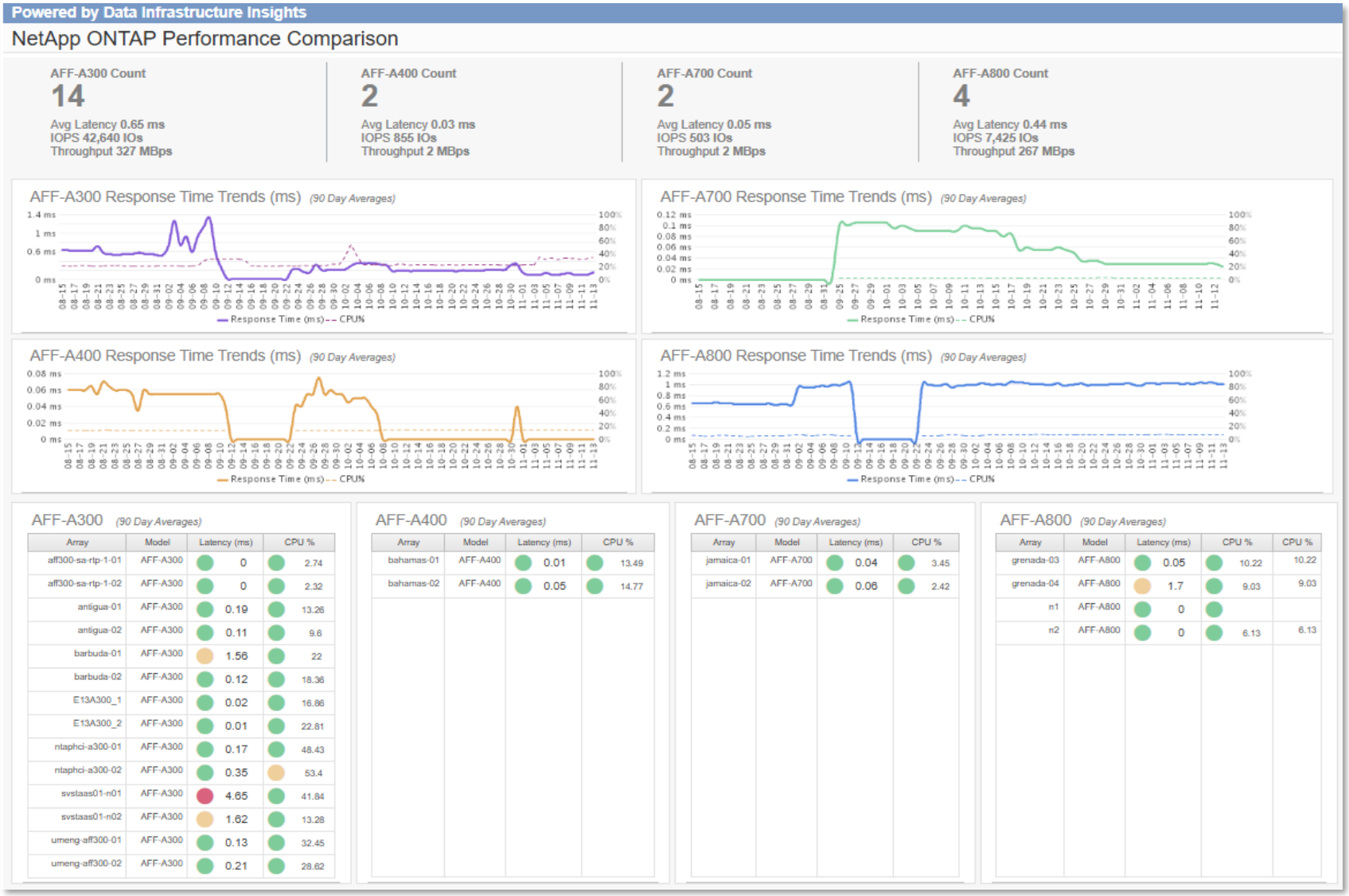
Report XML: 10.20 Kubernetes Infrastructure Capacity and Performance

10.20 K8s Infrastructure Capacity and Performance – Advanced Metrics Definitions

Metric/Attribute	Description
Node CPU and Memory Utilization	
K8s	K8s refers to the shortened 10 letter Kubernetes name. 8 refers to the 8 letters between the 'K' and the 's'.
K8s Cluster	Name of the Kubernetes Cluster discovered and monitored by DII
K8s Node	Name of the node associated with the K8s Cluster. A 'node' can be a virtual or physical computer running the K8s platform
vCPU	Number of processors allocated to the K8s node
Average CPU Saturation	This is a measure of how many average CPU requests are unable to be fulfilled due to unavailability. It's calculated based on the saturation numbers across all nodes in a cluster
Max CPU Saturation	This is the point where a container reaches its configured CPU limit
CPU Days to Full	Linear regression forecast in Days for when allocatable CPU saturation is 100%
vRAM	Amount of Memory in Gibibytes that is allocated to a node
Average RAM Saturation	This is a situation where the available memory on a node in the cluster is nearly exhausted
Max RAM Saturation	This is the point where a container or pod reaches its configured memory limit
RAM Days to Full	Linear regression forecast for when allocatable Memory saturation is 100%
PVC Utilization	
Cluster Name	Name of the Kubernetes Cluster discovered and monitored by DII
Namespace	Kubernetes namespace which is a logical grouping of resources within a Kubernetes cluster that allows for isolation; organization; security; management and resource sharing
Data Center	DII configured annotation. Defines the location of the device
Volume	Name of the volume that supports the Persistent. Can be a QTREE, INTERNAL_VOLUME or VOLUME in DII
Allocated (GiB)	Allocated capacity in Gibibytes as reported by the block volume or internal volume in DII
Used (GiB)	Used capacity in Gibibytes of the block or internal volume
Days to Full	Linear regression forecast in Days for when the Persistent Volume reaches full capacity
PVC Name	The name of the Persistent Volume Claim. A PVC is a user's request for a specific amount of storage within a Kubernetes cluster
PVC Size (GiB)	The allocated size in Gibibytes of the Persistent Volume Claim. Derived from the k8s_pvc_capacity_fact in DII
PV Name	The name of the Persistent Volume. A PV is a storage resource in a cluster that's used to manage the storage of containerized applications
PV Size (GiB)	The allocated size in Gibibytes of the Persistent Volume
Total IOPS	Measures the total number of I/O service requests (read+write) on the volume during the selected time period (measured in I/O per sec)
Total Throughput (MB/sec)	The Rate at which data is being transmitted in a fixed amount of time in response to I/O service requests (measured in MB per sec)
Total Latency (ms)	The time it takes (total response time) from the moment a request for information arrives at the

	storage device to the time when the storage device begin to send the information back in response. This is the actual latency of the device in milliseconds
Workload Counters	
Cluster Name	Name of the Kubernetes cluster discovered and monitored by DII
Namespace	Kubernetes namespace which is a logical grouping of resources within a Kubernetes cluster that allows for isolation; organization; security; management and resource sharing
Container	A Kubernetes container is a software package that bundles an application and its runtime environment together e.g. ContainerD, Docker
Pod	The smallest unit of computing in Kubernetes. A pod is a collection of one or more containers that share resources and are scheduled to run together
Workload Name	A workload is an application running on Kubernetes
Usage CPU Cores	This is the amount of processing power a container or pod can utilize. Measured in units where one unit is equivalent to one virtual CPU core, allowing you to specify how much CPU a container can use by assigning a fractional value of a core (e.g., 0.5 CPU)
Request CPU Cores	The minimum amount of CPU processing power a container or pod needs to function properly, expressed as a number of CPU cores (which can be fractional)
Limit CPU Cores	The maximum amount of CPU resources a container or pod can use
Usage Memory (GiB)	The amount of RAM in Gibibytes currently being used by a container or pod within a cluster
Request Memory (GiB)	The minimum amount of memory in Gibibytes that Kubernetes is guaranteed to allocate to a container
Limit Memory (GiB)	The maximum amount of a resource to be used by a container

10.21 NetApp ONTAP Performance Comparison



Description: This report shows a performance comparison between NetApp AFF models 300,400,700 and 800.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 10.21 NetApp ONTAP Performance Comparison

10.21 NetApp ONTAP Performance Comparison Definitions

Metric/Attribute	Description
Array	Name of the NetApp storage node discovered and monitored by DII
Model	Model name of the NetApp storage node
Latency (ms)	The time it takes from the moment a request for information arrives at the storage device to the time when the storage device begin to send the information back in response. This is the actual latency of the device in milliseconds ● Latency (ms) >= 3 ● Latency (ms) Between 1.5 and 3
Throughput (MBps)	The Rate at which data is being transmitted in a fixed amount of time in response to I/O service requests (measured in MB per sec)
CPU %	Node CPU Utilization shows the percentage of time that one or more CPUs were busy. In DII, this is based on the higher of CPU, WAFL_EX and Kahuna Processor Domain metrics. Details are as follows: • System – avg_processor_busy, cpu_elapsed_time1 • WAFL – total_cp_msecs, cp_phase_times.P2_FLUSH • Processor – domain_busy, processor_elapsed_time Overall node utilization then is displayed as the higher of the 3 (system, WAFL or processor domains) which all indicate a controller's ability (utilization) to process read/write requests. For EMC Symmetrix Arrays, this metric is FA Port Utilization. ● CPU % >=70 ● CPU % Between 50 and 70
Full Date	Hourdatetime and/or Full Date fields derived from the Time Dimension and Date Dimension tables in the DWH

10.23 Workloads with Zero IOPS

Powered by Data Infrastructure Insights

Volume Performance by Cluster - Zero IOPS

Cluster	Family	Node	Aggregate	Volume	Application	Allocated (GiB)	Used (GiB)	Current PeakIOPS	Peak IOPS - 1 month	Peak IOPS - 3 months	Peak IOPS - 6 months	Peak IOPS - 9 months	Peak IOPS - 1yr
rtp-sa-cl06	FAS2000	rtp-sa-cl06-01	rtp-sa-cl06-01:aggr0_rtp_sa_cl06_01_root	rtp-sa-cl06:rtp-sa-cl06-01:vol0	N/A	348.62	56.91	478.21					
trinidad	FAS2000	trinidad-02	trinidad-02:aggr1_trinidad_02	trinidad:artur-cbcart1:artur_cbcart1_root	N/A	1	0.01	0.00	0.00	0.00	0.00		
gemini	AFF	gemini-04	gemini-04:ag_gemini_04_root	gemini:gemini-04:vol0	N/A	348.62	51	460.09					
fas8060-2n-rtp-13	FAS8000	fas8060-rtp-13b	fas8060-rtp-13b:fas8060_rtp_13b_SATA_1	fas8060-2n-rtp-13:esx-nfs:fg_oss_1634668828__0006	N/A	12,264.05	32.53	0.00	0.00	0.00	0.00	0.00	0.00
trinidad	FAS2000	trinidad-01	trinidad-01:aggr1_trinidad_01	trinidad:artur-cbcart1:data1	N/A	50	0	0.00	0.00	0.00	0.00		
grenada	AFF	grenada-04	grenada-04:aggr0_grenada_04	grenada:grenada-04:vol0	N/A	151.29	72.26	575.65					
jamaica	AFF	jamaica-01	jamaica-01:jamaica_01_SSD_1	jamaica:azvsvmmgt001:azvsvmmgt001_root	N/A	1	0	0.00					
barbuda	AFF	barbuda-01	barbuda-01:aggr0_barbuda_01	barbuda:barbuda-01:vol0	N/A	348.62	89.49	800.40					
DEMOF2750	FAS2000	DEMOF2750-02	DEMOF2750-02:DEMOF2750_02_SAS_1	DEMOF2750:SVM-POC:Datastore02_vol	N/A	5,222.4	1,708.63	249.18					
gemini	AFF	gemini-04	gemini-04:ag_gemini_04_SSD	gemini:gemini:MDV_CRS_adc4c1d06eea11e2895612378563412_A	N/A	10	0	0.11	0.08	0.86	0.80	0.68	0.35
rtp-sa-cl01	FAS8000	rtp-sa-cl01-07	rtp-sa-cl01-07:aggr0_nj_cl01_07_root	rtp-sa-cl01:rtp-sa-cl01-07:vol0	N/A	677.09	74.01	777.55					
gemini	AFF	gemini-03	gemini-03:ag_gemini_03_SSD	gemini:ansible:ansibleVol	N/A	10	0	0.00	0.00	0.00	0.00	0.00	0.00
ocisedev	FAS2000	ocisedev-02	ocisedev-02:t1appAggr01	ocisedev:CloudComplianceSVM:CloudComplianceSVM_root	N/A	1	0	0.00	0.00	0.00	0.00	0.00	0.00
ocisedev	FAS2000	ocisedev-01	ocisedev-01:aggr0_ocisedev_01	ocisedev:ocisedev-01:vol0	N/A	522.93	46	738.47					
rtp-sa-cl07	FAS2000	rtp-sa-cl07-02	rtp-sa-cl07-02:aggr_SnapLock_02	rtp-sa-cl07:dpsvm01:leafly_MMC_demo_dest_sl1	N/A	10	0.02	0.00	0.00	0.00	0.00	0.00	0.00
rtp-sa-cl05	FAS2000	rtp-sa-cl05-02	rtp-sa-cl05-02:rtp_sa_cl05_02_data_ssd	rtp-sa-cl05:dpsvm:vol_spacesemi_dest	N/A	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00
antigua	AFF	antigua-01	antigua-01:antigua_01_SSD_1	antigua:bshsvmmgt002:bshsvmmgt002_root	N/A	1	0	0.31					
rtp-sa-fas8200-infra	FAS8000	rtp-sa-fas8200-1b	rtp-sa-fas8200-1b:rtp_sa_fas8200_1b_SAS_1	rtp-sa-fas8200-infra:earlyaccess:earlyaccess	N/A	3,072	1.34	5.63					
fas8060-2n-rtp-13	FAS8000	fas8060-rtp-13a	fas8060-rtp-13a:fas8060_rtp_13a_SSD_1	fas8060-2n-rtp-13:db_svm:MySQLMP1	N/A	10.53	1.09	0.00	0.00	0.00	0.00	0.00	0.00
fas8060-2n-rtp-13	FAS8000	fas8060-rtp-13a	fas8060-rtp-13a:aggr0_fas8060_rtp_13a	fas8060-2n-rtp-13:fas8060-rtp-13a:vol0	N/A	677.09	56.53	488.49					
rtp-cilab-fas2750	FAS2000	rtp-cilab-fas2750a	rtp-cilab-fas2750a:aggr1a_ssd	rtp-cilab-fas2750:vmwareDSfc01:Tier1_vmdsfc01	App1_Production_Primary Site	395.52	0.08	3.43					
A250-41-42-43	AFF	A250-42	A250-42:astra_aggr1	A250-41-42-43:A250-41-42-43:MDV_CRS_6cec870ecfca11ecbaedd039ea4da9fd_A	N/A	10	0.04	1.39					
stiA200-2391731424741	AFF	stiA200-239	stiA200-239:stiA200_239_aggr1	stiA200-2391731424741:vs0:root_vs0	N/A	1	0	0.00					
rtp-sa-cl06	FAS2000	rtp-sa-cl06-02	rtp-sa-cl06-02:aggr_data1_rtp_sa_cl06_02	rtp-sa-cl06:dpsvm01_dest:dpsvm01_dest_root	N/A	1	0	0.00	0.00	0.00	0.00	0.00	0.00
rtp-sa-cl01	FAS8000	rtp-sa-cl01-06	rtp-sa-cl01-06:aggr_cl01_06_SSD	rtp-sa-cl01:Containers_SVM:ufw_test	N/A	10.53	0.03	0.00	0.00	0.00	0.00	0.00	0.00
Infra-OTS	FAS	Infra-OTS-01	Infra-OTS-01:Infra_OTS_01_SSD_1	Infra-OTS:paul-cifs:paul_vol1	N/A	20	11.31	0.00	0.00				
barbuda	AFF	barbuda-01	barbuda-01:barbuda_01_SSD_1	barbuda:barbuda:MDV_CRS_3da52ee5dbce11eeb54a00a098f23270_B	N/A	10	0.08	6.31		0.11	0.11		
rtp-sa-cl05	FAS2000	rtp-sa-cl05-02	rtp-sa-cl05-02:rtp_sa_cl05_02_data	rtp-sa-cl05:dpsvm:cm_sourcedata_dest	N/A	8.89	7.33	0.00	0.00	0.00	0.00	0.00	0.00
barbuda	AFF	barbuda-02	barbuda-02:aggr0_barbuda_02	barbuda:barbuda-02:vol0	N/A	348.62	97.55	544.89					
rtp-cilab-fas2750	FAS2000	rtp-cilab-fas2750b	rtp-cilab-fas2750b:aggr1b_ssd	rtp-cilab-fas2750:vmwareDatastores:fabrizis_8th	N/A	0.1	0	0.00	0.00				
A250-41-42-43	AFF	A250-43	A250-43:aggr0_A250_41_42_43_02	A250-41-42-43:A250-43:vol0	N/A	151.29	81.38	460.68					
rtp-sa-cl07	FAS2000	rtp-sa-cl07-02	rtp-sa-cl07-02:aggr0_rtp_sa_cl07_02_root	rtp-sa-cl07:rtp-sa-cl07-02:vol0	N/A	677.09	59.44	747.11					
Fsxid025b9d58c14bdafbb	FSx for ONTAP	Fsxid025b9d58c14bdafbb-01	Fsxid025b9d58c14bdafbb-01:aggr1	Fsxid025b9d58c14bdafbb:fsx:epic_nfs	N/A	4,000	0.53	0.00	0.00	0.00	0.00	0.00	0.00
rtp-sa-fas8200-infra	FAS8000	rtp-sa-fas8200-1b	rtp-sa-fas8200-1b:rtp_sa_fas8200_1b_SSD_1	rtp-sa-fas8200-infra:sa-app-db-nonprod:cxscdb1_oraarch1_dest	N/A	155.3	141.78	0.00	0.00				
DEMOF2750	FAS2000	DEMOF2750-01	DEMOF2750-01:DEMOF2750_01_SAS_1	DEMOF2750:SVM-POC:Datastore01_vol	N/A	5,222.4	900.8	208.32					
tawny	FAS8000	tawny02	tawny02:tawny02sas1	tawny:tawny_ci_dev:flexVol_dev01	N/A	3,072	553.61	0.00	0.00	0.00	0.00	0.00	0.00
rtp-sa-cl05	FAS2000	rtp-sa-cl05-02	rtp-sa-cl05-02:aggr0_rtp_sa_cl05_02_root	rtp-sa-cl05:rtp-sa-cl05-02:vol0	N/A	348.62	55.7	737.45					
saba	FAS	saba-01	saba-01:aggr0_saba_01	saba:saba-01:vol0	N/A	151.29	71.01	456.98					
umeng-aff300-01-02	AFF	umeng-aff300-01	umeng-aff300-01:umeng_aff300_aggr2	umeng-aff300-01-02:abcde:abc	N/A	0.1	0	0.00					
barbuda	AFF	barbuda-02	barbuda-02:barbuda_02_SSD_1	barbuda:barbuda:MDV_CRS_3da52ee5dbce11eeb54a00a098f23270_A	N/A	10	0.01	0.04	0.03				
antigua	AFF	antigua-02	antigua-02:aggr0_antigua_02	antigua:antigua-02:vol0	N/A	348.62	86.31	568.40					
rtp-cilab-fas2750	FAS2000	rtp-cilab-fas2750b	rtp-cilab-fas2750b:aggr0_rtp_cilab_fas2750b	rtp-cilab-fas2750:rtp-cilab-fas2750b:vol0	N/A	151.29	45.5	564.86					
rtp-sa-cl07	FAS2000	rtp-sa-cl07-01	rtp-sa-cl07-01:aggr_data_01_rtp_sa_cl07_01	rtp-sa-cl07:dpsvm01:a_demo_volume_clone_restore1	Ansible	10	0	0.00	0.00	0.00	0.00	0.00	0.00
rtp-sa-cl07	FAS2000	rtp-sa-cl07-02	rtp-sa-cl07-02:aggr_data_01_rtp_sa_cl07_02	rtp-sa-cl07:dpsvm01:dpsvm01_root	N/A	1	0	0.00	0.00	0.00	0.00	0.00	0.00
saba	FAS	saba-02	saba-02:aggr1_saba_02	saba:cbc-san-fcp8:svm_georg_fcp8_root	N/A	1	0	0.00	0.00	0.00	0.00	0.00	0.00
rtpsh-openlab-01-02	FAS2000	rtpsh-openlab-01	rtpsh-openlab-01:nane_conahan	rtpsh-openlab-01-02:nane_conahan:nane_conahan	N/A	9,216	5,072.47	345.84					

Description: This report shows NetApp volumes with extremely low or zero IOPS for current, 1 month ago, 3 months ago, 6 months ago, 9 months ago, and 1 year ago.

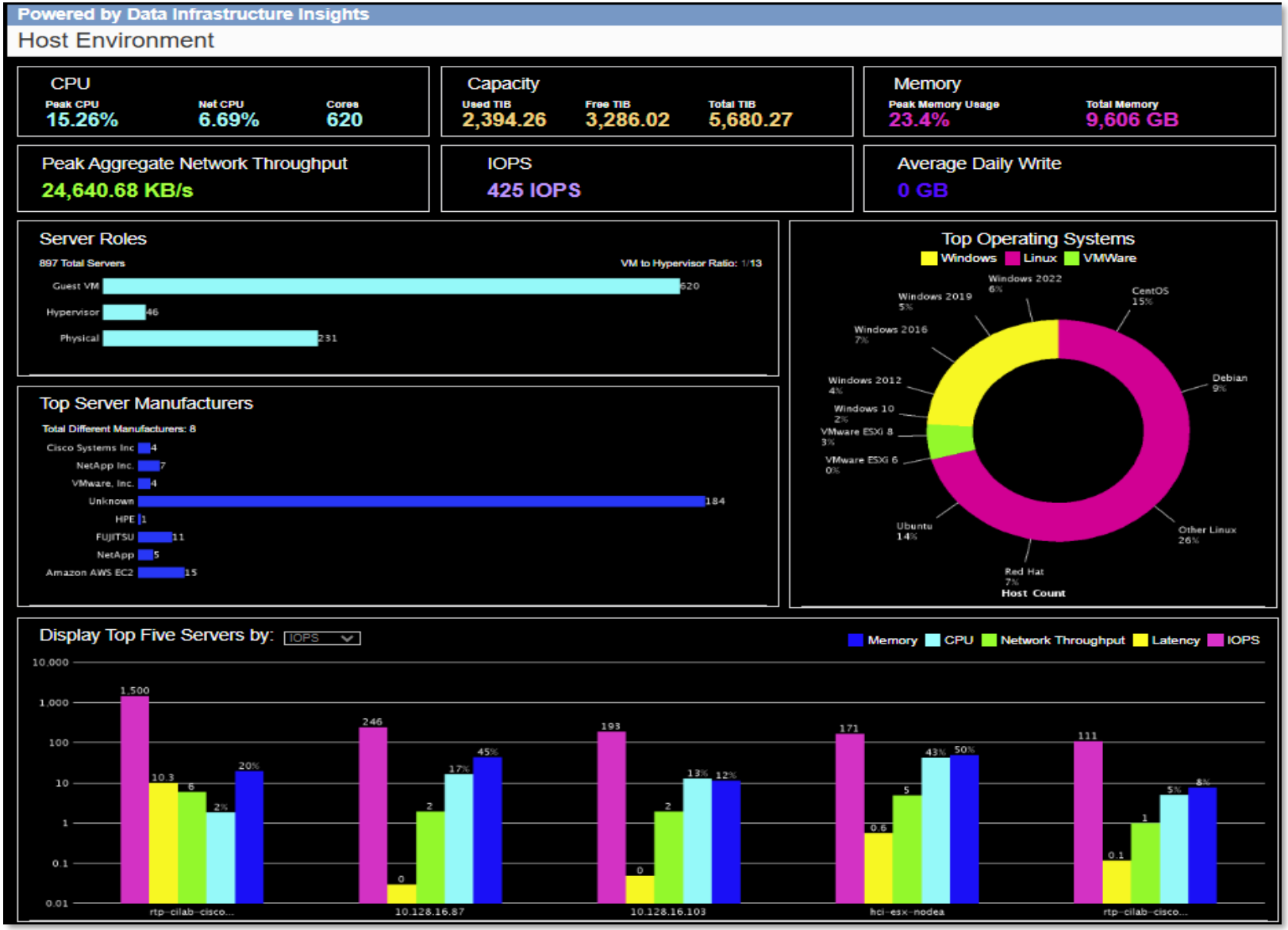
Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 10.23 Volume Performance by Cluster - Zero IOPS

10.23 Workloads with Zero IOPS Definitions

Metric/Attribute	Description
Cluster	Name of the CDOT cluster discovered and monitored by DII
Family	Family name of the cluster
Node	Name of the node associated with the cluster
Aggregate	Name of the aggregate associated with the node
Volume	Name of the volume associated with the aggregate
Application	DII configured annotation. Defines the application associated with the virtual machine or backend storage capacity
Allocated (GiB)	Total allocated capacity in Gibibytes for the internal volume (Flexvol) as reported by the aggregate
Used (GiB)	Total used capacity in Gibibytes for the internal volume
Current Peak IOPS	Maximum IOPS for the internal volume for the current period when peakIOPS < 1
Peak IOPS – 1 Month	Maximum IOPS for the internal volume exactly 1 month ago when peakIOPS < 1. Derived from the internal_volume_capacity fact using the date filter DATE(date_dimension.fullDate) = DATE_SUB(DATE(CURDATE()), INTERVAL 30 DAY) CURDATE() = today's date
Peak IOPS – 3 Months	Maximum IOPS for the internal volume exactly 3 months ago when peakIOPS < 1. Derived from the internal_volume_capacity fact using the date filter DATE(date_dimension.fullDate) = DATE_SUB(DATE(CURDATE()), INTERVAL 3 MONTH)
Peak IOPS – 6 Months	Maximum IOPS for the internal volume exactly 3 months ago when peakIOPS < 1. Derived from the internal_volume_capacity fact using the date filter DATE(date_dimension.fullDate) = DATE_SUB(DATE(CURDATE()), INTERVAL 6 MONTH)
Peak IOPS – 9 Months	Maximum IOPS for the internal volume exactly 3 months ago when peakIOPS < 1. Derived from the internal_volume_capacity fact using the date filter DATE(date_dimension.fullDate) = DATE_SUB(DATE(CURDATE()), INTERVAL 9 MONTH)
Peak IOPS – 1 Year	Maximum IOPS for the internal volume exactly 3 months ago when peakIOPS < 1. Derived from the internal_volume_capacity fact using the date filter DATE(date_dimension.fullDate) = DATE_SUB(DATE(CURDATE()), INTERVAL 12 MONTH)

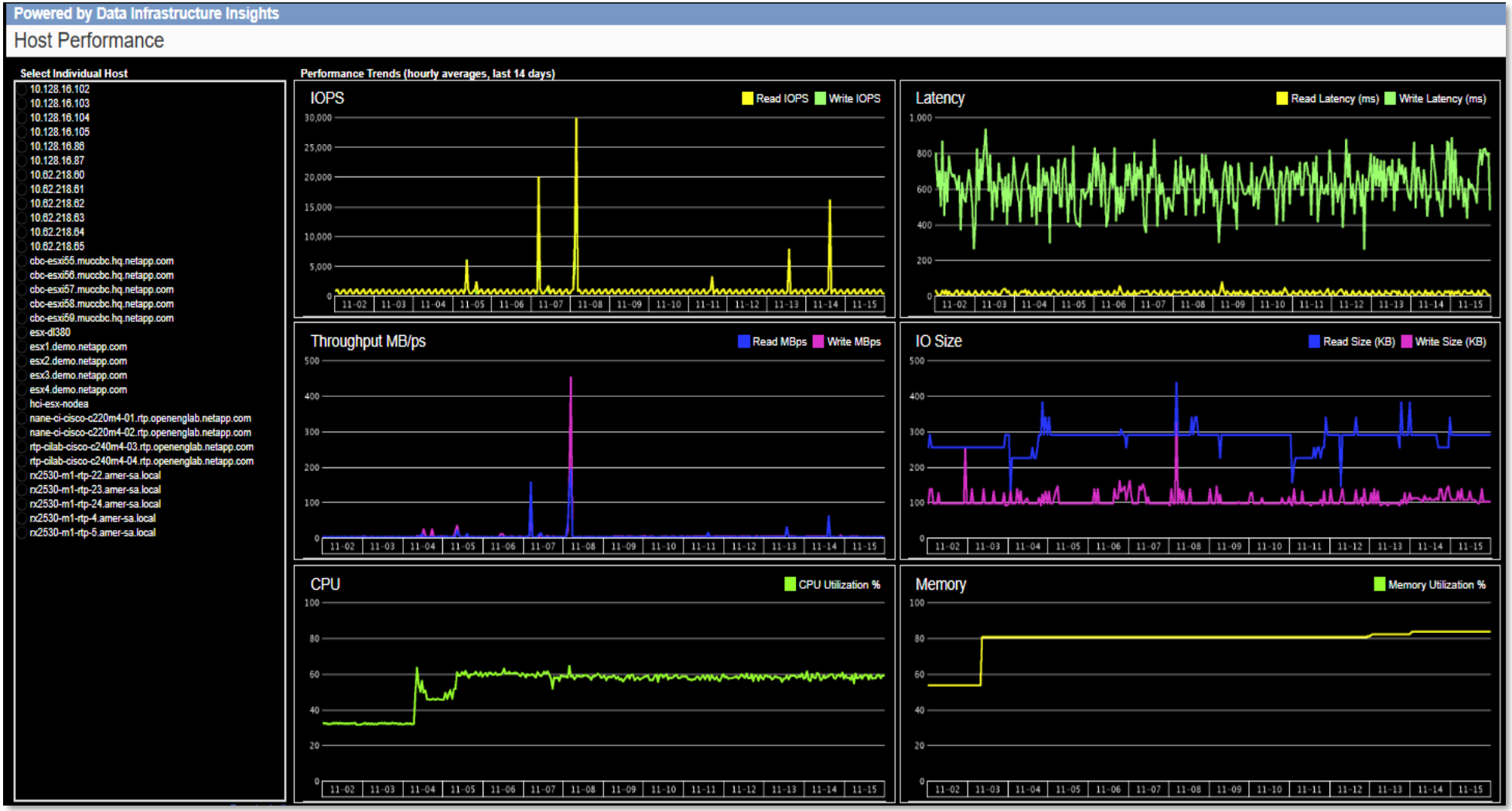
10.24 Host Environment (Live Optics)



Description: This report shows Host Environment Capacity and Performance details.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 10.24 Host Environment (Live Optics)



10.24 Host Environment (Live Optics) Definitions

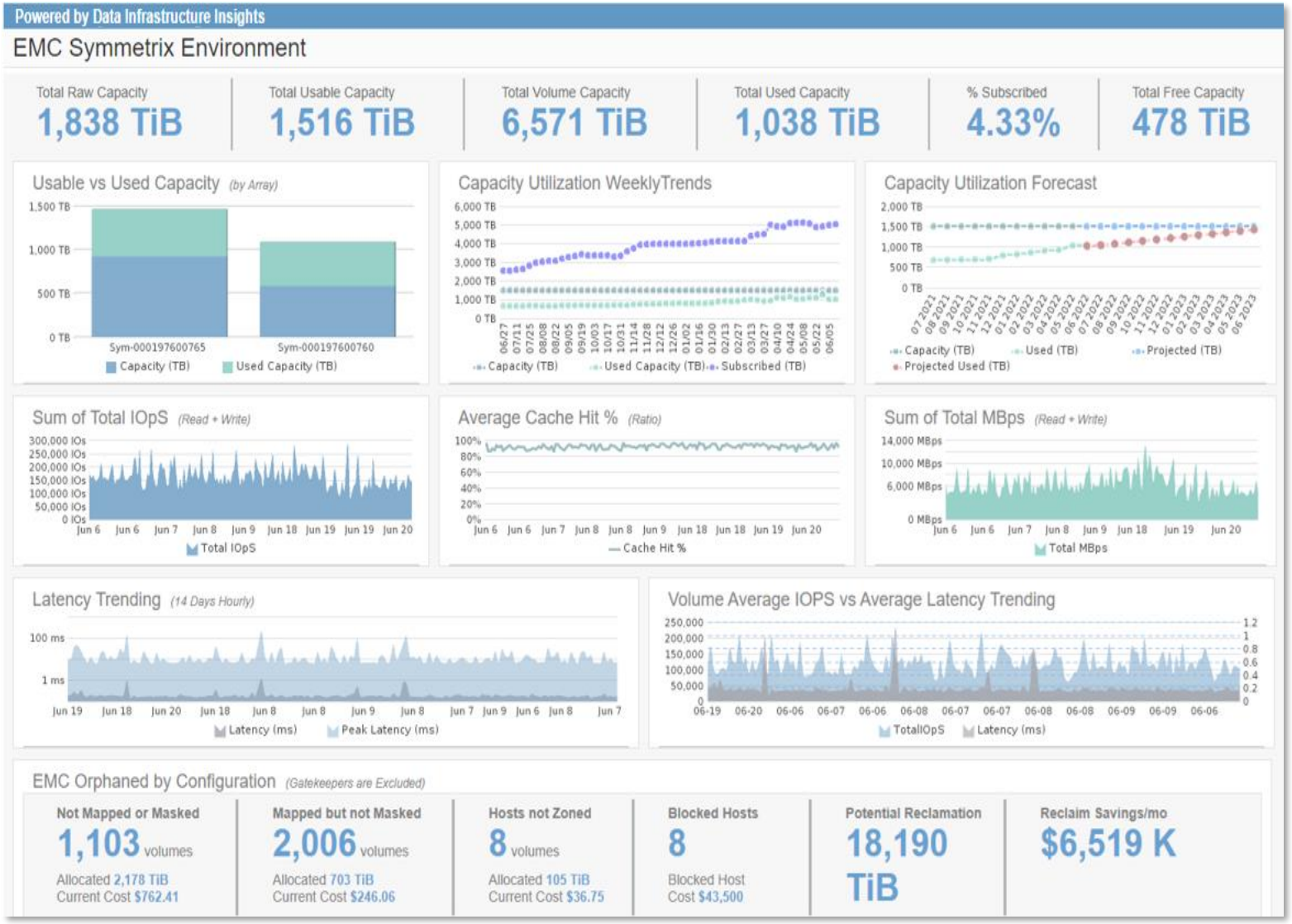
Metric/Attribute	Description
Host Environment	
Host	The name of the host/server discovered and monitored by DII
Manufacturer / Vendor	The name of the manufacturer or vendor associated with the host
Peak CPU %	The maximum utilization percentage of physical CPUs associated with the ESX server or hypervisor
Net CPU %	The average utilization percentage of physical CPUs associated with the ESX server or hypervisor
Cores	The number of total cores associated with physical servers
Used TiB	Total amount of used capacity in Tebibytes for all storage pools or aggregates
Free TiB	Total TiB - Used TiB
Total TiB	Usable capacity allocated for a storage-pool as reported by the storage-array in Tebibytes (Base 2 units)
Peak Memory Usage %	The maximum vRAM utilization % for all virtual machines discovered and monitored by DII
Total Memory	Total amount of vRAM in Gibibytes allocated to virtual machines
Peak Aggregate Network Throughput	Maximum throughput in Megabytes per second (MB/sec) for all disks associated with storage pools or aggregates in DII
IOPS	Maximum of average total IOPS (read+write) for all disks associated with storage pools or aggregates
Latency	Average response time in milliseconds for the top 5 ESX hypervisors discovered and monitored by DII
Average Daily Write	Average throughput in Megabytes per second (MB/sec) for all disks associated with storage pools or aggregates in DII
Server Roles	The server role e.g. Physical, Hypervisor, Guest VM
Top Operating Systems	All the operating systems associated with virtual machines with % allocation
Host Performance	
IOPS	Maximum of average total IOPS (read+write) for ESX hypervisors for 14 days hourly data collection
Latency	Maximum of average total response time in milliseconds for ESX hypervisors for 14 days hourly data collection
Throughput MBps	Maximum of throughput in Megabytes per second (read+write) for ESX hypervisors for 14 days hourly data collection
IO Size Read	(Throughput MBps*1024) / Read IOPS
CPU	The maximum of average utilization percentage of physical CPUs associated with the ESX server or hypervisor for 14 days hourly data collection
Memory	The maximum of average utilization percentage of physical Memory associated with the ESX server or hypervisor for 14 days hourly data collection
Date / Time	Full Date field derived from the DateDimension table in the DWH. Hourdatetime field derived from the Time Dimension table in the DWH

Vendor Centric Overview

These are some of the day-to-day and monthly vendor centric IT infrastructure issues that can be addressed by leveraging the reports in this catalog. Here are some of the objectives met by this section.

- ❑ EMC Symmetrix Environment
- ❑ HDS Environment Usage
- ❑ 3Par Environment Usage
- ❑ Multi-Vendor Storage Overview
- ❑ Isilon Capacity and Performance
- ❑ EMC Data Domain Inventory
- ❑ NetApp Qtree Capacity and Performance

11.1 EMC Symmetrix Environment



Report XML: 11.1 EMC Symmetrix Environment

Description: This EMC vendor centric dashboard created exclusively for Symmetrix Arrays shows capacity and performance metrics for all devices by default. A filter is provided to select one or more arrays known to DII.

Capacity Trends, VMAX Port Utilization, IOpS and Disk Utilization are visible using 14-day hourly performance metrics. The report is rounded out with Orphaned Capacity and Violations at the bottom.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

11.1 EMC Symmetrix Environment Definitions

Metric/Attribute	Description
Array	Name of the Symmetrix storage device monitored by DII
Total Raw Capacity TiB	Pre-RAID raw capacity in Tebibytes as reported by the Storage Array monitored by DII and contained in the Storage and Storage Pool Capacity Fact table
Total Usable Capacity TiB	Usable capacity in Tebibytes as reported by the storage pool or aggregate and contained in the Storage and Storage Pool Capacity Fact table
Total Volume Capacity TiB	Total SAN provisioned capacity in Tebibytes presented to host initiators
Total Used Capacity TiB	Used capacity in TiB as reported by the storage pool or aggregate and contained in the Storage and Storage Pool Capacity Fact table. If Thin Provisioned, then Used = Written. If Thick Provisioned, then Used = Allocated
% Subscribed	Total Volume Capacity TiB / Total Usable Capacity TiB
Total Free Capacity	Total Usable Capacity TiB – Total Used Capacity TiB
Date	Hourdatetime and/or fulldate fields derived from the Time Dimension and Date Dimension tables in the DWH
Capacity (TiB)	Same as Total Usable Capacity TiB
Used (TiB)	Same as Total Used Capacity TiB
Projected (TiB)	Projected Capacity in Tebibytes for future 12-month period. Based on standard linear regression formula and contained in the Storage and Storage Pools Capacity Future Fact table
Projected Used (TiB)	Projected Used Tebibytes for future 12-month period. Based on standard linear regression formula and contained in the Storage and Storage Pools Capacity Future Fact table
Avg Utilization	Average FA Port Utilization for EMC Symmetrix devices collected hourly for 14 days
Peak Utilization	Peak FA Port Utilization for EMC Symmetrix devices collected hourly for 14 days
Cache Hit %	Cache Hit Ratio as reported by the storage system cache collected hourly for 14 days
Sum of Total IOPS	Sum of Total Volume IOpS (both Read and Write) averaged hourly for 14 days
Latency (ms)	Average Volume Latency in milliseconds averaged hourly for 14 days
Peak Latency (ms)	Peak Volume Latency in milliseconds averaged hourly for 14 days
Average Disk Utilization	Average Disk Utilization % reported by the disks that support storage pools or RAID Groups, averaged hourly for 14 days
Peak Disk Utilization	Peak Disk Utilization % reported by the disks that support storage pools or RAID Groups, averaged hourly for 14 days
Orphaned Capacity GiB	Capacity in Gibibytes that is allocated but not mapped or masked to host initiators. This metric is reported by the volume_history_capacity_fact table in the DWH

11.2 HDS Environment Usage

Description: This Hitachi (HDS) vendor centric dashboard created exclusively for Hitachi Arrays shows capacity and performance metrics for all devices by default. A filter is provided to select one or more arrays known to DII.

Thin and Thick Capacity metrics, Capacity Trends, IOpS, Latency, Throughput and Disk Utilization are visible using 14-day hourly performance metrics

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 11.2 HDS Environment Usage

11.2 HDS Environment Usage Definitions

Metric/Attribute	Description
Data Center	DII configured annotation. Defines the location or Data Center associated with the specific device
Version	The Model Name of the Hitachi Storage Array monitored by DII
Date	Hourdatetime and/or fulldate fields derived from the Time Dimension and Date Dimension tables in the DWH
Raw TiB	Pre-RAID raw capacity in Tebibytes as reported by the Storage Array monitored by DII and contained in the Storage and Storage Pool Capacity Fact table
Thick Usable TiB	Sum of LDEV configured capacity that is available for mapping and masking to host initiators
Thin Usable TiB	Usable capacity in Tebibytes as reported by the storage pool and contained in the Storage and Storage Pool Capacity Fact table
Violations	Not currently supported in DII
Thick Allocated TiB	LDEV capacity that is mapped and masked to host initiators
Thick UnAllocated TiB	LDEV capacity that is NOT mapped or masked to host initiators
Thin Allocated TiB	Capacity that is thin provisioned and allocated to host initiators
Thin Used TiB	Used capacity in TiB that is flagged as thin provisioned as reported by the storage pool or aggregate and contained in the Storage and Storage Pool Capacity Fact table. This is capacity that is written to the volume
Subscription %	Thin Allocated TiB / Thin Usable TiB
% Used	Thin Used TiB / Thin Usable TiB
Latency (ms)	Average Volume Latency in milliseconds reported by the Hitachi Array for 14 days hourly
Sum of Average/Peak MBps	Average and Peak Volume Throughput in MB/sec reported by the Hitachi Array for 14 days hourly
Sum of Average/Peak IOPS	Average and Peak Volume IOpS reported by the Hitachi Array for 14 days hourly
Disk Utilization %	Average and Peak Disk Utilization % reported by the disks that support storage pools or RAID Groups over the selected time period

11.3 3Par Environment Usage

Description: This dashboard depicts the overall 3PAR footprint within the global infrastructure. Starting off with basic capacity metrics, it displays how well the overall environment is performing against default thresholds that can be configured from a utilization and from a capacity perspective. This quickly describes what should be investigated and where additional storage may be required.

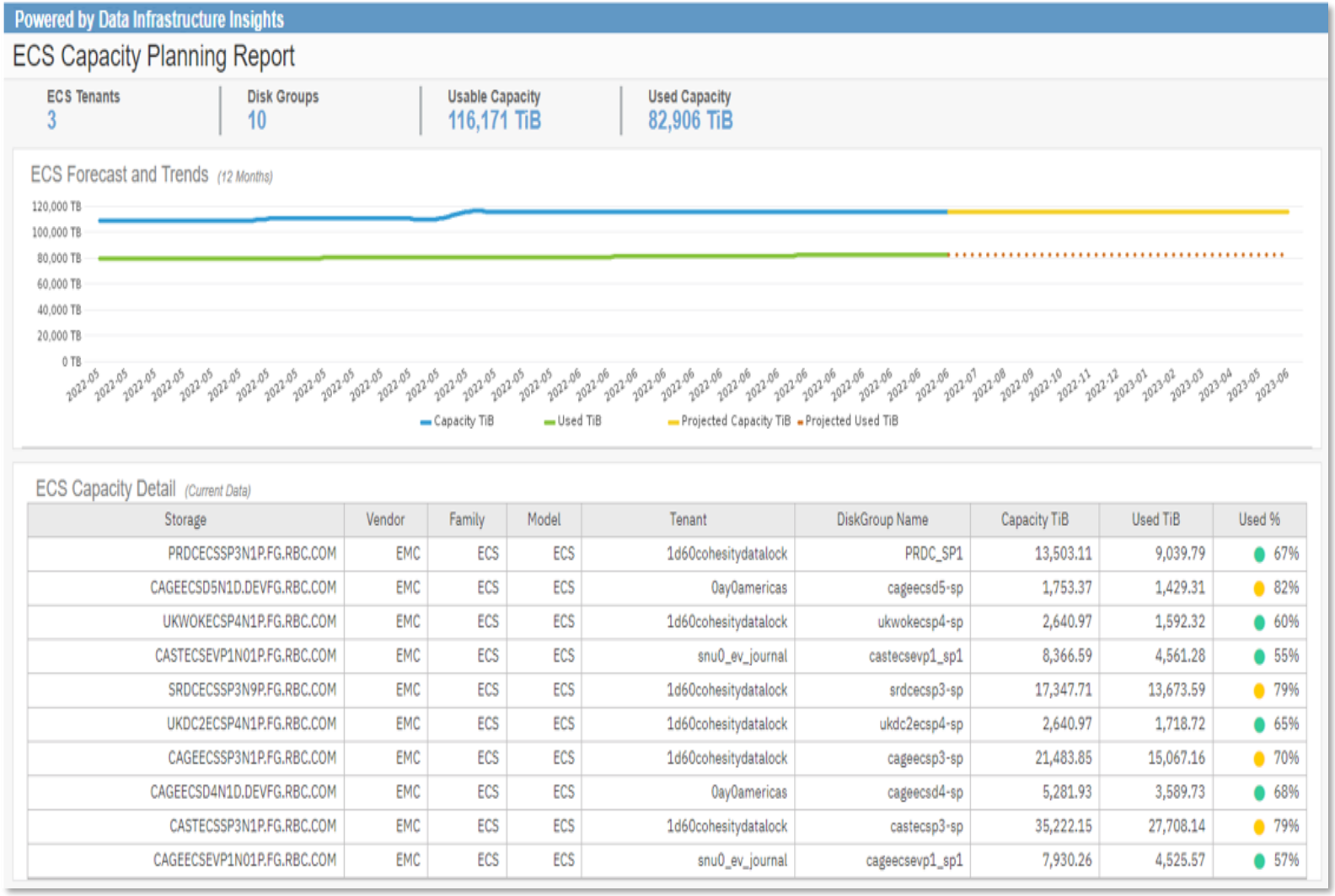
Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 11.3 3Par Environment Usage

11.3 3Par Environment Usage Definitions

Metric/Attribute	Description
Data Center	DII configured annotation. Defines the location or Data Center associated with the specific device
Version	The Model Name of the 3Par Storage Array monitored by DII
Date	Hourdatetime and/or fulldate fields derived from the Time Dimension and Date Dimension tables in the DWH
Raw TiB	Pre-RAID raw capacity in Tebibytes as reported by the Storage Array monitored by DII and contained in the Storage and Storage Pool Capacity Fact table
Thick Usable TiB	Sum of Disk Capacity associated with CPG pools
Thick Used Capacity TiB	Sum of Disk Capacity – Available Capacity
Available Capacity GiB	Physical Disk Capacity associated with the FREE CHUNKLET storage pool
Thin Usable TiB	Usable capacity in Tebibytes as reported by the storage pool and contained in the Storage and Storage Pool Capacity Fact table
Thin Used Capacity TiB	Used capacity in TiB as reported by the storage pool and contained in the Storage and Storage Pool Capacity Fact table. Thin Provisioned capacity is reported as written
Thin Capacity Utilization %	Thin Used Capacity TiB / Thin Usable TiB
Thin Volume Allocated TiB	Capacity that is thin provisioned to host initiators
Subscription %	Thin Volume Allocated TiB / Thin Usable TiB
% Used	Thin Used TiB / Thin Usable TiB
Latency (ms)	Average Volume Latency in milliseconds reported by the 3Par Array for 14 days hourly
Sum of Average/Peak MBps	Average and Peak Volume Throughput in MB/sec reported by the 3Par Array for 14 days hourly
Sum of Average/Peak IOPS	Average and Peak Volume IOpS reported by the 3Par Array for 14 days hourly
Disk Utilization %	Average and Peak Disk Utilization % reported by the disks that support storage pools or RAID Groups over the selected time period

11.5 ECS Capacity Planning Report



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ECS Capacity Planning Report

ECS Tenants	Disk Groups	Usable Capacity	Used Capacity
3	10	116,171 TiB	82,906 TiB

ECS Forecast and Trends (12 Months)

ECS Capacity Detail (Current Data)

Storage	Vendor	Family	Model	Tenant	DiskGroup Name	Capacity TiB	Used TiB	Used %
PRDCECSSP3N1P.FG.RBC.COM	EMC	ECS	ECS	1d60cohesitydatalock	PRDC_SP1	13,503.11	9,039.79	67%
CAGEECSD5N1D.DEVFG.RBC.COM	EMC	ECS	ECS	0ay0americas	cageecsd5-sp	1,753.37	1,429.31	82%
UKWOKECSP4N1P.FG.RBC.COM	EMC	ECS	ECS	1d60cohesitydatalock	ukwokecsp4-sp	2,640.97	1,592.32	60%
CASTECSEVP1N01P.FG.RBC.COM	EMC	ECS	ECS	snu0_ev_journal	castecsevp1_sp1	8,366.59	4,561.28	55%
SRDCECSSP3N9P.FG.RBC.COM	EMC	ECS	ECS	1d60cohesitydatalock	srdcecsp3-sp	17,347.71	13,673.59	79%
UKDC2ECSP4N1P.FG.RBC.COM	EMC	ECS	ECS	1d60cohesitydatalock	ukdc2ecsp4-sp	2,640.97	1,718.72	65%
CAGEECSSP3N1P.FG.RBC.COM	EMC	ECS	ECS	1d60cohesitydatalock	cageecsp3-sp	21,483.85	15,067.16	70%
CAGEECSD4N1D.DEVFG.RBC.COM	EMC	ECS	ECS	0ay0americas	cageecsd4-sp	5,281.93	3,589.73	68%
CASTECSSP3N1P.FG.RBC.COM	EMC	ECS	ECS	1d60cohesitydatalock	castecsp3-sp	35,222.15	27,708.14	79%
CAGEECSEVP1N01P.FG.RBC.COM	EMC	ECS	ECS	snu0_ev_journal	cageecsevp1_sp1	7,930.26	4,525.57	57%

Description: This report shows capacity planning metrics for ECS storage devices.

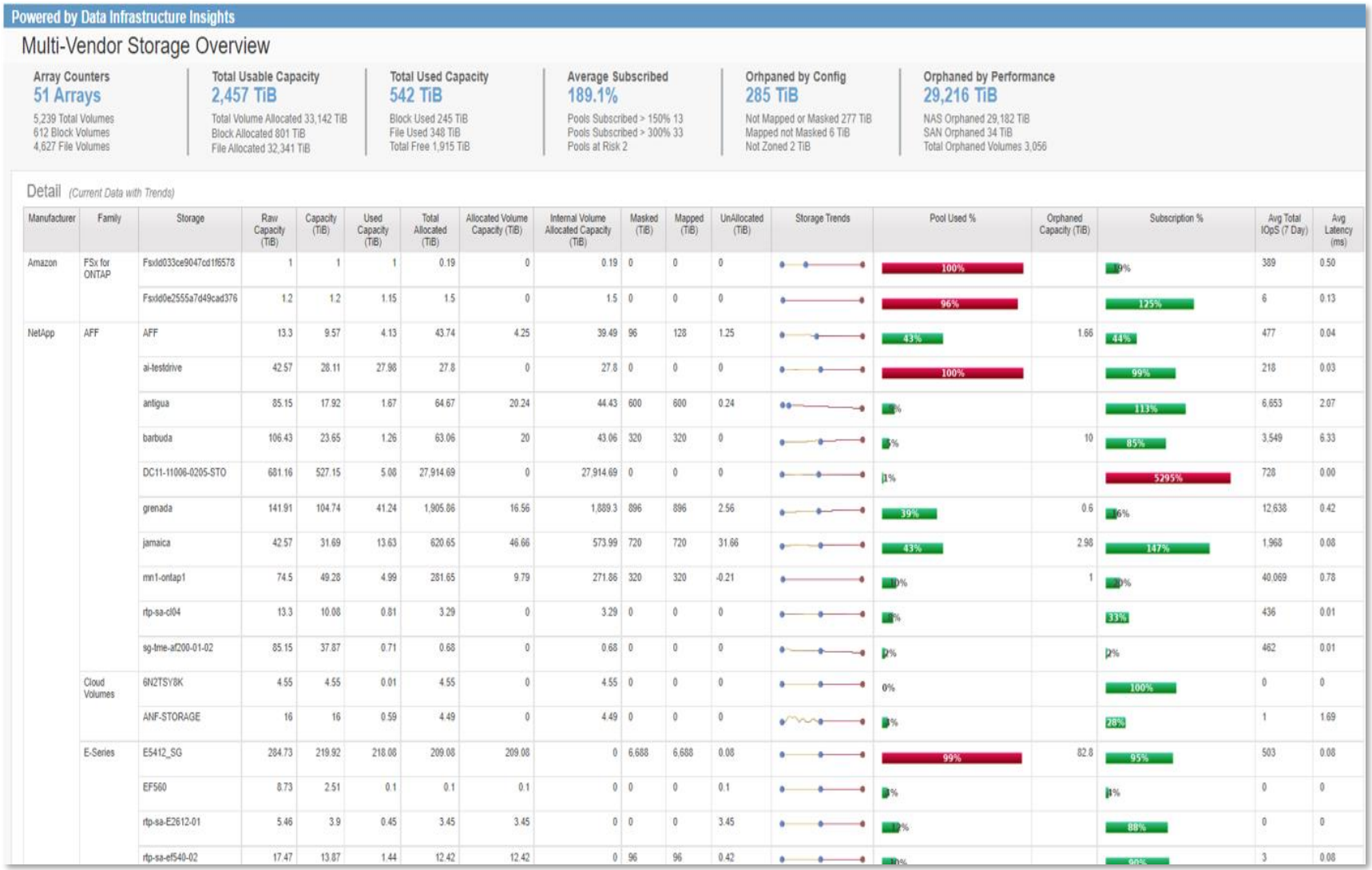
Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 11.5 ECS Capacity Planning Report

11.5 ECS Capacity Planning Report Definitions

Metric/Attribute	Description
Storage	Name of the ECS storage device discovered and monitored by DII
Vendor	Manufacturer of the storage device
Family	Storage family associated with the ECS storage device
Model	Model name associated with the ECS storage device
Tenant	Name of the Tenant as derived from the storage pool associated with the ECS device
DiskGroup Name	Name of the DiskGroup associated with the ECS storage device
Capacity TiB	Usable Capacity in Tebibytes as derived form the disk_group_capacity_fact and associated with the ECS device
Used TiB	Used Capacity in Tebibytes as derived form the disk_group_capacity_fact
Used %	Used TiB / Capacity TiB ● Used % >= .9 ● Used % Between .70 and .90 ● Used % < .70
Projected Capacity TiB	Forecast capacity in Tebibytes derived from the disk_group_capacity_future_fact table in the DWH
Projected Used TiB	Forecast Used capacity in Tebibytes derived from the disk_group_capacity_future_fact table
Date	Hourdatetime and/or fulldate fields derived from the Time Dimension and Date Dimension tables in the DWH

11.6 Multi-Vendor Storage Overview



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Multi-Vendor Storage Overview

Array Counters	Total Usable Capacity	Total Used Capacity	Average Subscribed	Orhpaned by Config	Orphaned by Performance
51 Arrays	2,457 TiB	542 TiB	189.1%	285 TiB	29,216 TiB
5,239 Total Volumes 612 Block Volumes 4,627 File Volumes	Total Volume Allocated 33,142 TiB Block Allocated 801 TiB File Allocated 32,341 TiB	Block Used 245 TiB File Used 348 TiB Total Free 1,915 TiB	Pools Subscribed > 150% 13 Pools Subscribed > 300% 33 Pools at Risk 2	Not Mapped or Masked 277 TiB Mapped not Masked 6 TiB Not Zoned 2 TiB	NAS Orphaned 29,182 TiB SAN Orphaned 34 TiB Total Orphaned Volumes 3,056

Detail *(Current Data with Trends)*

Manufacturer	Family	Storage	Raw Capacity (TiB)	Capacity (TiB)	Used Capacity (TiB)	Total Allocated (TiB)	Allocated Volume Capacity (TiB)	Internal Volume Allocated Capacity (TiB)	Masked (TiB)	Mapped (TiB)	UnAllocated (TiB)	Storage Trends	Pool Used %	Orphaned Capacity (TiB)	Subscription %	Avg Total IOpS (7 Day)	Avg Latency (ms)
Amazon	FSx for ONTAP	Fsxid033ce9047cd1f6578	1	1	1	0.19	0	0.19	0	0	0		100%		9%	389	0.50
		Fsxid0e2555a7d49cad376	1.2	1.2	1.15	1.5	0	1.5	0	0	0		96%		125%	6	0.13
NetApp	AFF	AFF	13.3	9.57	4.13	43.74	4.25	39.49	96	128	1.25		43%	1.66	44%	477	0.04
		ai-testdrive	42.57	28.11	27.98	27.8	0	27.8	0	0	0		100%		99%	218	0.03
		antigua	85.15	17.92	1.67	64.67	20.24	44.43	600	600	0.24		3%		113%	6,653	2.07
		barbuda	106.43	23.65	1.26	63.06	20	43.06	320	320	0		5%	10	85%	3,549	6.33
		DC11-11006-0205-STO	681.16	527.15	5.08	27,914.69	0	27,914.69	0	0	0		1%		5295%	728	0.00
		grenada	141.91	104.74	41.24	1,905.86	16.56	1,889.3	896	896	2.56		39%	0.6	6%	12,638	0.42
		jamaica	42.57	31.69	13.63	620.65	46.66	573.99	720	720	31.66		43%	2.98	147%	1,968	0.08
		mn1-ontap1	74.5	49.28	4.99	281.65	9.79	271.86	320	320	-0.21		0%	1	0%	40,069	0.78
		rtp-sa-cl04	13.3	10.08	0.81	3.29	0	3.29	0	0	0		8%		33%	436	0.01
		sg-tme-af200-01-02	85.15	37.87	0.71	0.68	0	0.68	0	0	0		2%		2%	462	0.01
	Cloud Volumes	6N2TSY8K	4.55	4.55	0.01	4.55	0	4.55	0	0	0		0%		100%	0	0
		ANF-STORAGE	16	16	0.59	4.49	0	4.49	0	0	0		3%		28%	1	1.69
	E-Series	E5412_SG	284.73	219.92	218.08	209.08	209.08	0	6,688	6,688	0.08		99%	82.8	95%	503	0.08
		EF560	8.73	2.51	0.1	0.1	0.1	0	0	0	0.1		3%		1%	0	0
		rtp-sa-E2612-01	5.46	3.9	0.45	3.45	3.45	0	0	0	3.45		12%		88%	0	0
		rtp-sa-ef540-02	17.47	13.87	1.44	12.42	12.42	0	96	96	0.42		10%		99%	3	0.08

Description: This report shows multi-vendor capacity and performance metrics for storage devices.

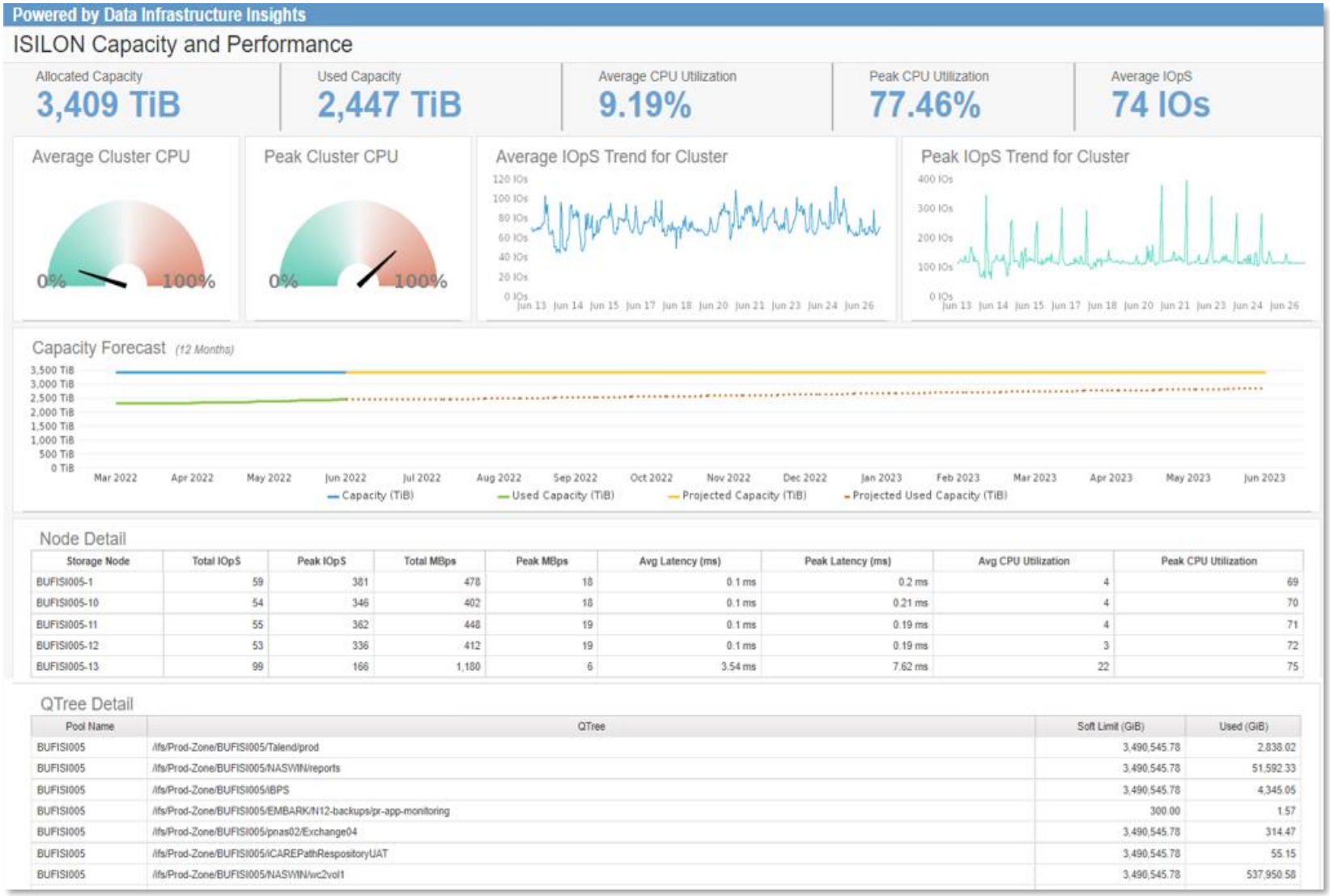
Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 11.6 Multi-Vendor Storage Overview

11.6 Multi-Vendor Storage Overview Definitions

Metric/Attribute	Description
DC (Data Center)	DII configured annotation. Defines the location of the device
Storage	Name of the storage device discovered and monitored by DII
Family	Family name of the storage device
Model	Model name of the storage device
Pool / Aggregate	Name of the storage pool or aggregate associated with the storage device
Capacity (TiB)	Usable capacity allocated for a storage-pool as reported by the storage-array in Tebibytes (Base 2 units)
Used Capacity (TiB)	Used capacity in Tebibytes as reported by the storage pool or aggregate. If Thin Provisioned, then Used = Written. If Thick Provisioned then Used = 100% of Allocated
Allocated Volume Capacity (TiB)	Provisioned capacity of all block/SAN volumes on this storage pool in Tebibytes
Internal Volume Allocated Capacity (TiB)	Total allocated capacity of internal volumes (NAS/Flexvol) on this storage pool in TiB
Pool Used %	Used Capacity (TiB) / Used Capacity (TiB)
Subscription %	The greater of Internal Volume Allocated Capacity (TiB) + Allocated Volume Capacity (TiB) / Capacity (TiB)
Avg Total IOPS (7 Days)	Maximum of average total IOPS (read+write) over a 7 day hourly collection interval
Avg Latency (ms)	Average response time in milliseconds over a 7 day hourly collection interval
Pool Usable Capacity	Same as Capacity (TiB)
Pool Used Capacity	Same as Used Capacity (TiB)
Average Subscribed	Same as Subscription %
Orphaned by Config	Total allocated capacity in Tebibytes when block volumes are not mapped or masked or not zoned
Orphaned by Performance	Total volume and internal volume allocated capacity in Tebibytes when total IOPS = 0

11.7 Isilon Capacity and Performance



Description: This dashboard focuses on Isilon Capacity and Performance for each individual Isilon device monitored by DII. Capacity and Performance metrics summary are displayed at top. Gauges for Average Cluster CPU Utilization and Peak CPU Utilization are visible near top left. Trends for IOpS and Peak IOpS are available near top right.

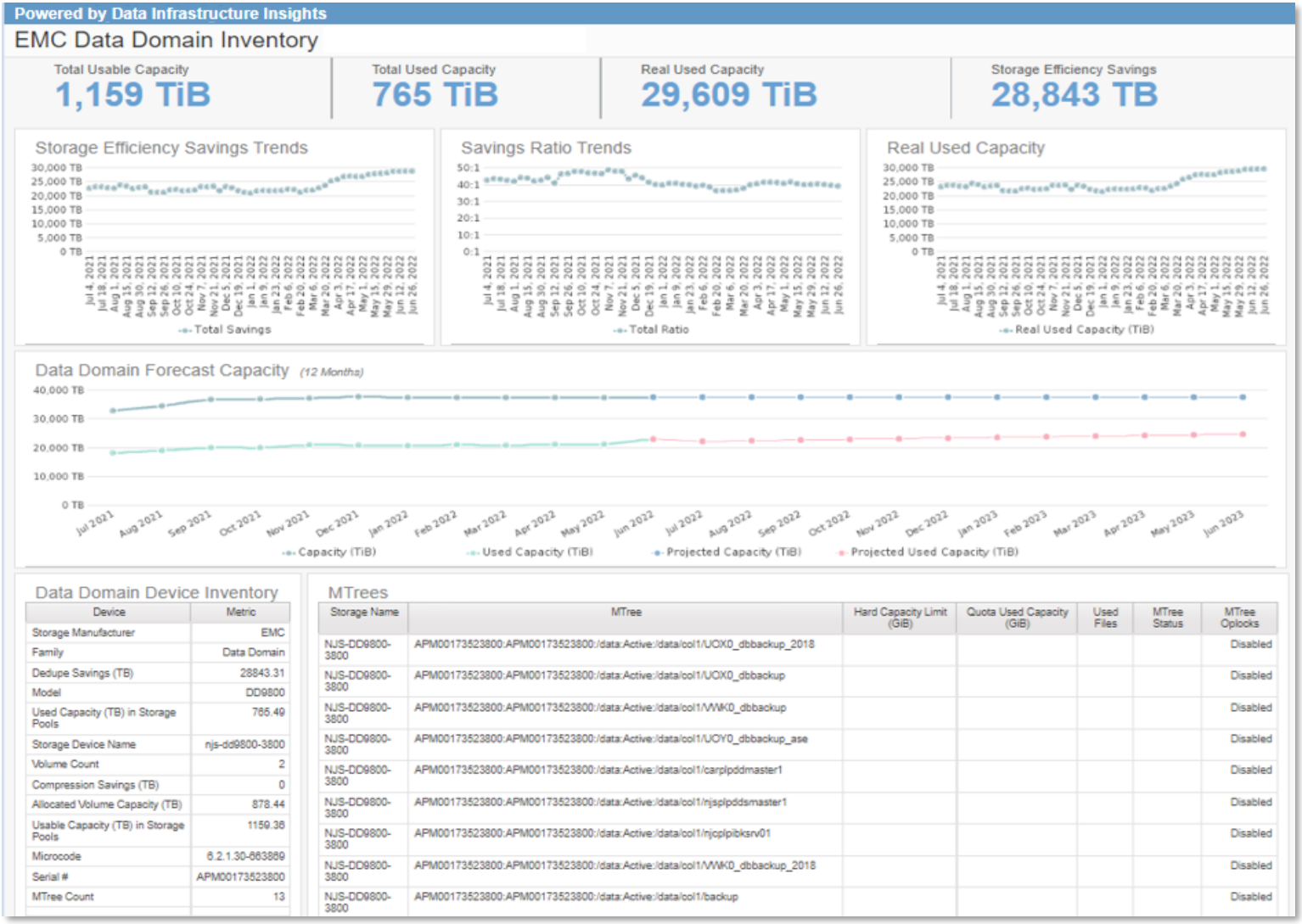
Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 11.7 Isilon Capacity and Performance

11.7 Isilon Capacity and Performance Definitions

Metric/Attribute	Description
Storage Node	Name of the Isilon Node associated with the Isilon Cluster monitored by DII
Total IOPS	Measures the total number of I/O service requests (read+write) on the Isilon node for 14 days hourly (measured in I/O per sec)
Peak IOPS	Maximum I/O service requests on the Isilon node for 14 days hourly
Total MBps	Total throughput (read+write) on the Isilon node for 14 days hourly. This is the Rate at which data is being transmitted in a fixed amount of time in response to I/O service requests (measured in Megabytes per second)
Peak MBps	Maximum throughput in MB/second on the Isilon node for 14 days hourly
Avg Latency (ms)	Total response time in milliseconds on the Isilon node for 14 days hourly. The time it takes from the moment a request for information arrives at the storage device to the time when the storage device begin to send the information back in response.
Peak Latency (ms)	Maximum response time on the Isilon node for 14 days hourly
Avg CPU Utilization	Average Node CPU Utilization shows the percentage of time that one or more CPUs were busy on the Isilon node for 14 days hourly
Peak CPU Utilization	Maximum CPU Utilization on the Isilon node for 14 days hourly
Pool Name	Name of the storage pool associated with the Isilon node
Qtree	Name of the Qtree associated with the Isilon node
Soft Limit (GiB)	Soft quota space limit, in Gibibytes, that if exceeded, issues warnings rather than rejecting space requests
Used (GiB)	Used capacity in Gibibytes as reported by the Internal Volume
Capacity (TiB)	Usable capacity allocated for a storage-pool as reported by the storage-array in Tebibytes (Base 2 units)
Used Capacity (TiB)	Used capacity in Tebibytes as reported by the storage pool or aggregate. If Thin Provisioned, then Used = Written. If Thick Provisioned then Used = 100% of Allocated
Projected Capacity (TiB)	Usable Capacity in Tebibytes for the future 12 month period. This field is the basis for the intercept as a result of linear regression and projected used capacity. The field is contained in the Storage and Storage Pools Capacity FUTURE Fact table
Projected Used Capacity (TiB)	Forecast Used Capacity in Tebibytes for the future 12 month period
Full Date	Hourdatetime and/or fulldate fields derived from the Time Dimension and Date Dimension tables in the DWH

11.8 EMC Data Domain Inventory



Device	Metric
Storage Manufacturer	EMC
Family	Data Domain
Dedupe Savings (TB)	28843.31
Model	DD9800
Used Capacity (TB) in Storage Pools	765.49
Storage Device Name	njs-dd9800-3800
Volume Count	2
Compression Savings (TB)	0
Allocated Volume Capacity (TB)	878.44
Usable Capacity (TB) in Storage Pools	1159.36
Microcode	6.2.1.30-663869
Serial #	APM00173523800
MTree Count	13

Storage Name	MTree	Hard Capacity Limit (GiB)	Quota Used Capacity (GiB)	Used Files	MTree Status	MTree Oplocks
NJS-DD9800-3800	APM00173523800:APM00173523800:/data:Active:/data/col1/UOX0_dbbackup_2018					Disabled
NJS-DD9800-3800	APM00173523800:APM00173523800:/data:Active:/data/col1/UOX0_dbbackup					Disabled
NJS-DD9800-3800	APM00173523800:APM00173523800:/data:Active:/data/col1/WWK0_dbbackup					Disabled
NJS-DD9800-3800	APM00173523800:APM00173523800:/data:Active:/data/col1/UOY0_dbbackup_ase					Disabled
NJS-DD9800-3800	APM00173523800:APM00173523800:/data:Active:/data/col1/carplpddmaster1					Disabled
NJS-DD9800-3800	APM00173523800:APM00173523800:/data:Active:/data/col1/njsplpddsmaster1					Disabled
NJS-DD9800-3800	APM00173523800:APM00173523800:/data:Active:/data/col1/njcplpibksrv01					Disabled
NJS-DD9800-3800	APM00173523800:APM00173523800:/data:Active:/data/col1/WWK0_dbbackup_2018					Disabled
NJS-DD9800-3800	APM00173523800:APM00173523800:/data:Active:/data/col1/backup					Disabled

Description: This dashboard focuses on Data Domain Capacity and Inventory for each individual Data Domain device monitored by OCI. Capacity metrics summary is displayed at top. Storage Efficiency, Ratios and Real Used Capacity Trends are highlighted over a 30-day period. Forecast capacity for the next 12 months is based on linear regression formula. Device inventory with Mtrees are displayed at bottom.

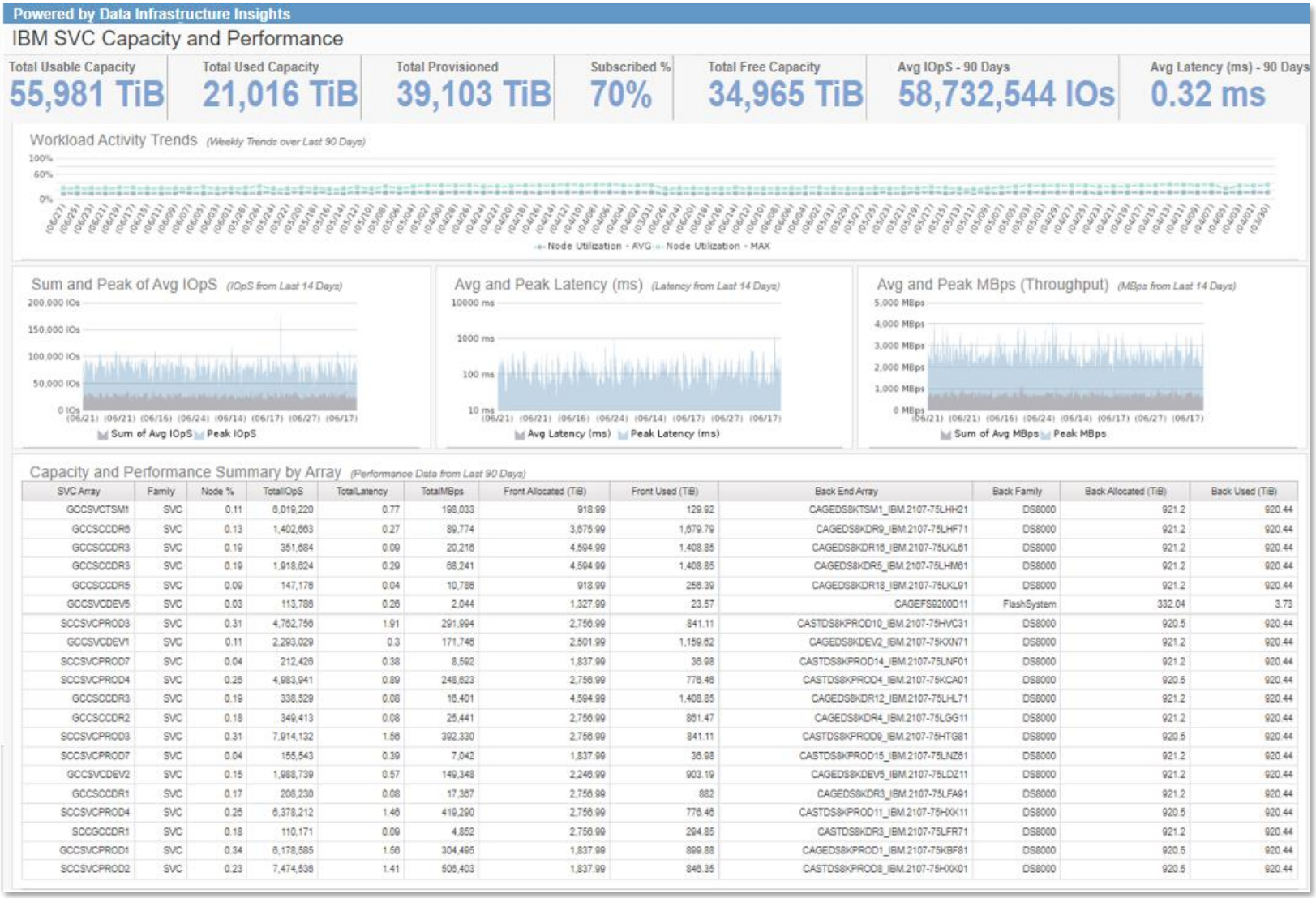
Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 11.8 EMC Data Domain Inventory

11.8 EMC Data Domain Inventory Definitions

Metric/Attribute	Description
Storage Device Name	Name of the Data Domain storage device discovered and monitored by DII
Storage Manufacturer	Manufacturer name of the storage device
Family	Family name of the storage device
Model	Model name of the storage device
Serial #	Serial number of the storage device
Microcode	Microcode or firmware version of the storage device
MTree	This is a logical partition of a file system that is identified by a unique name. Mtrees are used to create VTL pools and NFS/SMB shares
Quota Hard Limit (GiB)	MTree Quota Hard Limit in Gibibytes is a strict, non-flexible storage capacity restriction set on a specific data domain within a storage system
Quota Soft Limit (GiB)	MTree Quota Soft Limit in Gibibytes is a capacity limit that can be exceeded until a grace period has expired
Quota Used (GiB)	MTree Quota Used in Gibibytes is the amount of capacity used towards the hard and soft capacity limit set on the quota
MTree Status	Indicates whether an MTree is active or not
MTree Oplocks	If enabled, an Oplock is the ability to enable "opportunistic locking" on a specific MTree, which allows a client to cache file data locally on their machine, improving performance by reducing network traffic when accessing files within that MTree
Usable Capacity (TiB)	Usable capacity allocated for a storage-pool as reported by the storage-array in Tebibytes (Base 2 units)
Used Capacity (TiB)	Used capacity in Tebibytes as reported by the storage pool. If Thin Provisioned, then Used = Written. If Thick Provisioned then Used = 100% of Allocated
Projected Capacity (TiB)	Projected Capacity in Tebibytes for future 12-month period. Based on standard linear regression formula and contained in the Storage and Storage Pools Capacity Future Fact table
Projected Used (TiB)	Projected Used Tebibytes for future 12-month period. Based on standard linear regression formula and contained in the Storage and Storage Pools Capacity Future Fact table
Allocated Volume Capacity (TiB)	Total allocated capacity in Gibibytes for the volume as reported by the storage pool
Dedupe Savings (TiB)	Derived from the internal_volume_capacity_fact (1 – (dedupeRatio / dedupeRatio) * (Used Capacity GiB))
Compression Savings (TiB)	(1 – (compressionRatio / compressionRatio) * (Used Capacity GiB))
Total Savings (TiB)	Dedupe Savings (TiB) + Compression Savings (TiB)
Total Ratio	Dedupe Ratio + Compression Ratio
Real Used Capacity (TiB)	Dedupe Savings (TiB) + Compression Savings (TiB) + Used Capacity (TiB)
Date	Hourdatetime and/or fulldate fields derived from the Time Dimension and Date Dimension tables in the DWH

11.9 IBM SVC Capacity and Performance



SVC Array	Family	Node %	TotalIOpS	TotalLatency	TotalMBps	Front Allocated (TiB)	Front Used (TiB)	Back End Array	Back Family	Back Allocated (TiB)	Back Used (TiB)
GCCSVCTSM1	SVC	0.11	6,019,220	0.77	198,033	918.99	129.92	CAGEDS8KTSM1_IBM.2107-75LHH21	DS8000	921.2	920.44
GCCSCCDR6	SVC	0.13	1,402,663	0.27	89,774	3,675.99	1,579.79	CAGEDS8KDR9_IBM.2107-75LHF71	DS8000	921.2	920.44
GCCSCCDR3	SVC	0.19	351,684	0.09	20,216	4,594.99	1,408.85	CAGEDS8KDR16_IBM.2107-75LKL61	DS8000	921.2	920.44
GCCSCCDR3	SVC	0.19	1,918,624	0.29	68,241	4,594.99	1,408.85	CAGEDS8KDR5_IBM.2107-75LHM61	DS8000	921.2	920.44
GCCSCCDR5	SVC	0.09	147,178	0.04	10,788	918.99	256.39	CAGEDS8KDR18_IBM.2107-75LKL91	DS8000	921.2	920.44
GCCSVCDEV5	SVC	0.03	113,786	0.26	2,044	1,327.99	23.57	CAGEFS9200D11	FlashSystem	332.04	3.73
SCCSVCPROD3	SVC	0.31	4,762,756	1.91	291,994	2,756.99	841.11	CASTDS8KPROD10_IBM.2107-75HVC31	DS8000	920.5	920.44
GCCSVCDEV1	SVC	0.11	2,293,029	0.3	171,746	2,501.99	1,159.62	CAGEDS8KDEV2_IBM.2107-75KXN71	DS8000	921.2	920.44
SCCSVCPROD7	SVC	0.04	212,426	0.38	8,592	1,837.99	36.98	CASTDS8KPROD14_IBM.2107-75LNF01	DS8000	921.2	920.44
SCCSVCPROD4	SVC	0.26	4,983,941	0.89	248,823	2,756.99	776.46	CASTDS8KPROD4_IBM.2107-75KCA01	DS8000	920.5	920.44
GCCSCCDR3	SVC	0.19	338,529	0.08	16,401	4,594.99	1,408.85	CAGEDS8KDR12_IBM.2107-75LHL71	DS8000	921.2	920.44
GCCSCCDR2	SVC	0.18	349,413	0.08	25,441	2,756.99	861.47	CAGEDS8KDR4_IBM.2107-75LGG11	DS8000	921.2	920.44
SCCSVCPROD3	SVC	0.31	7,914,132	1.56	392,330	2,756.99	841.11	CASTDS8KPROD9_IBM.2107-75HTG81	DS8000	920.5	920.44
SCCSVCPROD7	SVC	0.04	155,543	0.39	7,042	1,837.99	36.98	CASTDS8KPROD15_IBM.2107-75LNZ81	DS8000	921.2	920.44
GCCSVCDEV2	SVC	0.15	1,988,739	0.57	149,348	2,246.99	903.19	CAGEDS8KDEV5_IBM.2107-75LDZ11	DS8000	921.2	920.44
GCCSCCDR1	SVC	0.17	208,230	0.08	17,367	2,756.99	882	CAGEDS8KDR3_IBM.2107-75LFA91	DS8000	921.2	920.44
SCCSVCPROD4	SVC	0.26	6,378,212	1.46	419,290	2,756.99	776.46	CASTDS8KPROD11_IBM.2107-75HXK11	DS8000	920.5	920.44
SCCGCCDR1	SVC	0.18	110,171	0.09	4,852	2,756.99	294.85	CASTDS8KDR3_IBM.2107-75LFR71	DS8000	921.2	920.44
GCCSVCPROD1	SVC	0.34	6,178,585	1.56	304,495	1,837.99	899.88	CAGEDS8KPROD1_IBM.2107-75KBF81	DS8000	920.5	920.44
SCCSVCPROD2	SVC	0.23	7,474,536	1.41	506,403	1,837.99	846.35	CASTDS8KPROD8_IBM.2107-75HXK01	DS8000	920.5	920.44

Description: The focus of this dashboard is to present IBM SVC Capacity and Performance metrics. When the report is run, a global view of the SVC environment is shown. At the top of the page, a summary of capacity and performance is available. Workload Activity Trends as reported by the SVC shows how busy the environment is. Average and Peak performance metrics are trended hourly for 14 days and a detail summary is included at the bottom.

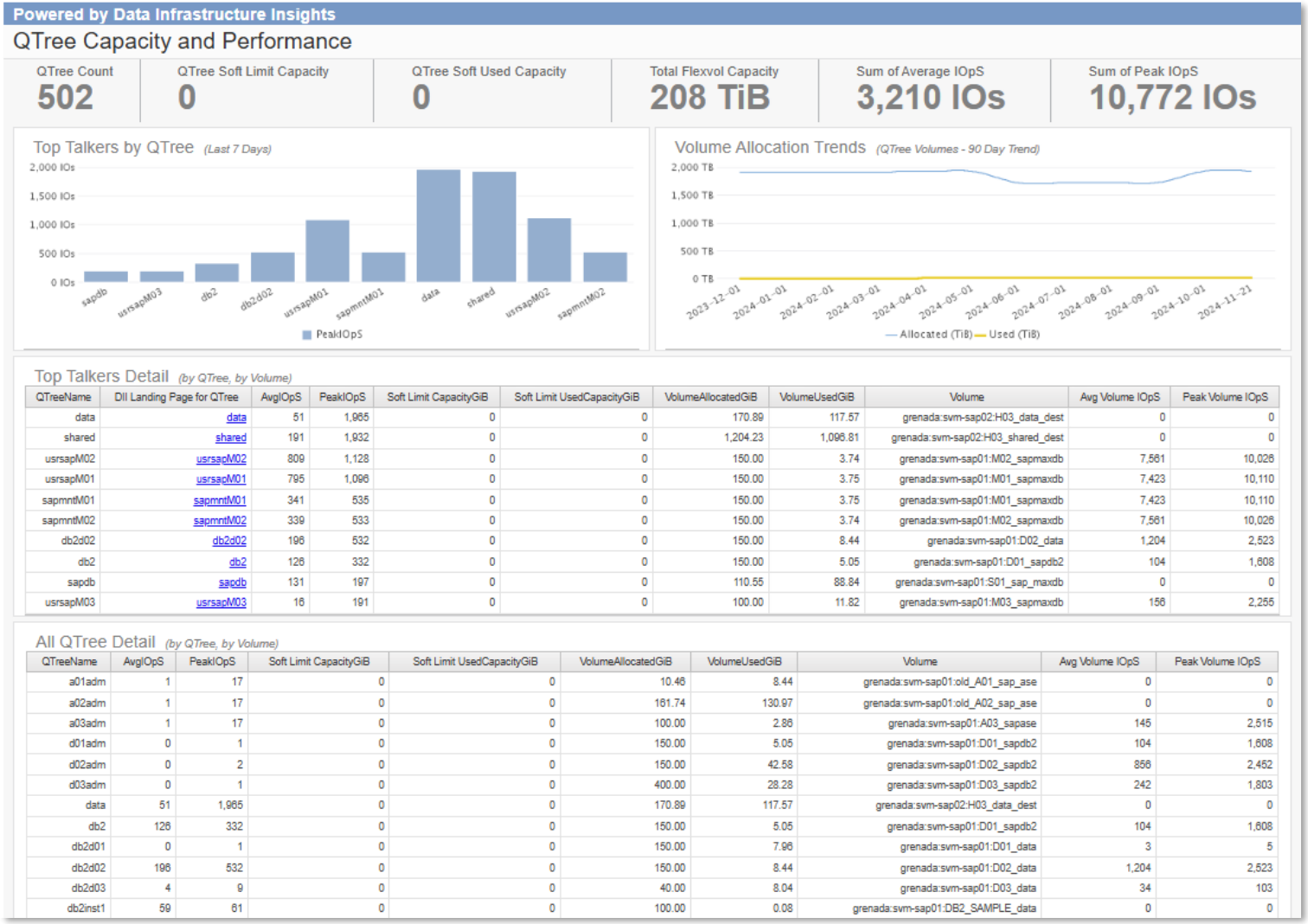
Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 11.9 IBM SVC Capacity and Performance

11.9 IBM SVC Capacity and Performance Definitions

Metric/Attribute	Description
SVC Array	Name of the front end SVC virtualizer discovered and monitored by DII
Usable Capacity (TiB)	Usable capacity allocated for a storage-pool as reported by the storage-array in Tebibytes (Base 2 units)
Used Capacity (TiB)	Used capacity in Tebibytes as reported by the storage pool. If Thin Provisioned, then Used = Written. If Thick Provisioned then Used = 100% of Allocated
Provisioned (TiB)	Provisioned capacity of all block/SAN volumes on this storage pool in Tebibytes
Subscribed %	Provisioned (TiB) / Usable Capacity (TiB)
Free Capacity (TiB)	Usable Capacity (TiB) - Used Capacity (TiB)
Avg IOPS	Measures the total number of I/O service requests (read+write) on the volume for 90 days (measured in I/O per sec)
Avg Latency	The time it takes from the moment a request for information arrives at the storage device to the time when the storage device begin to send the information back in response. This is the actual latency of the device in milliseconds
Avg/Peak Latency	Maximum response time in milliseconds for 90 days
Avg MBps	Total throughput (read+write) on the Isilon node for 14 days hourly. This is the Rate at which data is being transmitted in a fixed amount of time in response to I/O service requests (measured in Megabytes per second)
Avg Node Util %	Node CPU Utilization shows the percentage of time that one or more CPUs were busy
Backend Array	The name of the backend storage array discovered by DII that supports the SVC
Backend Capacity (TiB)	Usable capacity allocated for a storage-pool as reported by the backend storage array in Tebibytes (Base 2 units)
Backend Used (TiB)	Used capacity in Tebibytes for a storage-pool as reported by the backend storage array

11.10 NetApp Qtree Capacity and Performance



Description: This report shows Qtree specific capacity and performance metrics and attributes. Quotas must be enabled to show used capacity details.

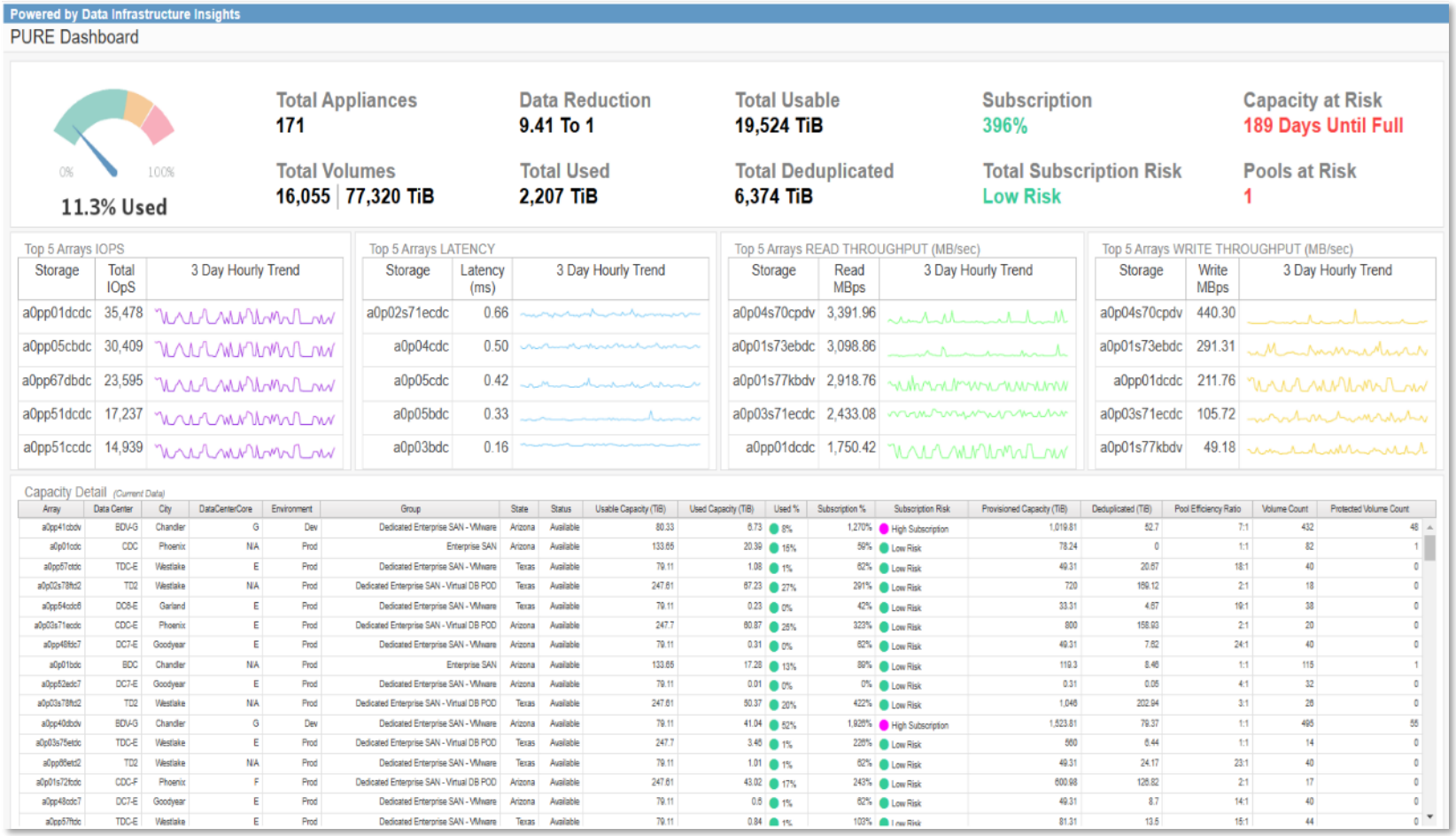
Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 11.10 Qtree Capacity and Performance

11.10 NetApp Qtree Capacity and Performance Definitions

Metric/Attribute	Description
QTree Name	Name of the QTree associated with the internal volume
Volume	Name of the internal volume
DII Landing Page for QTree	In-report link for the DII Qtree WebUI landing page
Avg Volume IOPS	Measures the total number of I/O service requests (read+write) on the volume for 7 days (measured in I/O per sec)
Peak Volume IOPS	Maximum IOPS as reported by the internal volume for 7 days
Allocated (TiB)	Total allocated capacity of internal volumes (NAS/Flexvol) on this storage pool in Tebibytes
Used (TiB)	Used capacity of internal volumes on this storage pool in TiB
Soft Limit Capacity (GiB)	QTree Quota Soft Limit in Gibibytes is a capacity limit that can be exceeded until a grace period has expired
Soft Limit Used Capacity (GiB)	QTree Quota Used in Gibibytes is the amount of capacity used towards the hard and soft capacity limit set on the quota
Volume Allocated (GiB)	Total allocated capacity of internal volumes (NAS/Flexvol) on this storage pool in Gibibytes
Volume Used (GiB)	Used capacity of internal volumes on this storage pool in Gibibytes
Date	Hourdatetime and/or fulldate fields derived from the Time Dimension and Date Dimension tables in the DWH

11.11 PURE Dashboard



Powered by Data Infrastructure Insights

PURE Dashboard

0% 100%

11.3% Used

Total Appliances	Data Reduction	Total Usable	Subscription	Capacity at Risk
171	9.41 To 1	19,524 TiB	396%	189 Days Until Full
Total Volumes	**Total Used**	**Total Deduplicated**	**Total Subscription Risk**	**Pools at Risk**
16,055 | 77,320 TiB	2,207 TiB	6,374 TiB	Low Risk	1

Top 5 Arrays IOPS

Storage	Total IOpS	3 Day Hourly Trend
a0pp01dcdc	35,478	
a0pp05cbdc	30,409	
a0pp67dbdc	23,595	
a0pp51dcdc	17,237	
a0pp51ccdc	14,939	

Top 5 Arrays LATENCY

Storage	Latency (ms)	3 Day Hourly Trend
a0p02s71ecdc	0.66	
a0p04cdc	0.50	
a0p05cdc	0.42	
a0p05bdc	0.33	
a0p03bdc	0.16	

Top 5 Arrays READ THROUGHPUT (MB/sec)

Storage	Read MBps	3 Day Hourly Trend
a0p04s70cpdv	3,391.96	
a0p01s73ebdc	3,098.86	
a0p01s77kbdv	2,918.76	
a0p03s71ecdc	2,433.08	
a0pp01dcdc	1,750.42	

Top 5 Arrays WRITE THROUGHPUT (MB/sec)

Storage	Write MBps	3 Day Hourly Trend
a0p04s70cpdv	440.30	
a0p01s73ebdc	291.31	
a0pp01dcdc	211.76	
a0p03s71ecdc	105.72	
a0p01s77kbdv	49.18	

Capacity Detail (Current Data)

Array	Data Center	City	DataCenterCore	Environment	Group	State	Status	Usable Capacity (TiB)	Used Capacity (TiB)	Used %	Subscription %	Subscription Risk	Provisioned Capacity (TiB)	Deduplicated (TiB)	Pool Efficiency Ratio	Volume Count	Protected Volume Count
a0pp41cbdv	BDV-G	Chandler	G	Dev	Dedicated Enterprise SAN - VMware	Arizona	Available	80.33	6.73	8%	1,270%	High Subscription	1,019.81	52.7	7:1	432	48
a0p01cdc	CDC	Phoenix	N/A	Prod	Enterprise SAN	Arizona	Available	133.65	20.39	15%	59%	Low Risk	78.24	0	1:1	82	1
a0pp67cbdc	TDC-E	Westlake	E	Prod	Dedicated Enterprise SAN - VMware	Texas	Available	79.11	1.08	1%	62%	Low Risk	49.31	20.67	18:1	40	0
a0p02s78fbt2	TD2	Westlake	N/A	Prod	Dedicated Enterprise SAN - Virtual DB POD	Texas	Available	247.61	67.23	27%	291%	Low Risk	720	189.12	2:1	18	0
a0pp54cdc6	DC6-E	Garland	E	Prod	Dedicated Enterprise SAN - VMware	Texas	Available	79.11	0.23	0%	42%	Low Risk	33.31	4.67	19:1	38	0
a0p03s71ecdc	CDC-E	Phoenix	E	Prod	Dedicated Enterprise SAN - Virtual DB POD	Arizona	Available	247.7	80.87	25%	323%	Low Risk	800	158.93	2:1	20	0
a0pp48dc7	DC7-E	Goodyear	E	Prod	Dedicated Enterprise SAN - VMware	Arizona	Available	79.11	0.31	0%	62%	Low Risk	49.31	7.82	24:1	40	0
a0p01bdc	BDC	Chandler	N/A	Prod	Enterprise SAN	Arizona	Available	133.65	17.28	13%	89%	Low Risk	119.3	8.46	1:1	115	1
a0pp52edc7	DC7-E	Goodyear	E	Prod	Dedicated Enterprise SAN - VMware	Arizona	Available	79.11	0.01	0%	0%	Low Risk	0.31	0.05	4:1	32	0
a0p03s78fbt2	TD2	Westlake	N/A	Prod	Dedicated Enterprise SAN - Virtual DB POD	Texas	Available	247.61	50.37	20%	422%	Low Risk	1,046	202.94	3:1	28	0
a0pp40dbdv	BDV-G	Chandler	G	Dev	Dedicated Enterprise SAN - VMware	Arizona	Available	79.11	41.04	52%	1,928%	High Subscription	1,523.81	79.37	1:1	495	55
a0p03s75etdc	TDC-E	Westlake	E	Prod	Dedicated Enterprise SAN - Virtual DB POD	Texas	Available	247.7	3.45	1%	226%	Low Risk	560	6.44	1:1	14	0
a0pp06etc2	TD2	Westlake	N/A	Prod	Dedicated Enterprise SAN - VMware	Texas	Available	79.11	1.01	1%	62%	Low Risk	49.31	24.17	23:1	40	0
a0p01s72fcdc	CDC-F	Phoenix	F	Prod	Dedicated Enterprise SAN - Virtual DB POD	Arizona	Available	247.61	43.02	17%	243%	Low Risk	600.98	126.82	2:1	17	0
a0pp48cdc7	DC7-E	Goodyear	E	Prod	Dedicated Enterprise SAN - VMware	Arizona	Available	79.11	0.6	1%	62%	Low Risk	49.31	8.7	14:1	40	0
a0pp57fcbc	TDC-E	Westlake	E	Prod	Dedicated Enterprise SAN - VMware	Texas	Available	79.11	0.84	1%	103%	Low Risk	81.31	13.5	15:1	44	0

Description: This report shows a comprehensive capacity and performance snapshot of a PURE storage environment. Metrics include Data Reduction ratios, capacity risks, and top 5 arrays by performance.

Prerequisites: Data Infrastructure Insights (DII) reporting enabled.

Report XML: 11.11 PURE Dashboard

11.11 PURE Dashboard Definitions

Metric/Attribute	Description
Array / Storage	Name of the PURE storage device discovered
Data Center	DII configured annotation. Defines the location of the device
City	DII configured annotation. Defines the city location of the device
DataCenterCore	DII configured annotation. Data Center Core location (specific customer defined)
Environment	DII configured annotation. Defines the Environment e.g. Prod, Dev, etc..
Group	DII configured annotation. Defines the Group (specific customer defined)
State	DII configured annotation. Defines the state location of the device
Status	Status of the device e.g. available, unavailable
Usable Capacity (TiB)	Usable capacity allocated for a storage-pool as reported by the storage-array in Tebibytes (Base 2 units)
Used Capacity (TiB)	Used capacity in Tebibytes as reported by the storage pool
Used %	Used Capacity (TiB) / Usable Capacity (TiB)
Subscription %	Provisioned Capacity (TiB) / Usable Capacity (TiB)
Subscription Risk	The level of risk that is associated with the Thin Subscription WHEN [Subscription %] > 3 AND [Used %] > .90 THEN 'High Risk' WHEN [Subscription %] > 1.5 AND [Used %] > .80 THEN 'Moderate Risk' WHEN [Subscription %] > 10 THEN 'High Subscription' ELSE 'Low Risk'
Provisioned Capacity (TiB)	Provisioned capacity of all block/SAN volumes on this storage pool in Tebibytes
Deduplicated (TiB)	Derived from the storage_and_storage_pool_capacity_ fact (1 – (dedupeRatio / dedupeRatio) * (Used Capacity TiB))
Pool Efficiency Ratio	Represents how effectively the system utilizes its storage space by combining data reduction techniques like deduplication and compression, resulting in a single number that indicates the overall storage efficiency achieved by a Pure Storage array. Typically expressed as a ratio e.g., 5:1
Volume Count	Total number of PURE volumes that have been provisioned
Protected Volume Count	Total number of PURE volumes with protection e.g. Snapshot Source, Snapshot Target
Total Appliances	Total number of PURE storage device discovered and monitored by DII
Capacity at Risk	Indicates when storage capacity in the entire PURE environment will run out of space
Pools at Risk	Total number of storage pools that are at risk to running out of space
Total IOPS	Measures the total number of I/O service requests (read+write) on the volume for 3 days (measured in I/O per sec)
Latency (ms)	The time it takes from the moment a request for information arrives at the storage device to the time when the storage device begin to send the information back in response. This is the actual latency of the device in milliseconds
Read MBps	Read throughput on the PURE array for 3 days hourly. This is the Rate at which data is being transmitted in a fixed amount of time in response to I/O service requests (measured in Megabytes per second)
Write MBps	Write throughput on the PURE array for 3 days hourly. This is the Rate at which data is being transmitted in a fixed amount of time in response to I/O service requests (measured in Megabytes per second)

Time	Hourdatetime and/or fulldate fields derived from the Time Dimension and Date Dimension tables in the DWH