



# **Documentation for NetApp Keystone subscription services**

Keystone subscription services

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# Documentation for NetApp Keystone subscription services

NetApp Keystone is a portfolio of on-premises capital expenditure (CapEx) alternatives to enable the on-ramp to cloud journey. NetApp Keystone subscription services offer a seamless hybrid cloud experience with storage services that span on your premises and in the cloud.



Keystone subscription services are succeeded by next-generation [NetApp Keystone STaaS](#). Learn more: [Keystone STaaS documentation](#)

## Keystone

Keystone is an pay-as-you-grow subscription-based service model that delivers a seamless hybrid cloud experience for those preferring OpEx consumption models to upfront CapEx or leasing. It enables customers to accelerate time to value by reducing the hurdles related to managing the unpredictable capacity growth and going through the complex procurement cycles. Keystone allows customers to align economics and operations to their business priorities.



**Prefer 100% opex**  
(no asset ownership)



**Single orchestration**



**Monitor, manage, & optimize usage**



**Flexible terms**  
(choice of term & capacity)



**Cloud economics on premises**

Keystone is a subscription-based service offering that provides storage capacity, at predefined performance service levels (service levels), for block, file, and object data types that can be deployed on-premises and can be operated by NetApp, a partner, or the customer. In addition to the base service that Keystone provides, add-on services can be chosen at an additional cost. These services are described in the below figure.

- **Data Protection Basic** service provides NetApp SnapMirror and NetApp SnapVault capabilities with default settings.
- **Data Protection Advanced** provides a service with SLAs of RPO=0 by leveraging the NetApp MetroCluster capabilities.



Keystone uses SnapVault technology for backup operations and SnapMirror for disaster recovery to replicate the data remotely; it does not automatically fail over and restore applications.



### Base package

All Flex Subscription services include:

- FlexVol®, FlexGroup®, protocols, clone, and encryption capabilities by default
- Snapshot™ default: 4 hours, 7 days retention
- Free SnapMirror® for initial ingest, provided Premium Bundle on source system



### DP Basic\* (for additional fee)

Data protection Basic Services subscription

- Includes SnapVault® and SnapMirror
- Requires additional storage subscription to store replicated data at the target; target can be already purchased and owned NetApp storage
- Disaster recovery snapshot every hour; replicated every 4 hours; retained 7 days
- Backup with SnapVault (snapshot every 4 hours; replicated every 24 hours; retained 7 days)



### DP Adv.\* (for additional fee)

Data protection Advanced Services subscription

- MetroCluster™ / RPO 0 Service
- Pre-requisite – data protection Basic

\* Available only for file and block data services.

## Benefits of Keystone

Keystone provides the following benefits:

- Frees up IT staff from complicated storage-related tasks and allows them to focus on application management
- Reduces upfront capital investment
- Allows customers to meet their demands without overprovisioning
- Aligns data storage costs with business needs/activity
- Simplifies infrastructure provisioning by bypassing complex organizational procurement procedures
- Keeps data secure on their premises
- Enables proper control over compliance, performance, and security



### Align costs and usage

Reduce upfront cash and pay only for what you use, avoiding overbuying and overprovisioning



### Free IT staff

Free up IT to focus more on innovation and business priorities and less on typical storage tasks



### Unlock the best of both clouds

Scale across clouds easily and leverage the public cloud for bursting, data migrations, DR, backup, and tiering



### Meet regulatory requirements

Gain improved performance, data protection, compliance, and security with certified and field-proven deployments and services

## Keystone service terms and descriptions

NetApp Keystone is guided by the following service terms and descriptions.

- Keystone services are available for a minimum of one year and up to three years. After the initial term, the service is renewable on an annual basis. Capacity can be increased in increments as small as 1 TiB.
- The minimum capacity is 100 TiB per site, and each site can have one or more clusters to meet the minimum capacity requirement. In a partner-operated model, subscriptions with flexible minimums are created for a customer, per site, and across service levels.
- The 100 TiB capacity can be one single service level or a combination of levels.
- Tenant subscriptions are limited to service levels that partners are subscribed to.
- 20% of burst capacity is available at each site; any burst usage is billed only for that billing period. If you need an additional burst requirements that is greater than 20%, contact support.
- Committed capacity or service levels cannot be altered during a contract term.
- Increasing capacity or changing to higher service level during term is allowed; however, moving from a higher service level to a lower level is not permitted.
- Any change request in the last 90 days of the term requires the customer to renew the service for a minimum of one year.

## Keystone service capacity definitions

The NetApp Keystone service capacities include:

### Logical capacity

This is the data placed into the Keystone infrastructure by a customer. All Keystone capacities refer to a logical capacity.

For example, if a 1 TiB file is stored on the Keystone infrastructure, then at least 1 TiB of capacity must be purchased.

### Committed capacity

The minimum logical capacity billed each month for the duration of the term:

- Capacity is committed to each service level.
- Committed capacity cannot be decreased during the term.
- Committed capacity and additional service levels can be added during the term.

### Changes to committed capacity

During the tenure of a subscription, you can change the committed capacities. However, there are certain preconditions:

- The committed capacity cannot be decreased
- The committed capacity cannot be increased 90 days prior to the expiry of your subscription, unless the subscription is to be renewed for an additional 12-month term.
- You can request changes to committed capacity through Keystone Success Manager.

### Burst capacity

This is the logical capacity that has exceeded the committed capacity. Note the following points:

- Keystone service provides 20% capacity more than the committed capacity.

- Burst capacity can be consumed on an elastic basis and is charged on a daily basis of the consumed average.
- Burst capacity up to 20% is charged at the same rate as the committed capacity.
- Burst capacity greater than 20% of committed is charged at a premium rate. Contact support for any additional burst requirements greater than 20%.

### Consumed/provisioned capacity

Consumed capacity refers to the capacity in TiB of storage currently being consumed on the service. Keystone service considers the sum of the provisioned sizes (not the logical or physical capacity used) of all volumes on a particular service level to be considered as consumed capacity for that service level. This includes:

- The capacity that is provisioned through the creation, modification, deletion, or potential auto-growth of volumes.
- The Snapshot copies and clones.



The amount of data stored within provisioned capacity, or the amount of data actually written to disk is not considered.

### Billed capacity

Monthly bill = (committed capacity [TiB] \* committed rate [\$/TiB]) + (daily average provisioned burst capacity [TiB] \* burst rate [\$/TiB]). The monthly bill contains a minimum charge based on the committed capacity.

The monthly bill varies beyond the minimum charge based on daily average burst capacity consumption. For more information on billing, see [Keystone billing](#).

### Service levels

Keystone offers data storage capacity at pre-defined performance service levels (service levels) or rate plans on a subscription basis. Each volume managed by Keystone services is associated with a service level.

Each service level is defined by its I/O density, that is IOPS/TiB/volume. This is the ratio of performance (input/output operations per second [IOPS]) and allocated storage capacity (TiB) which is IOPS/TiB at average latency per volume.

The I/O density for a volume is calculated at an hourly interval to report the peak I/O density. I/O density reports for volumes are generated monthly.

You select service levels based on your storage environment, and storage and consumption needs. The base service levels are available to you by default. Other service levels are additionally available, if you have opted for specific services. For example, for the data protection service, the *Data-Protect <base-service-level>* service level is assigned to your subscription.

The base service levels for file, block, and object storage types are listed here.

### Service levels for file storage

**Supported protocols:** NFS, CIFS, iSCSI, and FC

Service level	Extreme	Premium	Standard	Value
Workload type	Analytics, databases	VDI, virtualization apps, Software dev	File shares, web servers	Backup
Maximum IOPS/logical TiB allocated per volume	12,288	4,096	512	N/A
Target IOPS/logical TiB allocated per volume	6,144	2,048	128	N/A
Maximum MBps/logical TiB allocated per volume	384	128	16	N/A
Average Latency	<1 ms	<2 ms	<17 ms	N/A
Block size	32K			

#### More on service levels for file storage

The base service level metrics depend on the following conditions:

- The service levels for file and block storage support ONTAP 9.7 and later.
- IOPS/TiB/volume, MBps/TiB/volume, and latency values for service levels are based on the amount of logical data stored in the volume, 32KB block size, and a random combination of 70% read and 30% write IO operations.
- Actual IOPS/TiB/volume and MBps/TiB/volume may vary based on the actual or assumed block size, system workload concurrency, or input-output operations.
- Latency does not include the following:
  - application or host latency
  - customer network latency to or from the controller ports
  - overheads associated with the data transfer to the object store in case of FabricPool
  - latency automatically applied by QoS to keep IO within service level maximums
- Latency values are not applicable to MetroCluster write operations. These write operations are dependent on the distance of remote systems.
- If one or more volumes on a storage system do not have an AQoS policy assigned, then these volumes are considered as non-compliant volumes, and no target service levels are applicable for those systems.
- *Expected IOPS* is targeted for FabricPool only if the tiering policy is set to "none" and no blocks are in the cloud. *Expected IOPS* is targeted for volumes that are not in a SnapMirror synchronous relationship.
- Workload IO operations need to be balanced across all deployed controllers, as determined by the Keystone order.

#### Service levels for block storage

**Supported protocols:** FC and iSCSI

Service level	Extreme	Premium	Standard
Workload type	HPC	Video surveillance	Backup
Target IOPS/TiB	N/A		
Max IOPS/TiB	5,500	4,000	N/A
Max throughput MBps (32KB/IOP)	43	31	N/A
Average Latency	<0.5 ms	<0.5 ms	N/A
Block size	32K		

## Service levels for object storage

Supported protocol: S3

Service level	Object
Workload type	Media repository, archiving
Target IOPS/TiB	N/A
Max IOPS/TiB	N/A
Max throughput MBps (32KB/IOP)	N/A
Average Latency	N/A

## Service level metrics and definitions

The following terms and definitions are used within the NetApp Keystone:

- **GiB, TiB, and PiB.** Measurements of data storage capacity using base of 1024 (1 GiB = 1024<sup>3</sup> bytes, 1 TiB = 1024<sup>4</sup> bytes, and 1 PiB = 1024<sup>5</sup> bytes).
- **IOPS/TiB.** The protocol operations per second requested by the application divided by the allocated logical size of the volume.
- **Availability** is measured as a percentage of number of I/O requests successfully responded to by the service, divided by total number of I/O requests made of the service, measured at the service demarcation, in a given month, not including scheduled service downtime or unavailability of required facilities, network or other services to be provided by customer.
- **Durability** is the percentage of data accessed without loss of fidelity, excluding customer-caused deletion or corruption.
- **Target IOPS per TiB.** The guaranteed IOPS for all I/O requests made to a volume before the target IOPS per TiB threshold is reached. Performance on the volume is capped at the selected IOPS per TiB.



The target IOPS per TiB performance metric is calculated based on the logical consumed capacity in TiB.

- **Latency.** Time to service an I/O request received from a client, measured at the service demarcation (storage controller I/O port).



## Adaptive Quality of Service in Keystone

Storage quality of service (QoS) is a critical technology that ensures that applications obtain consistent and predictable performance. Without QoS, certain workloads, such as those for booting of multiple systems, may consume most or all the resources for a period, and affect other workloads. For information about QoS, see [Guarantee throughput with QoS overview](#).

### Adaptive QoS

Adaptive QoS (AQoS) is used by Keystone services to dynamically maintain the IOPS/TiB ratio based on the volume size. For information about AQoS policies, see [About adaptive QoS](#).

Keystone provides you with AQoS policies that you can set up once your cluster is in production. You should ensure that all your volumes are associated with the correct AQoS policies that are already created and available in your system.

An ONTAP volume is non-compliant if it does not have an AQoS policy applied. A volume without a QoS policy is the last on the list of priority for the system to provide any available input-output operations. However, if any input-output operations are available, then the volume could consume all available IOs.



If you have not applied AQoS policies to your volumes, those volumes will be measured and charged at the highest service level as per your subscription. This may result in unintended burst charges.

### Adaptive QoS settings

The Adaptive QoS (AQoS) settings vary with service levels.

Policy name	Extreme and Extreme Tiering	Premium and Premium Tiering	Standard	Value
Expected IOPS	6,144	2,048	128	64
Expected IOPS Allocation	Allocated space			
Peak IOPS	12,288	4,096	512	128
Peak IOPS Allocation	Allocated space			
Block Size	32K			

## Keystone billing

NetApp Keystone enables predictable and upfront pricing for your storage subscription.

If you prefer operational expenditures (OpEx) consumption model to capital expenditure (CapEx) or leasing, you can opt for the Keystone pay-as-you-grow model for your flexible and scalable consumption needs.

Keystone provides you with the following billing facilities:

- You can pay based on IOPS and latency committed capacity to meet various workload needs. The different

performance service tiers - Extreme, Premium, Standard, and Value enable you to manage your storage based on your purchased service level for your Keystone services.

- It presents predictable billing for the committed capacity and pay-per-use for variable (burst) capacity usage.
- You can select a bundle price for hardware, core OS, and support for one \$/TiB price. You have a single invoice for each storage type, file, block, object, or cloud storage services.
- Select a flexible term for the services and payment: You can opt for 12 months, 100TiB, or more per site. Thereafter you can auto renew for 12 months or go month-to-month.

Keystone billing is based on committed capacity and variable burst consumption.

For information about committed and burst capacity usage, see [Keystone service capacity definitions](#).

### **Billing based on committed capacity**

Committed capacity refers to the capacities for various services in a single subscription, agreed upon by the parties involved (NetApp/partner and customer). This capacity is stated on each Keystone order and is billed, regardless of the actual consumption.

### **Metering of consumed capacity**

As a part of the Keystone service deployment, NetApp continuously monitors and measures the consumption of the service. At least once in every five minutes, a consumption record is generated by the system, detailing the current consumed capacity for the subscription. These records are aggregated over the billing period to generate invoices and usage reports.

### **Billing based on burst consumption**

When the consumed capacity is greater than the committed capacity for a given service level, burst consumption is recorded, and charges are applied accordingly. This process occurs for each consumption record generated. Burst consumption, therefore, is a reflection of both the amount and tenure of your over-consumed capacities on top of your committed capacities.

### **Billing schedules**

Keystone services are billed monthly and yearly.

#### **Monthly billing**

Invoices are sent monthly. For the month in which the services are used, an invoice is sent in the next month. For example, the invoice for the services you have used in January is delivered at the beginning of February. This invoice includes the charges for the committed capacity and if applicable, any burst usage.

#### **Annual billing**

An invoice is generated at the beginning of each subscription year for the minimum payment of the committed capacity. It is generated on the start date of the subscription.

Another invoice is sent at the end of a subscription quarter, summing up the applicable charges of any burst usage accrued in that quarter.

If the committed capacity is changed during a subscription, then an invoice is sent on the same day the change in the committed capacity is effective, for the prorated minimum payments for the rest of that subscription year.

#### **Grace period in burst billing**

During the first 60 days of the activation of a subscription, any burst consumption that you accrue is recorded, but not charged on your Keystone service invoice. This grace period grants you the time to configure your

storage with the appropriate Adaptive Quality of Service (AQoS) settings so that it can be properly monitored and billed. On configuring your storage correctly, you can avoid any unexpected burst charges. Any burst usage accrued after the initial grace period of 60 days will be billed on your next invoice. This grace period does not affect any modifications or renewals to your existing subscriptions.

## **Miscellaneous scenarios for Keystone billing**

There are several scenarios for Keystone billing, and you should be familiar with those scenarios.

### **Billing for cloned volumes**

If volumes are cloned in ONTAP and you use them for backing up and restoring your data, you can continue using the clones without any additional payments. However, cloned volumes used for any other purpose in your business for an extensive duration are charged.

Note the following:

- Clone volumes are free from charging as long as their size is less than 10% of the parent volume (the physical capacity used in the clone volume compared to the physical capacity used in the parent volume).
- There is no 24-hour grace period for cloned volumes, only the size of the clone is considered.
- Once the clone volume exceeds 10% of the physical size of the parent, the clone is billed as a standard volume (logical used capacity).

### **Billing for MetroCluster**

Advanced Data Protection uses NetApp MetroCluster to mirror data between two physically separated clusters. On MetroCluster mirrored aggregates, data is written twice, once on each cluster. Keystone service charges for consumption on each side independently, resulting in two identical consumption records.

If you monitor your clusters through ONTAP System Manager (System Manager) or Active IQ Unified Manager (Unified Manager), you might see a discrepancy between the consumption reported on these tools and Keystone services. System Manager and Unified Manager do not report volumes on the mirrored (remote) cluster, and in doing so, reports half the consumption metrics that the Keystone service reports.

For Example:

Site A and Site B are set up in a MetroCluster configuration. When a user creates a volume of 10TB in site A, an identical volume of 10TB is created in site B. Keystone distinguishes both the volumes and records an additional 10TB of consumption in each site, for a total increase of 20TB. System Manager and Unified Manager reports a 10TB volume created in site A.

### **Billing for temporary volumes**

Occasionally, temporary (TMP) volumes are created by ONTAP when moving volumes. These temporary volumes are short-lived, and the consumption on these volumes is not measured for billing.

### **Billing and adaptive QoS policies**

Keystone measures consumption based on service levels. Each service level is associated with a specific adaptive quality of service (QoS) policy. During deployment, you will be informed of the details of each QoS policy for your subscribed Keystone services. During storage management operations, ensure that your volumes have the appropriate QoS policies assigned as per your subscribed service levels, to avoid unexpected billing.

For more information about QoS policies in ONTAP, see [Guarantee throughput with QoS overview](#).

### Billing for SnapMirror destinations

The pricing for the SnapMirror destination volume governed by the QoS policy for the service level assigned on the source. However, if the source does not have an associated QoS policy, the destination is billed based on the lowest available service level.

### Billing for FlexGroups

FlexGroups are billed based on the adaptive QoS policy of the FlexGroup. The QoS policies of its constituents are not considered.

### Billing for LUNs

For LUNs, usually the same billing pattern is followed as for the volumes that are governed by QoS policies. If separate QoS policies are set on LUNs, then:

- The size of the LUN is counted for consumption according to the associated service level of that LUN.
- The remainder of the space in the volume, if any, is charged according to the QoS policy of the service level set on the volume.

### Billing for FabricPool usage

If data is tiered from a Keystone system to ONTAP Simple Storage Service (S3) object storage or NetApp StorageGRID, then the consumed capacity on the hot tier (Keystone system) will be reduced by amount of data that has been tiered off, impacting the resultant billing. This is regardless of the fact whether the ONTAP S3 storage or StorageGRID system is covered by the Keystone subscription.

For tiering your data to any third-party object storage, contact your Keystone Success Manager.

For information on the use of FabricPool technology for your Keystone subscriptions, see [Tiering](#).

### Billing for system and root volumes

System and root volumes are monitored as a part of the overall monitoring of the Keystone service but are not counted or billed. The consumption on these volumes is exempted for billing.

## Data protection

NetApp Keystone data protection service can back up your data and is able to recover it if required. The available data protection services are:

- Snapshots of disks and shares
- Backups of disks and shares (requires data protection service as part of the subscription)
- Disaster recovery for disks and shares (requires data protection service as a part of the subscription)



Backup and disaster recovery services are available as add-on services, while snapshot is available as a part of the basic storage service.

If you have subscribed to data protection services, specific service levels are assigned to your subscriptions, for example *Data-Protect Extreme*, *Data-Protect Premium*, and so forth. For information, see [Reference charts for data protection](#).

	<b>Single Region snapshots (Available as a part of the basic storage service)</b>	<b>Multi-region Backup (data protection add-on)</b>	<b>Multi-region Disaster Recovery (data protection add-on)</b>
Use case	Mitigate the risk of user or application data deletion or corruption, not against infrastructure loss or failure	Mitigate the risk of complete loss of data on the primary volume due to infrastructure loss or failure	Mitigate the risk of complete loss of data on the primary volume due to infrastructure loss or failure with a recovery time objective
Policy	Hourly, daily, weekly, and monthly	Number of backups to retain based on hourly, daily, weekly, and monthly snapshots	1 hour, 4 hours, and daily
Topology	Source only	Backup	Async replication target
Target replication service level <sup>1</sup>	n/a	Standard	Same as primary

<sup>1</sup>Additional storage capacity to be subscribed



Subscription to a basic Keystone service does not automatically back up your data. You should subscribe to add-on data protection services and configure your system for data backup and disaster recovery services. If your storage system is not managed by Keystone services, NetApp can still support protecting the data on your storage system and help in connecting it with your Keystone services. However, NetApp is not responsible for any backup failures.

## Tiering

NetApp Keystone service includes a tiering capability that identifies less frequently used data and tiers it to storage that is owned, deployed, and managed by NetApp.

The tiering capability leverages the NetApp FabricPool technology that enables automated tiering of data to low-cost object storage tiers either on or off premises. With this capability, infrequently accessed data is automatically tiered to a lower cost storage either on premises or in the cloud, based on the services agreed upon.

Partners and tenants can avail this capability easily by opting for the two preconfigured service levels, the Extreme-tiering and Premium-tiering service levels while provisioning their storage. The Extreme-tiering has the same QoS policies as the Standard, Extreme, and Premium service levels.

The add-on tiering capability is available only with Extreme and Premium service tiers. NetApp assumes 25% of data is hot and 75% is less frequently used and can be moved to cold storage. Billing is determined based on the duration per volume is in each service level.

The following features are enabled:

- You can create reports of the inactive data for your disks and file shares and decide upon whether to change the service level. On moving or changing the tiering policy, the latencies can be higher if data is accessed from cold tier.
- You can change the service level of the volumes from Extreme and Premium to Extreme-tiering and

Premium tiering respectively, provided that the destination tiering is enabled on the cluster.

- Likewise, you can change the tiering service levels to non-tiering for your volumes.
- Enable and disable backups for a volume on a tiering service level.
- Enable and disable disaster recovery for a volume on a tiering service level.

For information on billing, see [Billing for FabricPool usage](#).

## Non-returnable disk offering

As a part of NetApp Keystone services, NetApp extends the non-returnable disk (NRD) offering.

If you purchase the NRD offering for Keystone, NetApp does not recover the physical storage media used during the entire service tenure because of support and maintenance activities, or at service termination when NetApp otherwise recovers all of its physical assets used in the delivery of the service.

If you have purchased this service, note the following:

- Even on purchasing this service, you can opt for NetApp to recover the physical storage media.
- In case NetApp is not responsible for recovering the media, you are entitled to destroy the storage media or disks used in the delivery of the Keystone service at the end of the service tenure.
- You can add, modify, or terminate the NRD offering during the renewal of the subscription and not in the middle of the tenure.
- The cost associated with the NRD offering changes based on the committed capacity of the subscription. That is, if you opt to increase your committed capacity in the middle of the subscription period, the cost of NRD is revised likewise. The increase will be proportional to the increase in the committed capacity.
- You can retain only the physical storage media used in your service. Controllers, shelves, cables, switches, network cards, and any other equipment owned by NetApp will be recovered by NetApp.

## U.S. Citizen Support (USCS)

United States Citizen Support (USCS) is an add-on offering for NetApp Keystone subscription services. It entitles you to receive delivery and support of ongoing Keystone services from U.S. citizens on U.S. soil.

Read the following sections to understand which elements of your subscriptions are bound by this add-on service; and are provided under the terms of NetApp Keystone Agreement. <sup>[1]</sup>

### NetApp Global Services Support Center monitoring

NetApp Global Services and Support Center (GSSC) monitors the health of your products and subscribed services, provides remote support, and collaborates with your Keystone Success Manager. All personnel monitoring the products associated with the relevant Keystone subscription orders are U.S. citizens operating on U.S. soil.

### Keystone Success Manager

The Keystone Success Manager is a U.S. citizen operating on U.S. soil. Their responsibilities are specified in your NetApp Keystone Agreement.

## Deployment activities

Where available, onsite and remote deployment and installation activities are conducted by U.S. citizens on U.S. soil. <sup>[2]</sup>

## Support

Where available, the necessary onsite troubleshooting and support activities are conducted by U.S. citizens on U.S. soil. <sup>[2]</sup>

## Keystone services powered by Equinix

NetApp has partnered with Equinix for hosting NetApp Keystone services in an Equinix data center to ensure the delivery of a unified solution for you.

Keystone services powered by Equinix is unchanged from the standard Keystone services offering.

In addition to the standard Keystone services offering, you will need to select an Equinix datacenter to host your Keystone equipment.

## Operational model, roles, and responsibilities

NetApp Keystone is based on the model of tenancy.

Keystone offers three operational models for service delivery.

- **NetApp-operated model** allows the customer to subscribe to the offered services (according to the selected performance tiers and storage service types) and selects the NetApp-operated option at an extra cost. NetApp defines the architecture and products, installs at the customer premises, and manages the day-to-day infrastructure management operations by using NetApp storage and IT resources. Available storage service types are file, block, and object. Storage subscriptions based on Cloud Volumes Service for GCP and AWS can also be managed through your NetApp Keystone instance.
- **Partner-operated model** is similar to the NetApp-operated model, but with the partner operating the service for their end customers. In this model, the partner is the referenced contracted party. Tenants are customers of partners or service providers and have no billing relationship with NetApp. A partner-operated model usually has a multi-tenant environment where tenants and end customers/subtenants have their own subscriptions that are billed by the service provider/partner. The partner admin performs the administrative tasks for all the tenants. The functions that an admin can perform in a partner-operated model are different from that of an admin in a NetApp-operated model.
- **Customer-operated model** allows the customer to subscribe to an offered service, according to the selected performance tiers and storage service types. NetApp defines the architecture and products and installs at the customer premises and allows customers to manage the infrastructure using their storage and IT resources. A customer can be tied to NetApp or a partner/service provider, and based on that, the service requests can be raised and addressed to NetApp or the service provider. A customer admin can perform the administrative tasks in a customer-operated environment. These tasks are tied to the tenants and subtenants for the specific customer.

The features and options in the offering vary based on the models.

## Roles and responsibilities across the service lifecycle

- **NetApp-operated model:** The end-to-end management of installation, deployment, operations, monitoring,

optimization and support is performed by NetApp.

- **Partner-operated model:** The share of roles and responsibilities depends on the SLA between you and the service provider or partner. Contact your service provider for information.
- **Customer-operated model:** The following table summarizes the overall service lifecycle model and the roles and responsibilities associated with them in a customer-operated environment.

Task	NetApp	Customer
Installation and related tasks <ul style="list-style-type: none"> <li>• Install</li> <li>• Configure</li> <li>• Deploy</li> <li>• Onboard</li> </ul>	[check]	None
Administration and monitoring <ul style="list-style-type: none"> <li>• Monitor</li> <li>• Report</li> <li>• Perform administrative tasks</li> <li>• Alert</li> </ul>	None	✓
Operations and optimization <ul style="list-style-type: none"> <li>• Manage capacity</li> <li>• Manage performance</li> <li>• Manage SLA</li> </ul>	None	✓
Support <ul style="list-style-type: none"> <li>• Support customer</li> <li>• Hardware break fix</li> <li>• Software support</li> <li>• Upgrades and patches</li> </ul>	✓	None

### Roles and responsibilities summary

The following list summarizes NetApp’s roles and responsibilities:

- NetApp delivers, installs, configures, and enables the applicable service. NetApp is responsible for the uninstallation at the end of the contract term or if the customer chooses to terminate the contract sooner.
- While interfacing with other IT service providers, NetApp cooperates with the customer’s IT service providers or their technical team.
- Performance of the NetApp-operated services are included, with the assumption that shared responsibilities are applicable to the supported environment.



# Tenancy and multi-tenancy in Keystone

NetApp Keystone uses the concepts of **Tenant** and **Subtenant** as hierarchical entities that own logical storage resources. The concept of multi-tenancy is also supported, where multiple tenants are tied to a partner or service provider. The entities partner and service provider are used interchangeably here.



In the context of Keystone, a single tenancy is a NetApp-operated model, while a multi-tenancy is a partner-operated model.

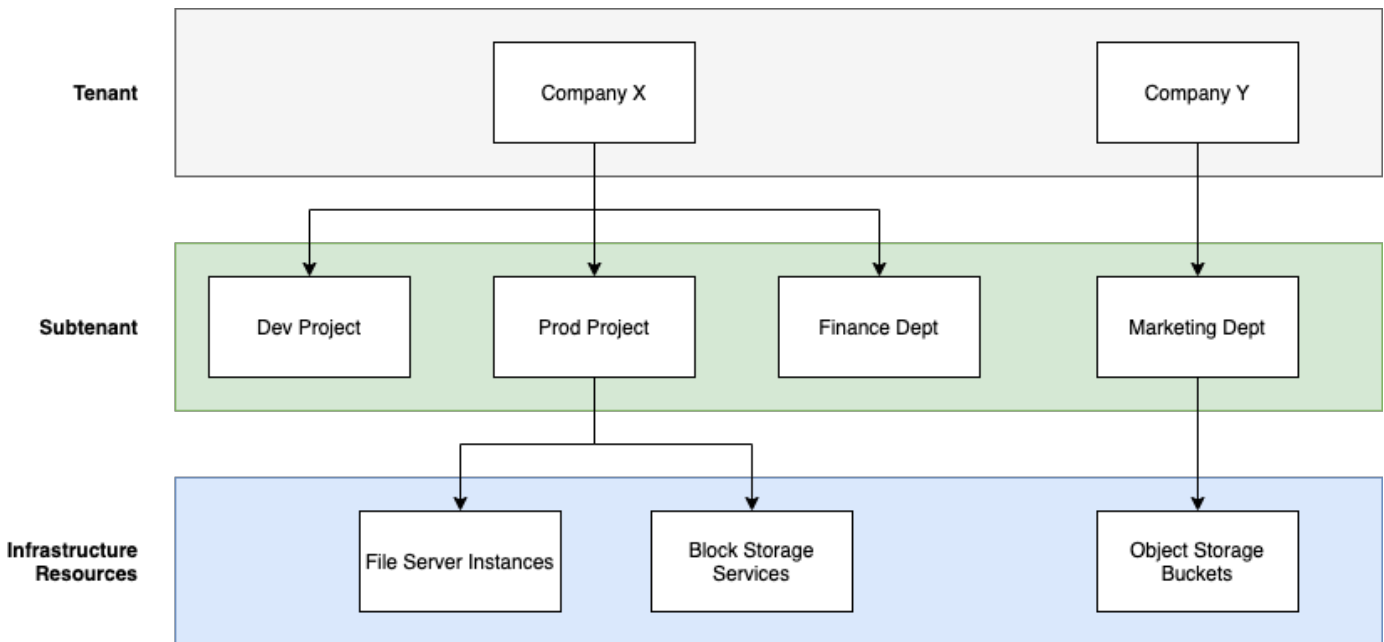
## Tenants

A tenant is the primary billing entity defined in Keystone. Each customer that is onboarded into Keystone and holds a subscription to the services, exists as a Keystone tenant. The customer provides NetApp with a customer name and/or identifier for the purposes of onboarding tenants and tracking subscription dates and commitment terms.

In a multi-tenancy, a partner is a tenant/customer of NetApp in a Keystone environment. The partner, in turn, can bear multiple tenants or customers, who are linked to end customers/subtenants. In this model, tenants/subtenants are the customers of the service providers, and have no billing relationship with NetApp.

## Subtenants

Keystone subtenants exist entirely within a parent tenant with a many-to-one relationship. Subtenants provide logical resource separation within a tenancy and are used as a basis for show-back reporting. All storage resources (that is file services, block storage, and object storage) belong to a subtenant.



## Subscription model in a NetApp-operated (single tenancy) environment

- A subscription is created by NetApp admin or GSSC for a tenant and zone.
- The subscription names are derived from the billing entity for which the tenant is subscribed.
- In the subscription, the start-date and contract term are configured.
- There can be only one active subscription for each tenant-zone

- One subscription can have multiple rate plans and each rate plan corresponds to a service level.
- Each rate plan has a committed capacity per service level.
- Service levels can include:
  - Extreme
  - Extreme-Tiering
  - Performance
  - Performance-Tiering
  - Value
  - Data protection for each of the service levels
  - Advanced Data Protection for Extreme, Performance, Value
  - Storage objects

## Subscription model in a multi-tenant environment

- Service Providers are Keystone customers and have subscriptions as tenants. The subscriptions are based on:
  - Commitment per service level and zone
  - Charged on allocated capacity with 100TiB minimum
  - Burst charges apply for 100-120% of committed capacity
- NetApp charges the providers monthly, as a part of their usual tenancy terms.
- For a service level to be available to tenants, the service provider or partner should first have a Keystone in place for the service level.
- The service provider creates tenant subscriptions per service level, zone, and flexible minimums.
- Service providers can sell more capacity to their tenants than they have purchased from NetApp (oversubscription). Therefore, the capacity used by tenants is not limited by the capacity the service provider has subscribed to.
- Tenants can use storage capacity over their subscribed amount, that is listed as 'burst' on usage reports.
- Tenant usage reports are available to partners for viewing on a daily or monthly basis.
- Tenants can create subscriptions for longer duration as compared to the corresponding Keystone subscription, but a warning message is displayed to the end customer during that activity.
- Keystone subscription for a partner is configured by NetApp admins or GSSC. Management of Keystone subscription and tenant subscriptions is performed by a user with Partner admin role.
- Users with the tenant admin roles can only view the tenant subscription (not partner's Keystone subscription). They can update the given subscription to change capacity and service level. They can raise service requests for additional subscriptions.
- The partner admin can create another subscription either when the existing subscription is expired, or for a future date when the existing subscription is no longer valid. The start date for a new subscription must be greater than or equal to current end date.

## Keystone infrastructure

This section describes the NetApp Keystone infrastructure architecture and management

application for the NetApp and customer-operated environments.

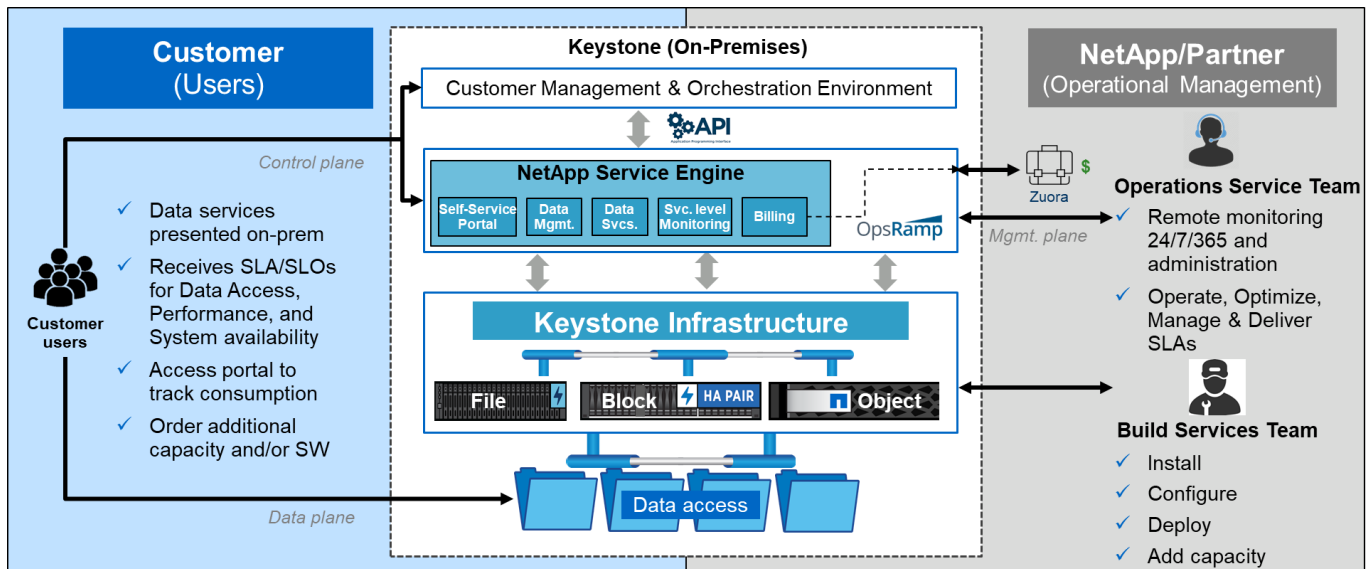
Keystone infrastructure architecture, design, choice of technology, and component products reside solely with NetApp. NetApp reserves the rights to take the following actions:

- Select, substitute, or repurpose products.
- Refresh products with new technology when deemed appropriate.
- Increase or decrease capacity of the products to meet service requirements.
- Modify architecture, technology, and/or products to meet service requirements.

The Keystone infrastructure includes multiple components:

- The Keystone infrastructure that includes storage controllers
- Tools to manage and operate the service such as OpsRamp, Active IQ Digital Advisor, and Active IQ Unified Manager.

For more information about NetApp Keystone integration with Active IQ, see [Active IQ Digital Advisor Documentation](#)



## Site requirements

There are multiple requirements for enabling NetApp Keystone services in your environment, such as space, racks, PDUs, power, and cooling, with additional network and security requirements discussed later.

### Space

Floor space to host the Keystone infrastructure equipment (to be provided by customers). NetApp provides the weight specifications based on the final configuration.

### Racks

Four post racks in the customer-operated offering (to be provided by customers). In the NetApp-operated

offering, either NetApp or the customer can provide the racks, depending on requirements. NetApp provides 42 deep racks.

## **PDUs**

You should be providing the power distribution units (PDUs), connected to two separate, protected circuits with sufficient C13 outlets. In the customer-operated offering, in some cases, C19 outlets are required. In the NetApp-operated offering, either NetApp or the customer can provide the PDUs, depending on requirements.

## **Power**

You should provide the required power. NetApp will provide the power requirement specifications based on 200V rating (Typical A, Max A, Typical W, Max W, Power cord type, and quantity), based on the final configuration. All components have redundant power supplies. NetApp will provide the in-cabinet power cords.

## **Cooling**

NetApp can provide the cooling requirement specifications (Typical BTU, Max BTU), based on the final configuration and requirement.

## **Networking**

Depending on customer requirements and the storage controllers used, NetApp can provide 10 Gib, 40 Gib, and 100 Gib connectivity at the customer site.

NetApp provides the required transceivers for NetApp-provided Keystone infrastructure devices only. You should supply transceivers required for customer devices and cabling to the NetApp-provided Keystone infrastructure devices.

# **Keystone Services Operations**

NetApp Keystone Keystone Services are run by leveraging the NetApp Global Services and Support Center (GSSC), NetApp Keystone Success Manager, and NetApp Keystone Service Delivery Manager.

## **NetApp Global Services and Support Center (GSSC)**

NetApp provides operational services remotely to NetApp Keystone customers. These services encompass a range of operational disciplines across storage management activities, including asset and configuration management, capacity and performance management, change management, event, incident and problem management, service request fulfillment, and reporting. NetApp will demonstrate a state of control and supporting evidence available as required.

## **Additional Information and Support Contact**

The NetApp Global Services and Support Center (GSSC) team primarily support the services to NetApp Keystone customers.

Raise a ticket with the appropriate details of the issue for assistance.

You can also use the following information to reach out to the support team.

- Global Service Contacts :  
<https://www.netapp.com/us/contact-us/support.aspx>
- If you have an open case/ticket that needs to be escalated, please send an email to one of the following addresses:  
[Keystone.services@netapp.com](mailto:Keystone.services@netapp.com)  
[Keystone.escalations@netapp.com](mailto:Keystone.escalations@netapp.com)
- NetApp uses OpsRamp, a cloud-based remote gateway solution to proactively monitor and connect to the NetApp Keystone environment for troubleshooting purposes. For information on OpsRamp, see <https://www.opsramp.com/#>.



In a partner-operated model, the tenant and subtenant's service requests are assigned to the partner's service desk. The partner's support tool might have integration with OpsRamp and GSSC applications. Only L3 issues are escalated to NetApp through GSSC.

To learn more about the information that is described in this document, review the following documents and/or websites:

- NetApp Keystone  
<https://www.netapp.com/us/solutions/keystone/index.aspx>
- NetApp Product Documentation  
<https://docs.netapp.com>

## What can Keystone customers view in Active IQ Digital Advisor?

You use the **Keystone Subscriptions** widget of the Active IQ Digital Advisor (also known as Digital Advisor) dashboard to get an overview of your subscriptions.



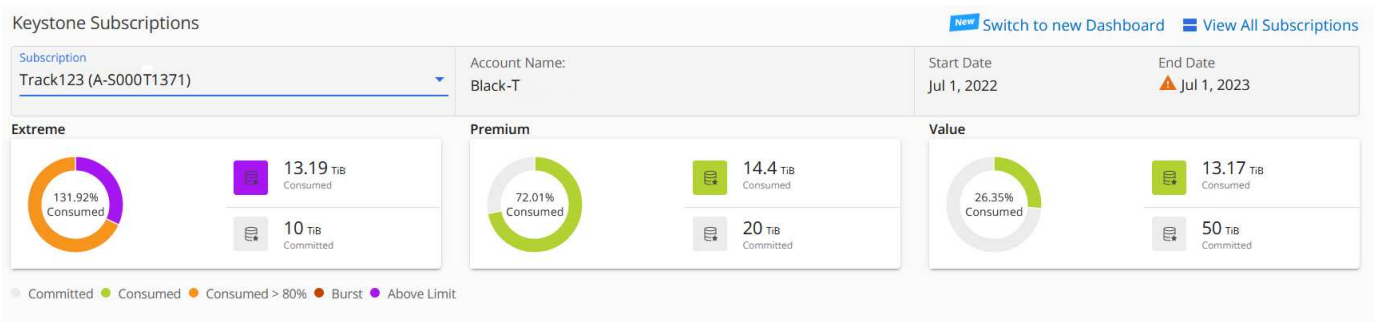
This information might be outdated. For recent updates, refer to the NetApp Keystone STaaS documents at [View Keystone dashboard on Active IQ Digital Advisor](#).

You can search for Keystone subscription by entering the first three characters of a customer or watchlist name, or the Keystone subscription number. For information about how to search Keystone subscriptions by watchlists, see [Search by using Keystone watchlists](#).

Digital Advisor offers a unified dashboard that gives insights into various levels of your subscription data and usage information through the **Switch to old/new dashboard** button.

### Default (old) dashboard

You can see your customer name and subscription number, account name, start and end dates of the subscription, and the capacity usage graphs as per your subscribed service levels. You can see the collection timestamp of the consumption data in UTC time.



**Alternative (new) dashboard**

You can see the breakup of the capacity usage as per your subscriptions, and warnings and alerts that require immediate attention or action. The information appears selectively, depending on your subscriptions and the status of your usage. You can view this information:

- **Capacity usage:** Consumption data such as:
  - No usage.
  - Consumption exceeding 80% of the committed capacity.
  - Burst usage.
  - Consumptions above the burst capacity.
- **Alerts:** You see alerts for various scenarios if they are applicable to you.
  - **Expiring soon:** In case your subscriptions expire within 90 days.
  - **Critical Hardware Upgrades:** If any critical hardware upgrades are pending.
  - **AQoS Warnings:** You have volumes without AQoS policies assigned.



Click the **Subscriptions** link to view the list of filtered subscriptions in the **Subscriptions** tab.



For more information about Digital Advisor, see [Digital Advisor documentation](#).

For information about the **Keystone Subscriptions** tab, see *Digital Advisor dashboard and reporting for Keystone*.

**Search by using Keystone watchlists**

Watchlist is a feature of Active IQ Digital Advisor (Digital Advisor). For information, see [Understand watchlist](#). For information about creating watchlists, see [Create a watchlist](#).

For Keystone, you can create watchlists for customers or subscription numbers. You can search by the watchlist name on the Digital Advisor screen. On searching by a watchlist, you can view the customers and their subscriptions in the **Subscription** drop-down list on the **Keystone Subscriptions** widget.



A search by watchlists retrieves the list of subscriptions on the old dashboard. If a watchlist consists of subscription numbers, only the **Keystone Subscriptions** widget is displayed on the Digital Advisor dashboard.

## Digital Advisor dashboard and reporting for Keystone

You use the Active IQ Digital Advisor (also known as Digital Advisor) dashboard to view the details of your Keystone subscriptions, to monitor capacity usage, and generate reports.



This information might be outdated. For recent updates, refer to the NetApp Keystone STaaS documents at [Use Keystone dashboard and reporting](#).

On subscribing to Keystone services, you can view the details of your subscription and usage on the **Keystone Subscriptions** widget on the Digital Advisor dashboard.



The information here applies to both ONTAP and StorageGRID. Exceptions have been pointed out in the relevant sections.

For information about the Keystone Digital Advisor widget, see [View capacity utilization with NetApp Keystone Subscription](#).

To view your Keystone subscription and usage details, perform the following steps:

### Steps

1. Log in to Digital Advisor. You can see the **Keystone Subscriptions** widget that summarizes the capacity usage against your purchased Keystone services.
2. On the **Keystone Subscriptions** widget, click **View More Details** to view the usage details and alerts on your volumes on the **Keystone Subscriptions** page. Alternately, from the left navigation pane, go to **GENERAL > Keystone Subscriptions**.  
The details of the subscriptions, usage charts for each service level, and volume details are displayed in the different tabs on the **Keystone Subscriptions** screen.



Capacity consumption in Keystone subscriptions is displayed in TiBs on the dashboards and reports, and is rounded off to two decimal places. If the usage is less than 0.01 TiB, then the value is shown as 0 or No Usage. The data on these screens is displayed in UTC time (server timezone). When you enter a date for query, it is automatically considered to be in UTC time.

For information about usage metrics, see [Service level metrics and definitions](#). For information about different capacities used in Keystone, see [Keystone service capacity definitions](#).

## Subscriptions

You can view a list of all your subscriptions in the **Subscriptions** tab.

To view this tab, from the left navigation pane, go to **GENERAL > Keystone Subscriptions > Subscriptions**. All your subscriptions are listed.

Subscriptions	Current Usage	SLA Details	Capacity Trend	Volumes & Objects	Performance	Assets
<div style="display: flex; justify-content: space-between;"> <span>Clear Filters</span> <span>View Usage Indicators <a href="#">Download CSV</a></span> </div>						
<input type="checkbox"/> Subscription Number	Linked Subscriptions	Tracking ID	Usage Type	Billing Period	Start Date (UTC)	End Date (UTC) ↑
<input type="checkbox"/> A-500022819		QA-2DayExpirySubscription	Logical (v2)	Annual ⓘ	February 7, 2023	▲ February 15, 2023
<input type="checkbox"/> A-500022297		MetroCluster_1	Provisioned (v1)	Annual ⓘ	December 13, 2022	▲ December 13, 2023
<input type="checkbox"/> A-500022301		MetroCluster_2	Provisioned (v1)	Annual ⓘ	December 13, 2022	▲ December 13, 2023
<input type="checkbox"/> A-500022705		QaAutomationQuarterly	Provisioned (v2)	Annual ⓘ	January 24, 2023	▲ January 24, 2024
<input type="checkbox"/> A-500022704		QaAutoAnnual	Physical (v2)	Annual ⓘ	January 24, 2023	▲ January 24, 2024
<input type="checkbox"/> A-500022706		QaAutoMonthly	Physical (v1)	Month	January 24, 2023	▲ January 24, 2024
<input type="checkbox"/> A-500022862		SPAR-UseCase-Test	Provisioned (v1)	Annual ⓘ	February 15, 2023	▲ February 15, 2024
<input type="checkbox"/> A-500023070		QA-MCC-SiteA ⓘ	Logical (v1)	Annual ⓘ	March 21, 2023	▲ March 21, 2024
Items per page: 100						1 to 37 of 37

You can filter the selection by clicking the hamburger icon for a column, or view all the subscriptions by clicking the **Clear Filters** button. For certain fields and columns, you might see information or warning icons and tooltips that provide you with additional information about the data.



- **Subscription Number:** The subscription number of the Keystone subscription assigned by NetApp.
- **Tracking ID:** The tracking ID assigned at the time of subscription activation. This is a unique ID for each subscription and site, used for tracking the subscription.



If you have subscribed to advanced data protection add-on service, then you can click the tooltip against your subscription number to view the tracking ID of the partner subscription in a MetroCluster setup. To know how to view detailed consumption by partner subscriptions in a MetroCluster configuration, see [Reference charts for data protection](#).

- **Usage Type:** You might have subscribed to multiple Keystone (version 1) or Keystone STaaS (version 2) subscriptions. The rate plan rules for the service levels might vary for the two subscription types. By looking at the value in this column, you know whether the usage type is billed as per the provisioned or logical usage for either v1 or v2. For more information about Keystone Subscriptions version 1, see [Keystone STaaS Documentation](#).
- **Billing Period:** The billing period of the subscription, such as monthly, quarterly, or yearly.



- **Start Date:** The start date of the subscription.
- **End Date:** The end date of the subscription. If you have a monthly-billable subscription that automatically renews every month, you see `Month-on-month` instead of the end date. Based on this date, you might see notifications for subscriptions that are about to end or have auto-renewal policies attached.
- **Usage Status:** Displays the usage indicator to indicate whether the consumption is within or exceeding the subscription limit. You can sort the list by this column if you want to view the highest consumption records.
-  : Clicking this icon for a subscription opens the **Current Usage** tab with the usage details of that subscription.
-  : Clicking this icon opens the **Capacity Trend** tab where you can see the historical usage data for each service level included in this subscription.

You can refer to the following usage indicators to check the usage status of each subscription:

- No Usage 0%
  - Consuming 0% - 80%
  - Consuming Above 80%
  - Within Burst Limit (20% of Committed)
  - Above Burst Limit
- Indicate consumed capacity
- Indicate burst usage

## Index

- : No capacity usage recorded against the committed capacity of the service level
- : The consumption is normal, within 80% of the committed capacity
- : Maximum consumption, that is, the usage is about to reach 100% or more of the committed capacity. The **Consumed** column displays this indicator for any consumption above 80% of the committed capacity
- : The consumption is within the burst limit. The burst consumption is the consumption that tops the 100% committed capacity of a service level, and is within the agreed-upon burst usage limit, such as 120%
- : Indicates consumption above the stipulated burst limit

## Current Usage

The **Current Usage** tab displays the usage details of your subscriptions.

To view this tab, from the left navigation pane, go to **GENERAL > Keystone Subscriptions > Current Usage**, and select the required subscription number.

Subscription	Start Date	End Date	Billing Period
QaAutoMonthly (A-500022706)	January 24, 2023	January 24, 2024	Annual

**Warning:** 149 volumes do not comply with this subscription's AQoS policies.

### Current Usage per Service Level

Legend: No Usage (grey), Consuming (green), Consuming > 80% (orange), Using Burst (red), Above Burst Limit (purple)

Service Level	Committed	Consumed	Available	Available With Burst	Current Burst	Accrued Burst
Premium	45 TiB	0.87 TiB	44.13 TiB	53.13 TiB	0 TiB	0 TiB
Extreme	110 TiB	2.44 TiB	107.56 TiB	129.56 TiB	0 TiB	0 TiB
Data-Protect Premium	10 TiB	0 TiB	10 TiB	12 TiB	0 TiB	0 TiB
Data-Protect Extreme	10 TiB	0.2 TiB	9.8 TiB	11.8 TiB	0 TiB	0 TiB

Items per page: 10 | 1 to 6 of 6 | Page 1 of 1 | [View Historical Data](#) | [Download CSV](#)

For the selected subscription, you can view details, such as the start and end dates of the subscription, and the billing period, such as monthly or annual. As a part of the subscription usage, you can view the service level name, committed, consumed, available capacities, and current and accrued burst usage (in TiB).



The **i** icon next to each column provides comprehensive information about that column. Specific service levels that record higher consumption are highlighted. You can also view warnings and alerts generated for your volumes.

For information about your Keystone storage services and the relevant service levels, see [Service levels](#).

Coupled with the current usage, you might want to view the historical usage data for comparison. Click the **View Historical Data** button to navigate to the **Capacity Trend** tab to view the historical data for the same subscription.

### Capacity Trend

The **Capacity Trend** tab displays historical data of your Keystone subscriptions for a specific period.

The vertical graphs display the usage details for the selected time range with appropriate indicators for you to compare and generate reports.

### Steps

1. Click **GENERAL > Keystone Subscriptions > Capacity Trend**.
2. Select the required subscription for which you want to view the details. The first subscription in your account name is selected by default.
3. Select **Capacity Trend** if you want to view the historical data and analyze the capacity usage trend. Select **Invoiced Accrued Burst** if you want to view the historical burst usage data, for which invoices have been generated. You can use this data to analyze the billed usage as per your invoice.

### View capacity trend

## Learn more

If you have selected the **Capacity Trend** option, follow these steps:

### Steps

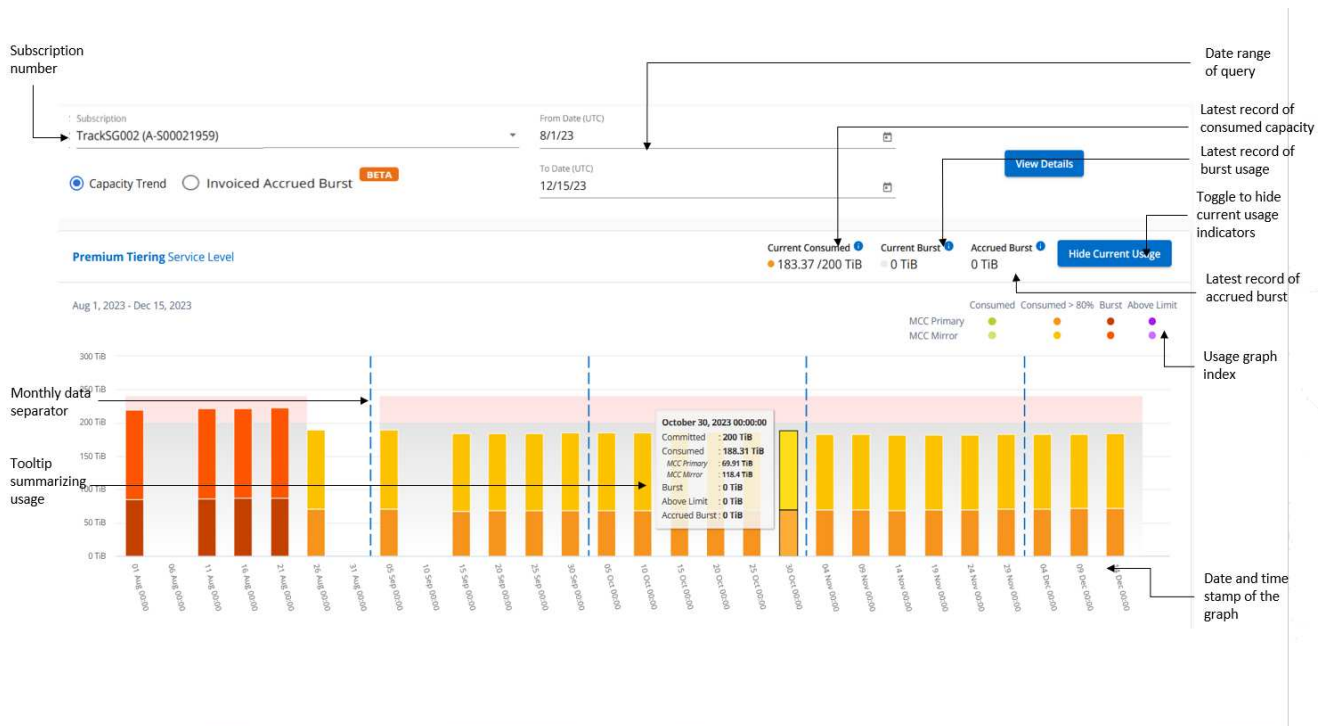
1. Select the time range from the calendar icons in the **From Date** and **To Date** fields. Select the date range for the query. The date range can be the beginning of the month, or the subscription start date to the current date or the subscription end date. You cannot select a future date.



For optimal performance and user experience, limit the date range of your query to three months.

2. Click **View Details**. The historical consumption data of the subscription for each service level is displayed based on the selected time range.

The bar charts display the service level name and the capacity consumed against that service level for the date range. The date and time of the collection are displayed at the bottom of the chart. Based on the date range of your query, the usage charts are displayed in a range of 30 data collection points. You can hover your mouse cursor over the charts to view the usage breakdown in terms of committed, consumed, burst, and above the burst limit data at that data collection point.



The following colors in the bar charts indicate the consumed capacity as defined within the service level. Monthly data across the charts is separated by a vertical line.

- Green: Within 80%.
- Amber: 80% - 100%.
- Red: Burst usage (100% of the committed capacity to the agreed burst limit)
- Purple: Above the burst limit or Above Limit.



A blank chart indicates that there was no data available in your environment at that data collection point.

You can click the toggle button **Show Current Usage** to view the consumption, burst usage, and accrual burst data for the current billing period. These details are not based on the date range of the query.

- **Current Consumed:** Indicator for the consumed capacity (in TiB) defined for the service level. This field uses specific colors:
  - No color: Burst or above burst usage.
  - Grey: No usage.
  - Green: Within 80% of the committed capacity.
  - Amber: 80% of the committed to the burst capacity.
- **Current Burst:** Indicator for the consumed capacity within or above the defined burst limit. Any usage within the burst limit for your subscription, for example, 20% above the committed capacity is within the burst limit. Further usage is considered as usage above the burst limit. This field displays specific colors:
  - No color: No burst usage.
  - Red: Burst usage.
  - Purple: Above the burst limit.
- **Accrued burst:** Indicator for the accrued burst usage or consumed capacity calculated per month for the current billing period. The accrued burst usage is calculated based on the committed and consumed capacity for a service level:  $(\text{consumed} - \text{committed}) / 365.25 / 12$ .

**View invoiced accrued burst**

## Learn more

If you have selected the **Invoiced Accrued Burst** option, by default, you can see the monthly accrued burst usage data for the last 12 months that has been billed. You can query by the date range of up to past 30 months. Bar charts are displayed for invoiced data, and if the usage has not yet been billed, you see *Pending* for that month.



The invoiced accrued burst usage is calculated per billing period, based on the committed and consumed capacity for a service level.



This functionality is available in a preview-only mode. Contact your KSM to learn more about this feature.

## Reference charts for data protection

## Learn more

If you have subscribed to the data protection service, you can view the breakup of the consumption data for the MetroCluster partner sites on the **Capacity Trend** tab.

For information about data protection, see [Data protection](#).

If the clusters in your ONTAP storage environment are configured in a MetroCluster setup, the consumption data of your Keystone subscription is split in the same historical data chart to display the consumption at the primary and mirror sites for the base service levels.



The consumption bar charts are split for only base service levels. For data protection service levels, this demarcation does not appear.

### Data protection service levels

For data protection service levels, the total consumption is split between the partner sites, and the usage at each partner site is reflected and billed in a separate subscription; that is one subscription for the primary site, and another for the mirror site. That is why, when you select the subscription number for the primary site on the **Capacity Trend** tab, the consumption charts for the DP service levels display the discrete consumption details for only the primary site. Because each partner site in a MetroCluster configuration acts as a source and a mirror, the total consumption at each site includes the source and the mirror volumes created at that site.



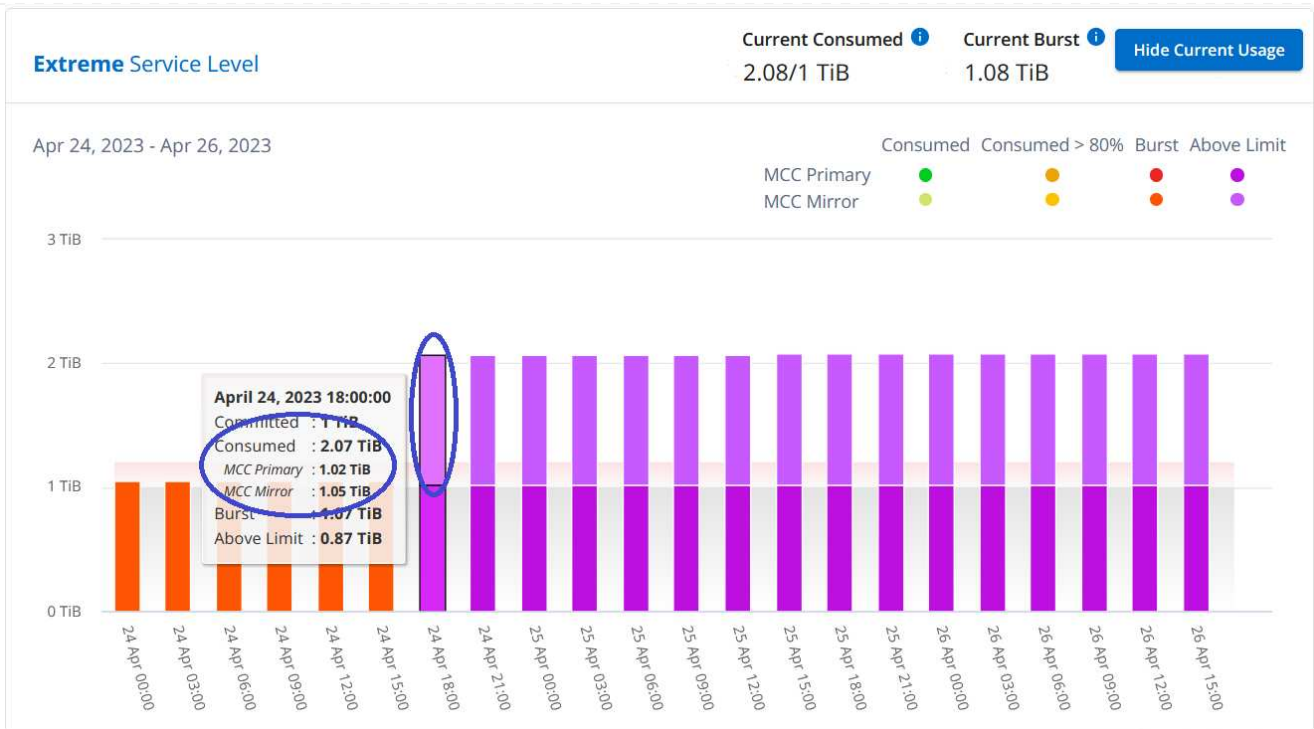
The tooltip next to the tracking ID of your subscription in the **Current Usage** tab helps you identify the partner subscription in the MetroCluster setup.

### Base service levels

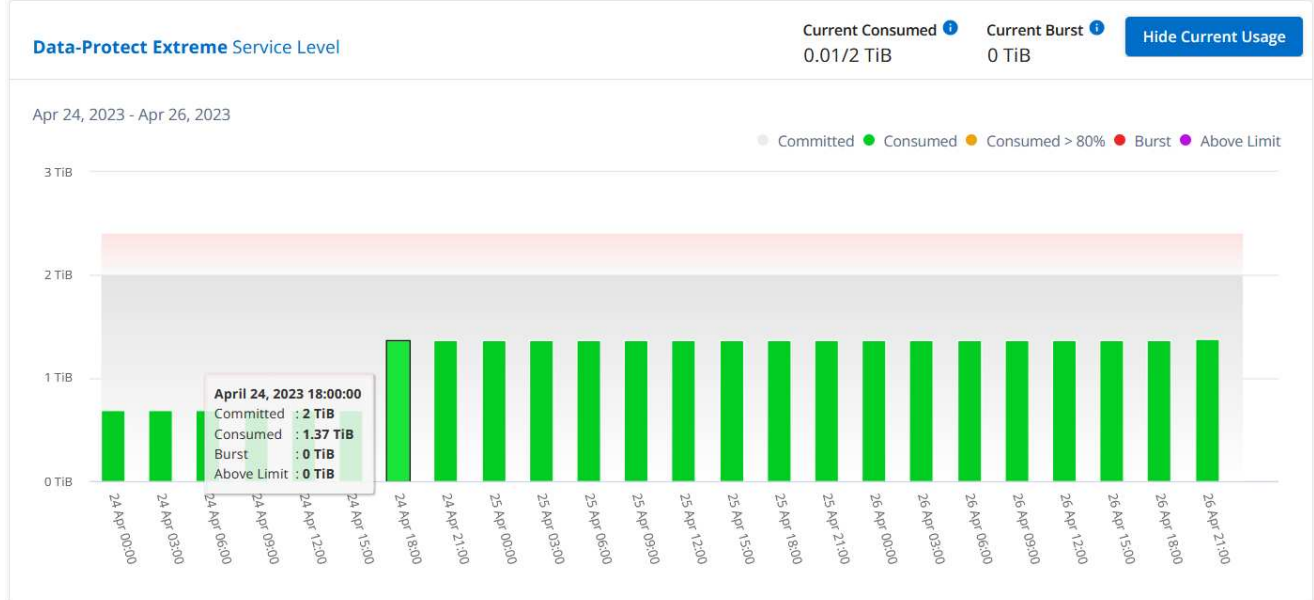
For the base service levels, each volume is charged as provisioned at the primary and mirror sites, and hence the same bar chart is split according to the consumption at the primary and mirror sites.

### What you can see for the primary subscription

The following image displays the charts for the *Extreme* service level (base service level) and a primary subscription number. The same historical data chart marks off the mirror site consumption in a lighter shade of the color code used for the primary site. The tooltip on mouse hover displays the consumption breakup (in TiB) for the primary and mirror sites, 1.02 TiB and 1.05 TiB respectively.



For the *Data-Protect Extreme* service level (data protection service level), the charts appear like this:



**What you can see for the secondary (mirror site) subscription**

When you check the secondary subscription, you can see that the bar chart for the *Extreme* service level (base service level) at the same data collection point as the partner site is reversed, and the consumption breakup at the primary and mirror sites is 1.05 TiB and 1.02 TiB respectively.

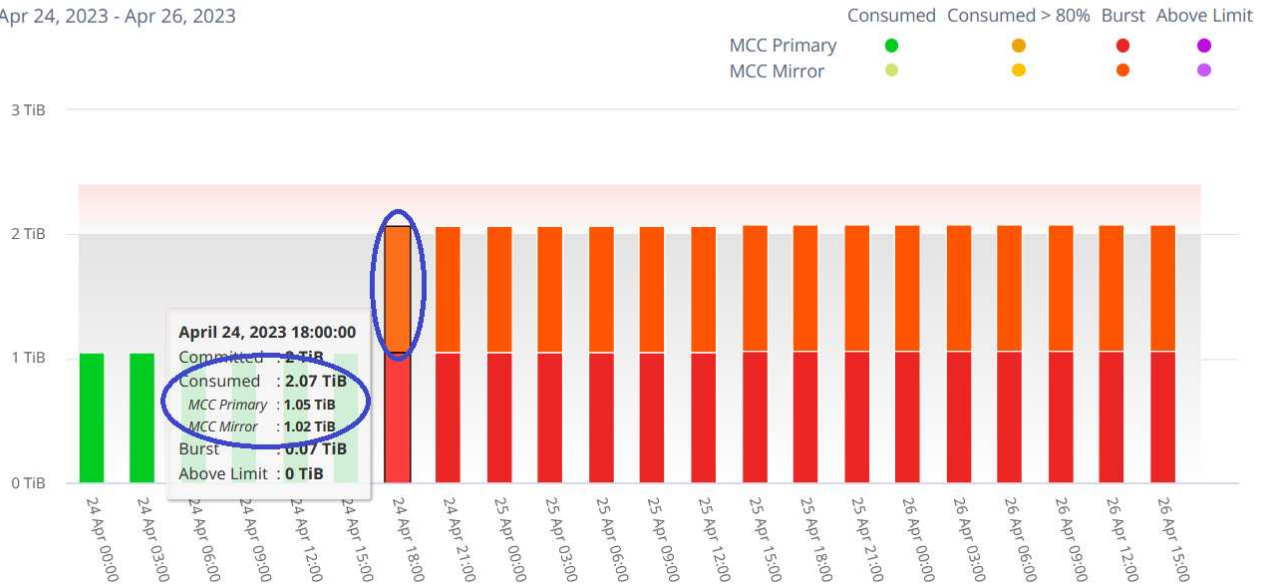
### Extreme Service Level

Current Consumed 2.08/2 TiB

Current Burst 0.08 TiB

Hide Current Usage

Apr 24, 2023 - Apr 26, 2023



For the *Data-Protect Extreme* service level (data protection service level), the chart appears like this at the same collection point as the partner site:

### Data-Protect Extreme Service Level

Current Consumed 0/1 TiB

Current Burst 0 TiB

Hide Current Usage

Apr 24, 2023 - Apr 26, 2023



For information about how MetroCluster protects your data, see [Understanding MetroCluster data protection and disaster recovery](#).

## Volumes & Objects

Use the **Volumes & Objects** tab to view the summary information and details of your ONTAP volumes. For StorageGRID, you can use this tab to read the usage by the individual nodes in your object storage environment.





The title of this tab varies with the nature of deployment at your site. If you have both ONTAP and object storage, the title of the tab appears as **Volumes & Objects**. For only ONTAP, the name appears **Volumes**. For StorageGRID object storage, you can see the **Objects** tab.

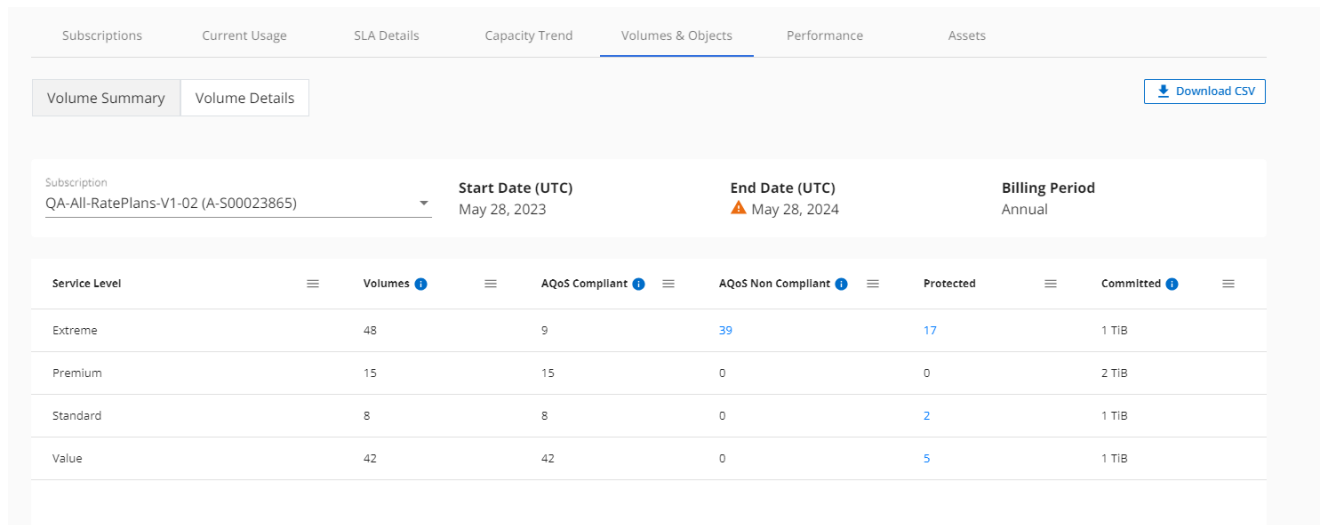
#### **View ONTAP volume summary and details**

The Volumes tab offers different levels of details on your ONTAP system volumes. There are two tabs, one each for the summary and details view of your ONTAP volumes. The **Volume Summary** tab provides an overall count of the volumes mapped to the subscribed service levels. The corresponding volumes are again listed in the **Volume Details** tab with their particulars.

## Volume Summary

1. Click **GENERAL > Keystone Subscriptions > Volumes & Objects > Volume Summary**.
2. Select the subscription number. By default, the first available subscription number is selected.

For the selected Keystone subscriptions, you can see the total number of volumes, their AQoS compliance status, count of protected volumes, and the total committed, consumed, and available capacity in all those volumes. If you click the number of non-compliant or protected volumes, it takes you to the **Volume Details** tab, where you can view a filtered list showing either the non-compliant volumes or the protected volumes, based on your selection.



Subscription	Start Date (UTC)	End Date (UTC)	Billing Period
QA-All-RatePlans-V1-02 (A-500023865)	May 28, 2023	May 28, 2024	Annual

Service Level	Volumes	AQoS Compliant	AQoS Non Compliant	Protected	Committed
Extreme	48	9	39	17	1 TIB
Premium	15	15	0	0	2 TIB
Standard	8	8	0	2	1 TIB
Value	42	42	0	5	1 TIB

## Volume Details

1. Click **GENERAL > Keystone Subscriptions > Volumes > Volume Details**.
2. Select the subscription number. By default, the first available subscription number is selected.

You can see the tabular listing of the volumes, such as capacity usage, volume type, cluster, aggregate, and the assigned Keystone service levels. You can scroll across the columns and learn more about them by hovering your mouse on the information icons beside the column headings. You can sort by the columns and filter the lists to view specific information.



For advanced data protection add-on service, an additional column appears to indicate whether the volume is a primary or mirror volume in the MetroCluster configuration. You can copy individual node serial numbers by clicking the **Copy Node Serials** button.

Subscriptions    Current Usage    SLA Details    Capacity Trend    **Volumes & Objects**    Performance    Assets

Volume Summary    Volume Details    [Download CSV](#)

Subscription  
QA-All-RatePlans-V1-02 (A-S00023865)    [Copy Node Serials](#)

**⚠️ AQoS non-compliance can impact performance**

[Clear Filters](#)

Volume Name	Compliant <span>?</span>	QoS Policy Type <span>?</span>	Cluster Name	Host Name	Aggregate Name
vol_aqos_cascading	Compliant	AQoS	sti43-vsimsim-ucs514k4l_si...	sti43-vsimsim-ucs514k	sti43_vsimsim_ucs514i_agg..
vol_aqos_cascading_dp	Compliant	AQoS	sti43-vsimsim-ucs514k4l_si...	sti43-vsimsim-ucs514k	sti43_vsimsim_ucs514k_ag...
vol_aqos_cascading_dp...	Compliant	Not Available	sti43-vsimsim-ucs514k4l_si...	sti43-vsimsim-ucs514k	sti43_vsimsim_ucs514i_agg..
vol_aqos_extreme_lun_...	Compliant	AQoS	sti43-vsimsim-ucs514k4l_si...	sti43-vsimsim-ucs514k	sti43_vsimsim_ucs514k_ag...
vol_aqos_extreme_lun_...	Compliant	AQoS	sti43-vsimsim-ucs514k4l_si...	sti43-vsimsim-ucs514k	sti43_vsimsim_ucs514i_agg..

**View StorageGRID nodes and consumption**

## Learn more

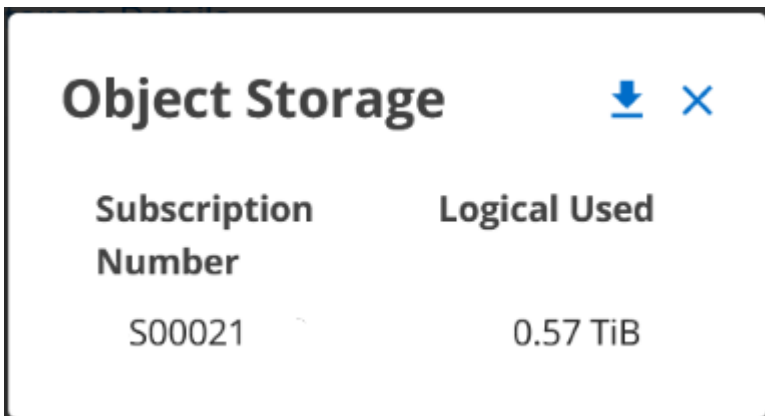
For StorageGRID, this tab displays the physical usage for the nodes for object storage.

### Steps

1. Click **GENERAL > Keystone Subscriptions > Objects**.
2. Select the subscription number. By default, the first available subscription number is selected. On selecting the subscription number, the link for object storage details is enabled.



3. Click the link to view the node names and logical usage details for each node.



Object Storage	
Subscription Number	Logical Used
S00021	0.57 TiB

## Performance


The **Performance** tab enables you to view the performance metrics of the ONTAP volumes managed by your Keystone subscriptions.



This tab is optionally available to you. Contact support for viewing this tab.

### Steps

1. Click the **Performance** tab.
2. Select the subscription number. By default, the first subscription number is selected.
3. Select the required volume name from the list.

Alternately, you can click the  icon against an ONTAP volume in the **Volumes** tab to navigate to this tab.

4. Select the date range for the query. The date range can be the beginning of the month, or the subscription start date to the current date or the subscription end date. You cannot select a future date.

The retrieved details are based on the service level objective for each service level. For example, the peak IOPS, maximum throughput, target latency, and other metrics are determined by the individual settings for the service level. For more information about the settings, see [Service levels](#).



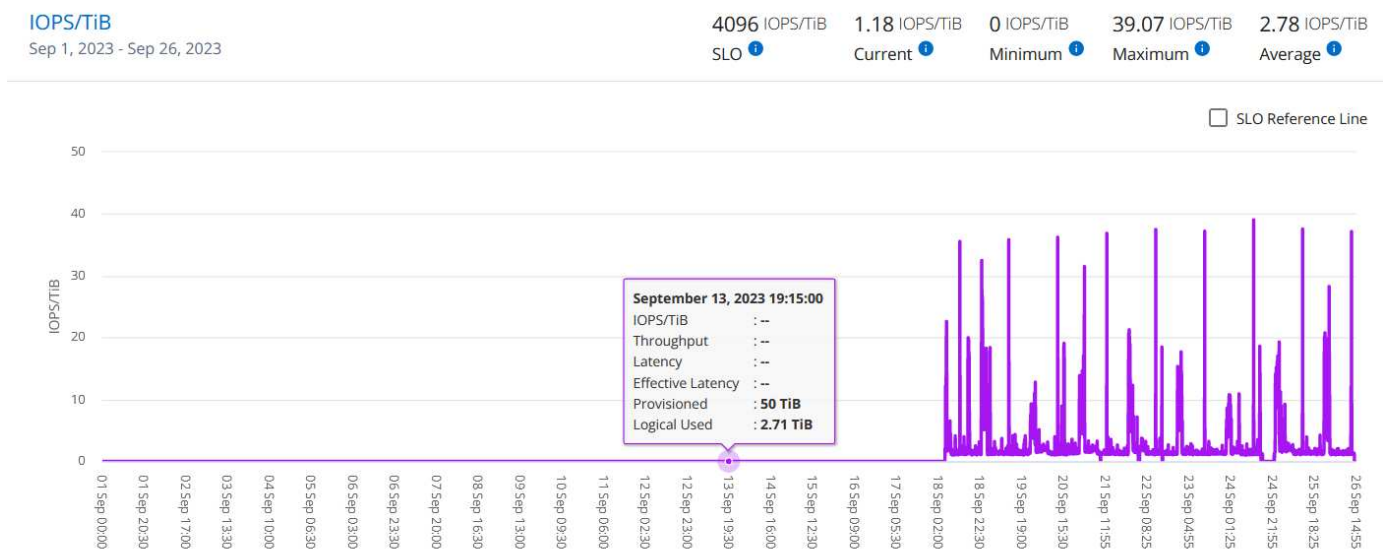
If you select the **SLO Reference Line** check box, the IOPS, throughput, and latency graphs are rendered based on the service level objective for the service level. Else, they are displayed in actual numbers.

The performance data displayed on the horizontal graph is an average at every five-minute interval, and arranged as per the date range of the query. You can scroll across the graphs and hover your mouse over specific data points to drill further down into the collected data.

You can view and compare the performance metrics in the following sections based on the combination of the subscription number, volume name, and the date range selected. The details are displayed as per service level assigned to the volume. You can see the cluster name and volume type, that is, the read and write permissions assigned to the volume. Any warning message associated with the volume is also displayed.

### IOPS/TiB

This section displays the input-output graphs for the workloads in the volume based on the date range of the query. The peak IOPS for the service level and the current IOPS (in the last five minutes, not based on the date range of the query) are displayed, along with the minimum, maximum, and average IOPS for the time range, in IOPS/TiB.

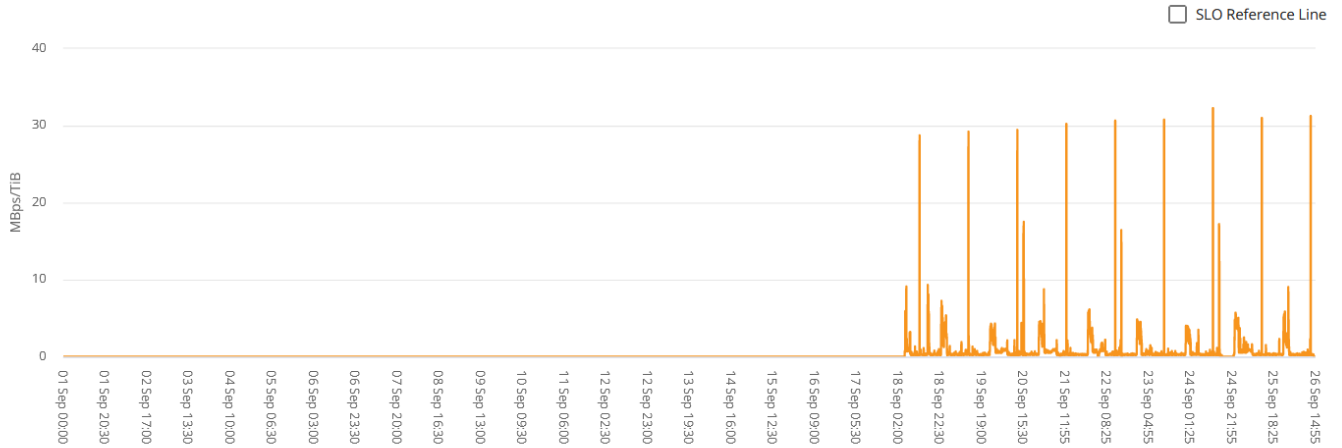


### Throughput (MBps/TiB)

This section displays the throughput graphs for the workloads in the volume based on the date range of the query. The maximum throughput for the service level (SLO Max), and current throughput (in the last five minutes, not based on the date range of the query) are displayed, along with the minimum, maximum, and average throughput for the time range, in MBps/TiB.

**Throughput (MBps/TiB)**  
Sep 1, 2023 - Sep 26, 2023

128 MBps/TiB SLO **1**    0.23 MBps/TiB Current **1**    0 MBps/TiB Minimum **1**    32.29 MBps/TiB Maximum **1**    0.91 MBps/TiB Average **1**



**Latency (ms)**

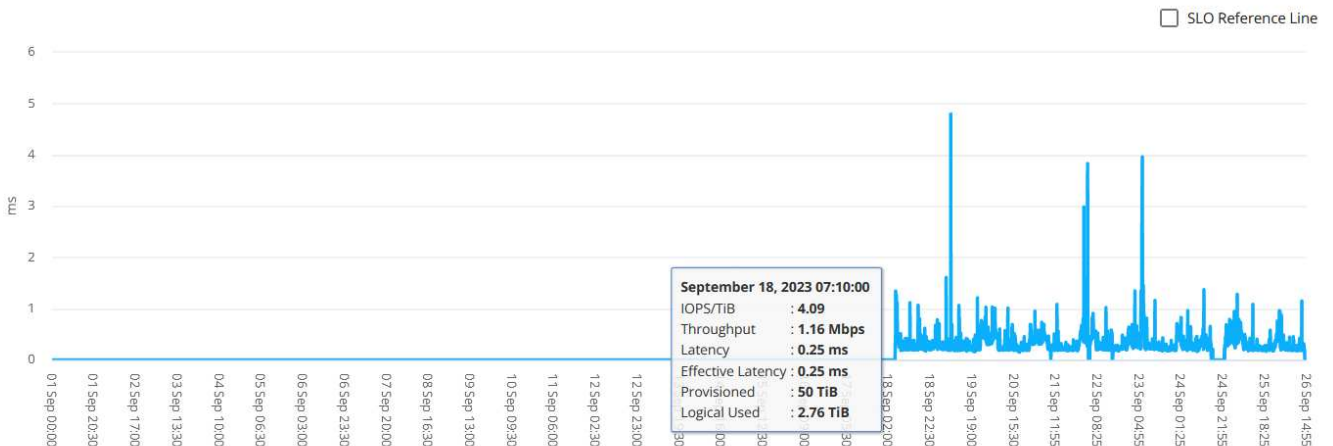
This section displays the latency graphs for the workloads in the volume based on the date range of the query. The maximum latency for service level (SLO Target), and current latency (in the last five minutes, not based on the date range of the query) are displayed, along with the minimum, maximum, and average latency for the time range, in milliseconds.

This graph has the following colors:

- Light blue: *Latency*. This is the actual latency that includes any latency other than your Keystone service. This might include additional latency, such as the latency occurring between your network and client.
- Dark blue: *Effective latency*. Effective latency is the latency applicable only to your Keystone service with respect to your SLA.

**Latency (ms)**  
Sep 1, 2023 - Sep 26, 2023

2 ms SLO **1**    0.19 ms Current **1**    0 ms Minimum **1**    4.8 ms Maximum **1**    0.32 ms Average **1**



**Logical Used (TiB)**

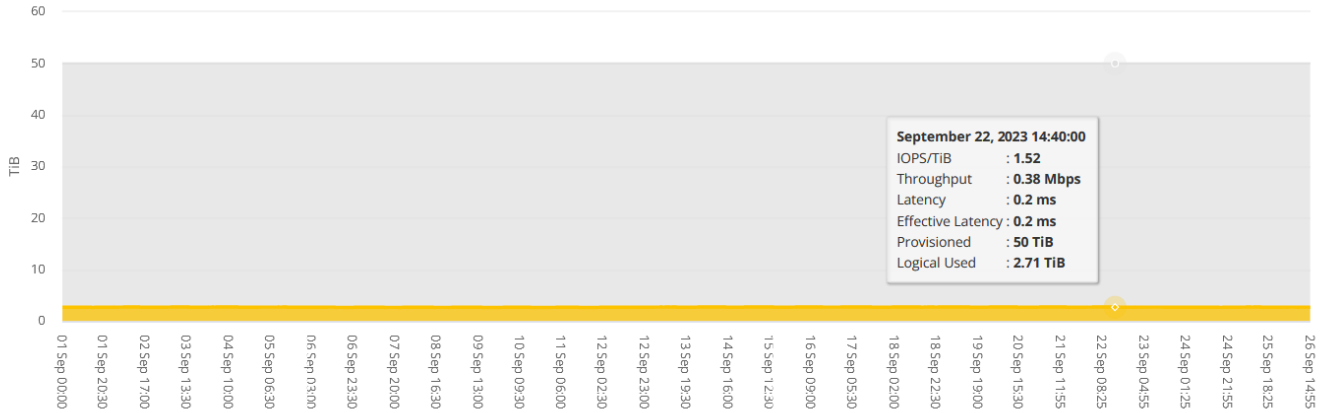
This section displays the provisioned and the logical used capacities of the volume. The current logical used capacity (in the last five minutes, not based on the date range of the query), along with the minimum,

maximum, and average usage for the time range, is displayed in TiBs. On this graph, the grey area represents the committed capacity, and the yellow graph indicates the logical use.

### Logical Used (TiB)

Sep 1, 2023 - Sep 26, 2023

2.7/50 TiB Current 📌 2.65 TiB Minimum 📌 2.77 TiB Maximum 📌 2.72 TiB Average 📌



## Assets

Use the **Assets** tab to gather perspectives on your cluster and nodes managed by your Keystone subscriptions.

Active IQ Digital Advisor (Digital Advisor) provides comprehensive inventory-level information of your deployments. The **Assets** tab of the Keystone dashboard, on the other hand, accumulates the cluster-level information on the basis of your subscriptions, and segregates and presents it with the accurate level of details.

## Steps

1. Click **GENERAL > Keystone Subscriptions > Assets**.
2. Select the subscription number for which you want to view the clusters.

You see the cluster details, broken down by storage efficiency settings, platform type, and capacity details. Clicking on one of the clusters takes you to the **Clusters** widget on the Digital Advisor screen, where you get additional information for that cluster.

Keystone Subscriptions 📌 Help Choose a customer

---

Subscriptions   Current Usage   SLA Details   Capacity Trend   Volumes & Objects   **Assets** Download CSV

Subscription	Start Date (UTC)	End Date (UTC)	Billing Period
QA-Sust-AFF (A-S00024086)	June 21, 2023	June 21, 2024	Annual

Cluster Name	SE Ratio	ONTAP Version	Platform	Node Serial	Total Raw Capacity	Total Usable Capacity
KSDevAFF	2.75:1	9.13.1P4	AFF-A300	451704000173	209.12 TiB	147.46 TiB
KSDevAFF	2.75:1	9.13.1P4	AFF-A300	451704000174	209.58 TiB	147.46 TiB

## Generate reports

You can generate and view reports for your subscription details, historical usage data for a time range, and

volumes details from each of the tabs by clicking the **Download CSV** button:



The details are generated in CSV format that you can save for future use.

In the **Capacity Trend** tab, you get the option of downloading the report for the default 30 data collection points of the date range of your query, or daily reports.

||
Download CSV
▼

Select the number of data points

Same as below charts (~30 data points)

One per day (75 data points)

A sample report for the **Capacity Trend** tab, where the graphical data is converted:

	1	2	3	4	5	6
1	Service Level	Timestamp	Committed (TiB)	Consumed (TiB)	Burst (TiB)	
2	Standard	12/31/2022 18:30	30	1.0293	0	
3	Standard	1/10/2023 21:30	30	3.5401	0	
4	Standard	1/11/2023 6:30	30	1.0293	0	
5	Value	12/31/2022 18:30	40	3.0781	0	
6	Value	1/1/2023 3:30	40	3.0781	0	
7	Value	1/1/2023 12:30	40	3.0781	0	
8	Value	1/1/2023 21:30	40	3.0781	0	
9	Data-Protect Premium	1/9/2023 18:30	33	2	0	
10	Data-Protect Premium	1/10/2023 3:30	33	2	0	
11	Data-Protect Premium	1/10/2023 12:30	33	2	0	
12	Data-Protect Premium	1/10/2023 21:30	33	2	0	
13	Data-Protect Premium	1/11/2023 6:30	33	2	0	
14	Extreme	12/31/2022 18:30	10	14.6221	4.6221	
15	Extreme	1/1/2023 3:30	10	14.6221	4.6221	
16	Extreme	1/1/2023 12:30	10	14.7998	4.7998	
17	Extreme	1/1/2023 21:30	10	14.7998	4.7998	
18	Extreme	1/2/2023 6:30	10	14.8556	4.8556	
19	Extreme	1/2/2023 15:30	10	14.8556	4.8556	
20	Extreme	1/3/2023 0:30	10	15.0064	5.0064	



## View alerts

Alerts on the dashboard send caution messages that enable you to understand the issues occurring in your storage environment.

The alerts can be of two types:

- **Information:** For issues, such as your subscriptions nearing an end, you can see information alerts. Hover your cursor over the information icon to learn more about the issue.
- **Warning:** Issues, such as non-compliance, are displayed as warnings. For example, if there are volumes within your managed clusters that do not have adaptive QoS (AQoS) policies attached, you can see a warning message. You can click the link on the warning message to see the list of the non-compliant volumes in the **Volumes** tab.



If you have subscribed to a single service level or rate plan, you won't be able to see the alert for non-compliant volumes.

For information about AQoS policies, see [Billing and adaptive QoS policies](#).

<input type="checkbox"/>	Subscription Number		Tracking ID	Billing Period	Start Date
<input type="checkbox"/>	A 500010		Tracking-123	Quarter	February 1, 2021
<input type="checkbox"/>	A-500021		Track123	Annual	July 1, 2022

**Warning:** [168 volumes do not comply with this subscription's AQoS policies.](#)

Contact NetApp support for more information on these caution and warning messages.

[1] The services and offerings described here are subject to, and limited and governed by a fully-executed Keystone Agreement.

[2] Availability of appropriate personnel for onsite activities is dependent of the geographical location at which the Keystone systems are deployed.

# Release Notes

## What's new in this release of NetApp Keystone services

The release notes inform you of the new features and enhancements introduced in NetApp Keystone subscription services, along with the known limitations and fixes.

The following features have been introduced in different releases of NetApp Service Engine to support enhanced functionalities offered through Keystone subscription services:

### Features introduced in NetApp Service Engine 2.2

The new features in this release include a revamped dashboard for new widgets on billing, capacity utilization, service requests, and alerts. This release also includes new screens for billing and alerts management, and renaming of the Subscribed Services menu to Cloud Services.

#### Enhanced dashboard view

The NetApp Service Engine dashboard has been redesigned to include the following new components:

- **Capacity Utilization** For viewing the utilized capacity for your subscribed services.
- **Monthly Charges (Billing)** For viewing the aggregated monthly charges for all your subscriptions.
- **Alerts** For viewing the summary of the most recent alerts in your environment.
- **Service Requests** For viewing the list of the most recent service requests generated in your environment.

#### New Billing screen

A new **Billing** screen has been added for easy accessibility and calculation of your historical billing data. The screen provides a holistic view of the monthly charges associated with all your subscribed services.

Navigate to this screen from the **Monthly Charges** widget on the dashboard or from **ADMINISTRATION > Billing** to view a monthly, subscription-level break up of the charges for all your subscribed services. The billing data is based on your committed and burst capacity usage, and is available for your usage in the previous months.

#### New Alerts screen

A new **Alerts** screen is introduced in this release that lists all system-generated and user-generated alerts. The screen also enables you to create custom alert messages for critical events concerning your environment and convey them to other users. They can view and dismiss the alerts, as required.

#### Enhanced user interface

The following enhancements have been made on the NetApp Service Engine user interface:

- The **Dashboard** menu on the left navigation pane presents an intuitive navigation point to access the dashboard.
- The **Subscribed Services** menu on the left navigation pane has been renamed to **Cloud Services**.

## Features introduced in NetApp Service Engine 2.1

The new features in this release include supporting multi-tenancy in a Keystone environment, and tiering capability that facilitates moving of inactive data to a lower cost local or cloud tier.

### Introducing Keystone subscription services for service providers

NetApp Service Engine now supports the management of a multi-tenant environment by a service provider. You can perform the functions of provisioning, reporting, billing, and managing customers having their own subscriptions. For supporting this feature, the following enhancements have been made:

- **Dashboard:** The Dashboard displays information on the storage subscriptions, such as service tiers, capacity usage for each service level, and add-on data protection services, for a specific subscription number. As a service provider, you can view the details of your NetApp Keystone subscription and tenant subscriptions. As a tenant administrator, you can view the details of all the tenant subscriptions for your tenancy.
- **Reporting:** You can create capacity and performance reports with respect to your NetApp Keystone subscription usage and also for your tenant usage. As a partner administrator, you can view the capacity report for your subscription usage from **Reports > Keystone Usage**. As a partner admin, you can view the capacity usage reports for a specific tenant from **Reports > Tenant Usage/Capacity Usage**. As a tenant administrator, you can view the tenancy reports from **Reports > Tenant Usage**.
- **Subscription:** As a partner admin, you can view and update your subscription and tenant subscriptions from **SUBSCRIPTIONS > Keystone Subscriptions** and **SUBSCRIPTIONS > Tenant Subscriptions** respectively. As a tenant administrator, you can only view your tenant subscriptions.
- **Users:** Based on your role, you can assign privileges to a new or existing user within a tenancy as per the requirement. The role can be NetApp administrator, NetApp administrator with read only privileges, partner administrator, or tenant administrator. As a partner administrator, you can assign only partner administrator or tenant administrator roles to new users. A tenant administrator user can assign only the tenant administrator role to other users.
- **Networks menu:** As a partner administrator, you can view the networks defined for your tenancy. You can also create subnets for your subtenant and zone from **NETWORKS > Subnets**. This is required while provisioning storage by the end customers or subtenants.

### Tiering

NetApp Keystone Keystone service now includes a tiering capability that leverages the NetApp FabricPool technology. It identifies less frequently used data and tiers it to cold storage that is owned, deployed, and managed on-premises by NetApp. You can opt for tiering by subscribing to the extreme-tiering or premium-tiering service levels.

The following APIs have been modified to include new attribute values for the new tiering service levels:

- File services APIs
- Block store APIs

For more information, see the following links:

- [Tiering](#)
- [service levels](#)

## Features introduced in NetApp Service Engine 2.0.1

The new features in this release include the following:

### Support extended to Cloud Volumes Services for Google Cloud Platform

NetApp Service Engine now has the ability to support Cloud Volumes Services for Google Cloud Platform (GCP) in addition to its existing support for Azure NetApp Files. You can now manage subscribed services, and provision and modify Google Cloud Volumes from NetApp Service Engine.



Subscriptions to Cloud Volumes Services are managed outside of NetApp Service Engine. The relevant credentials are provided to NetApp Service Engine to allow connection to the cloud services.

### Ability to manage objects provisioned outside of NetApp Service Engine

The volumes (disks and file shares) that already exist in the customer environment and belong to the storage VMs configured in NetApp Service Engine, can now be viewed and managed as a part of your NetApp Keystone subscription. The volumes provisioned outside of the NetApp Service Engine are now listed on the **Shares** and **Disks** pages with appropriate status codes. A background process runs at a periodic interval and imports the foreign workloads within your NetApp Service Engine instance.

The imported disks and file shares may not be of the same standard as the existing disks and file shares on NetApp Service Engine. After import, these disks and file shares are categorized with `Non-Standard` status. You can raise a service request from **Support > Service Request > New Service Request** for them to be standardized and managed through the NetApp Service Engine portal.

### SnapCenter integration with NetApp Service Engine

As a part of SnapCenter integration with NetApp Service Engine, you can now clone your disks and file shares from the Snapshots created in your SnapCenter environment, outside of your NetApp Service Engine instance. While cloning a file share or disk from an existing Snapshot on the NetApp Service Engine portal, these Snapshots are listed for your selection. An acquisition process runs in the background at a periodic interval to import the Snapshots within your NetApp Service Engine instance.

### New screen for maintaining backups

The new **Backup** screen enables you to view and manage the backups of the disks and file shares created in your environment. You can edit the backup policies, break the backup relationship with the source volume, and also delete the backup volume with all its recovery points. This feature allows the backups to be retained (as orphan backups) even when the source volumes are deleted, for later restoration. For restoring a file share or disk from a specific recovery point, you can raise a service request from **Support > Service Request > New Service Request**.

### Provision for restricting user access on CIFS shares

You can now specify the Access Control List (ACL) for restricting user access on a CIFS (SMB) or multi-protocol share. You can specify Windows users or groups based on the Active Directory (AD) settings to add to the ACL.

## Features introduced in NetApp Service Engine 2.0

The new features in this release include the following:

### MetroCluster support

NetApp Service Engine supports sites configured with MetroCluster configurations. MetroCluster is a data protection feature of ONTAP that provides recovery point objectives (RPO) 0 or recovery time objectives (RTO) 0 using synchronous mirror for continuously available storage.

MetroCluster support translates to a synchronous disaster recovery feature within NetApp Service Engine. Each side of a MetroCluster instance is registered as a separate zone, each with its own subscription that includes a Data Protection Advanced rate plan.

Shares or disks created in a MetroCluster-enabled zone synchronously replicate to the second zone. The consumption of the replicated zone follows the Data Protection Advanced rate plan applicable to the zone where storage is provisioned.

### Cloud Volumes Services support

NetApp Service Engine now has the ability to support Cloud Volumes Services. It can now support Azure NetApp Files.



Subscriptions to Cloud Volumes Services are managed outside of NetApp Service Engine. The relevant credentials are provided to NetApp Service Engine to allow connection to the cloud services.

NetApp Service Engine supports:

- Provisioning or modifying the Cloud Volumes Services volumes (including the ability to take snapshots)
- Backing up data to a Cloud Volumes Services zone
- Viewing Cloud Volumes Services volumes in NSE inventory
- Viewing Cloud Volumes Services usage.

### Host groups

NetApp Service Engine supports the use of host groups. A host group is a group of FC protocol host worldwide port names (WWPNs) or iSCSI host node names (IQNs). You can define host groups and map them to disks to control which initiators have access to the disks.

Host groups replace the need to specify individual initiators for every disk and allow for the following:

- An additional disk to be presented to the same set of initiators
- Updating the set of initiators across multiple disks

### Burst usage and notifications

Some NetApp Service Engine-supported storage subscriptions allow customers to use a burst capacity over their committed capacity, which is charged separately over and above the subscribed committed capacity. It is important for users to understand when they are about to use or have used burst capacity to control their usage and costs.

#### Notification when a proposed change results in using burst capacity

A notification to display a change in the proposed provisioning that will cause a subscription to go into burst.

The user can choose to continue, knowing that will put the subscription into burst or choose not to continue with the action.

#### Notification when subscription is in burst

A notification banner is displayed when a subscription is in burst.

#### Capacity report shows burst usage

Capacity report showing the number of days the subscription has been in burst and the quantity of burst capacity used.

#### Performance Report

A new Performance Report in the NetApp Service Engine web interface displays information about the performance of individual disks or shares on the following performance measures:

- IOPS/TiB (Input/Output operations per second per terabyte): The rate at which input and output operations per second (IOPS) occur on the storage device.
- Throughput in MBps: The data transfer rate to and from the storage media in megabytes per second.
- Latency (ms): The average time for read and write operations from the disk or share in milliseconds.

#### Subscription management

Subscription management has been enhanced. You can now:

- Request a data protection add-on, or request additional capacity for a data protection add-on for a subscription or service
- View data protection usage capacity

#### Billing enhancement

Billing now supports the ability to measure and bill for snapshot usage for ONTAP (file and block) storage.

#### Hidden CIFS shares

NetApp Service Engine supports creating hidden CIFS shares.

## Fixed issues in NetApp Service Engine

The following issues that were found in a previous release of NetApp Service Engine have been fixed for you to successfully use your NetApp Keystone services.

Issue Description	After the fix	Fixed in version
Volume move was automatically triggered when non-FabricPool aggregate existed on the cluster.  Any modifications to volumes or disks triggered a volume move to another aggregate.	No volume move is triggered for volume operations.	NetApp Service Engine 2.2

Issue Description	After the fix	Fixed in version
Host groups deletion removed host groups from the NetApp Service Engine user interface (UI), but not from the cluster.	Resolved.	NetApp Service Engine 2.2
Host groups could be unmapped from the disks on the NetApp Service Engine UI, but not from the cluster.	Resolved.	NetApp Service Engine 2.2
Export policies could not be deleted from the NetApp Service Engine UI.	The changed policies can be saved from the UI.	NetApp Service Engine 2.2

## Known issues in NetApp Service Engine

The following known issues have been reported in NetApp Service Engine. You might encounter these issues when you provision or use your storage as a part of your Keystone subscriptions.

Known Issue	Description	Workaround
Limitations in synchronous data protection	There is an issue where the VLANs, IPspaces, and Broadcast domains are not defined on the secondary partner of a MetroCluster cluster. This issue can affect recovery of data from the replica zone.	Place a service request for GSSC to perform a manual network configuration on the partner cluster. The network configuration can be done in advance if the network components (VLAN, IPspace, and Broadcast domains) are known.
Limitations in disabling and deleting volumes that are disaster recovery enabled	If there are two or more volumes in a storage VM that are disaster recovery enabled, disaster recovery cannot be disabled for a file share or disk.	Raise a service request for GSSC to resolve the issue.
Limitations in deleting file servers and block stores that are disaster recovery enabled	Deleting a disaster recovery enabled block store or file share might fail because peering is not removed due to timeout.	Failed deletion is available in “Contact Support” and Support will be notified via OpsRamp Ticket.
Limitation when creating multiple snapshots	When multiple snapshots are triggered for creation, the web page initially displays only the last snapshot issued.	Auto job picks up the other snapshots within 15 minutes.
Disaster recovery enabled file servers on the secondary controllers are not deleted.	All primary volumes and the replication relationships are removed. However, the disaster recovery object is not deleted. This object does not consume any capacity or networking.	There is no workaround for this issue.
Limitation in disabling backup on volumes	Raise a service request for GSSC to resolve the issue.	There is no workaround for this issue.

Known Issue	Description	Workaround
Limitation in deleting network subnets	Customers are unable to delete network subnets.	Raise a service request for GSSC to resolve the issue.
Limitation in deleting VLAN using API	Deleting a VLAN that has a subnet associated with it leaves an empty subnet stub in the UI.	Raise a service request for GSSC to resolve the issue.
Limitation in importing storage VMs with non-standard subnet	Storage VMs (storage virtual machines, also known as SVMs), created outside of NetApp Service Engine cannot be operational due to a non-standard subnet. The storage VMs are imported with the status <code>Contacted Support</code> .	Raise a service request for GSSC to resolve the issue.
Capacity and billing reports might be inaccurate in NetApp-managed environments	In a NetApp-managed environment, the capacity and billing reports generated from the UI might be affected due to missing LUN size metrics and service levels on backup volumes.	Raise a service request for GSSC to resolve the issue.
A 15-minute lag in reporting the committed capacity on graphs after subscription creation.	When a tenant subscription is created, and the report graphs are checked immediately (within 15 minutes of the subscription creation), the committed capacity is not reported correctly.	Check the report graphs at least 15 minutes after the subscription is created.
Change in service levels does not move volumes	If two different aggregates in the same cluster are used for two service levels, changing the service level on a volume to another does not move the volume to the other aggregate. Only the adaptive QoS policy is applied.	Raise a service request for GSSC to resolve the issue.
Creation of FCP SVM requires iSCSI activation	For creating a storage virtual machine (SVM) and enabling FCP support on it, an iSCSI interface activation is required.	Raise a service request for GSSC to resolve the issue.
Limitation with multiple host groups with same initiator	If multiple host groups are created with the same initiator name, and disks are mapped to all the host groups, the disks get mapped to only one host group on the cluster.	Raise a service request for GSSC to resolve the issue.



# NetApp Keystone frequently asked questions (FAQs)

The following questions give answers to your frequent queries about NetApp Keystone.

## What is NetApp Keystone?

NetApp Keystone is a portfolio of on-premises capital expenditure (CapEx) alternatives. For more information, see [NetApp Keystone](#).

## How does NetApp Keystone benefit my customers?

NetApp Keystone is the bridge that connects the pillars of our CapEx and hybrid cloud strategy—delivering agility, financial flexibility, and reduced financial risk that helps customers meet their cash flow and business needs.

The NetApp Keystone brand offers a portfolio of flexible payment solutions that include traditional financing, leasing, and fixed/variable options for cash-conscious customers along with Keystone services.

### Keystone services (OpEx, cloud-like experience):

- \* Prefer 100% OpEx, so assets will not end up on your customer's balance sheet
- \* Internal/external Service Providers looking to align costs with usage/revenue
- \* Workloads with unpredictable capacity growth
- \* Reallocated IT resources from typical storage tasks (migrations, tech refresh, upgrades, and so on)
- \* Short-term solution before migrating workloads to the cloud
- \* Repatriating workloads back from the cloud to on-premises

## What is NetApp Keystone?

NetApp Keystone is a new, flexible, on-premises subscription-based procurement model. It enables customers to accelerate time to value by removing the hurdles around managing the resources and going through the lengthy procurement cycle. Keystone services allow customers to align economics to their business priorities. For more information, see [here](#).

## What does on-premises mean?

On-premises is defined as a customer-owned data center or customer-owned space in a colocation facility. The customer is responsible for the space, power, and cooling.

## What are the benefits of Keystone services?

Some benefits of Keystone services are:

- Frees up IT staff from complicated storage-related tasks and allows them to focus on application management
- Reduces upfront capital investment
- Allows customers to meet their demands without overprovisioning
- Aligns data storage costs with business needs/activity
- Simplifies infrastructure provisioning by bypassing complex organizational procurement procedures
- Keeps data secure on their premises

- Enables proper control over compliance, performance, and security  
For more information, see [here](#).

## NetApp Keystone FAQ

The following questions give answers to your frequent queries about NetApp Keystone Keystone services.

### **What is offered as part of NetApp Keystone?**

NetApp Keystone is a subscription-based service offering for block, file, and object data services that can be deployed on-premises and can be operated by NetApp, a partner, or a customer.

### **What storage service offers are provided as part of Keystone?**

For information, see [Service Levels](#)

### **What add-on services are supported?**

Advanced data protection (backup and disaster recovery) and Hybrid Cloud Tiering with FabricPool are add-on services that can be chosen at an additional cost.

### **What service levels does NetApp guarantee with the service?**

In a NetApp operated scenario, NetApp Keystone guarantees IOPS/TiB for the storage that is provisioned and the latency for each service level.

### **What does Keystone map to?**

Keystone maps to a single site or a single data center and it can comprise of different service levels.

### **What are the benefits of extreme-tiering and premium-tiering service levels?**

Tiering is enabled in the extreme-tiering and premium-tiering service levels, which enables you to reduce your storage footprint and associated costs. NetApp assumes that 25% of your data is hot, while the remaining 75% is less frequently used or cold, and moves it to cold storage. Additionally, you can check usage reports to understand how frequently data is accessed and enable tiering service based on the information.

### **Can partners sell more capacity than they have purchased from NetApp to customers?**

Tenant subscriptions are not limited by the capacity that the partner has purchased. Partners can sell more capacity than they have purchased from NetApp to their customers. The capacity that is in excess of the purchased capacity is referred to as oversubscription.

### **What is burst capacity?**

You can increase and decrease usage up to 20% above the committed capacity. The burst capacity usage is measured on a daily basis and billed only when used.

For example, if the committed capacity is 100 TiB, you can burst up to 120 TiB.

### **Is there a premium charge for using burst?**

The burst capacity usage up to 20% of committed capacity is billed at the same rate as committed capacity, any usage above 20% of committed capacity is billed at 50% premium.

### **What is the benefit of burst capacity?**

Burst capacity gives you the flexibility to consume storage on demand versus committing for the long term.

### **How is burst capacity allocated to tenants?**

Burst capacity is allocated to partners, who further allocate it to their customers based on requirements.

### **Where can I see the committed and burst capacity usage?**

In Active IQ Digital Advisor dashboard.

### **Will there be any notifications if I reach a certain percentage in committed capacity usage?**

Yes, the management tools provide notifications on capacity usage through the Active IQ Digital Advisor dashboard.

### **How do I view Keystone usage?**

Active IQ Digital Advisor provides a dashboard view, with information on all the services that are subscribed to and how much is consumed.

### **How do I report any issues with the service?**

NetApp Keystone support can be reached through these various channels:

- Support email: [keystone.services@netapp.com](mailto:keystone.services@netapp.com)
- Escalations email: [keystone.escalations@netapp.com](mailto:keystone.escalations@netapp.com)

### **Can I order new storage service?**

Yes, new storage service or expansion to storage service can be requested through KSMs. The request is processed by the NetApp Keystone operations team before making it available for use.

### **Are increases to storage commitments available immediately?**

Depending the amount of capacity requested, a determination is made whether the capacity is already deployed, or it requires additional equipment to be shipped and installed.

### **Can workloads be moved between the tiers?**

Yes, workloads can be moved between tiers, provided the user has subscribed to the tier the workload is moving to. However, we do not recommend moving from a higher tier to a lower tier because it can cause performance degradation. The process is achieved by simply editing the file share and changing the service level setting.

### **What software version (for example, ONTAP) is installed as default?**

Depending on the service tier subscribed (for example, ONTAP with File and Block services, SANtricity for Block, and StorageGRID for Object) the support team installs the latest stable release with no security or feature issues.

## **Keystone services offering**

The following questions give answers to your frequent queries about NetApp Keystone Keystone service offering.

### **What is the minimum committed capacity?**

The minimum committed capacity for a NetApp Keystone subscription services is 100 TiB, per site, across one or more service tiers.

### **What is the typical length of term of a Keystone services agreement?**

Keystone services offers 12, 24, and 36-month term periods.

### **How can I access the storage?**

In a NetApp-operated (standard) model, the storage controllers (ONTAP System Manager or administrative access to the systems) are owned and managed by NetApp. You can monitor your storage only through Active

IQ Digital Advisor UI.

In a customer-managed (or Lite) deployment, where the Active IQ Digital Advisor UI is used mainly for billing functions, you can access the storage controllers, such as Active IQ Unified Manager and ONTAP System Manager, and directly access ONTAP clusters.

### **How do I manage the service?**

You can raise support tickets for any requirement.

### **How can I increase the committed capacity in a subscription?**

Through your NetApp Keystone success manager.

### **Does increasing the capacity extend the term?**

All the additions are co-term to the existing term period, except if the request is made in the last 90 days of the subscription, in which case the term must extend for at least 12 months.

### **Can subscriptions co-term with one another?**

No, subscription terms are independent of one another.

### **Can I add backup storage to an existing subscription?**

For a backup use case, you can add capacity to an existing subscription for an existing or new service level, including Standard or Value service levels. This does not change the term of the existing subscription. There is one caveat though, that is, if you want to add capacity within the last 90 days of the subscription term ( that is the last 90 days before your subscription ends), you must also renew the subscription for at least one year.

### **Does a new subscription have flexibility to come with a new yearly term?**

Yes, new subscriptions can have new terms separate from any existing subscriptions.

### **Can tenant subscription terms extend beyond the subscription term of the partner?**

Tenant subscriptions can extend beyond the current Keystone services term of the partner. A warning will be displayed when subscriptions are created and also in usage reports.

### **Can I mix multiple subscriptions on the same ONTAP cluster?**

No, each cluster is assigned to a particular subscription.

### **Who does the monitoring and operations?**

For the NetApp-operated service, NetApp is responsible for monitoring the infrastructure remotely so that the service is delivered according to the agreed expectations.

For the partner-operated service, partner is responsible for monitoring the infrastructure remotely so that the service is delivered according to the agreed expectations.

For the customer-operated service, customer is responsible for monitoring the infrastructure and raise any issues to NetApp.

### **What happens if I terminate the service early?**

The minimum service commitment is 12 months. If you cancel the service early, the residual value needs to be

paid upfront.

**Is there an opportunity to convert into a purchase after the initial term is completed?**

No. The offer does not include an option to convert into a purchase. Additionally, previously purchased NetApp products are outside the scope of this program.

**Can I request a particular software version?**

No. NetApp Keystone has standardized the software version across all its customer base.

**Will I be informed about software upgrades?**

Yes. All maintenance/upgrade activities are communicated to and scheduled at a mutually agreeable time with the customer by the NetApp Keystone Success Manager.

## Operational models and responsibilities

There are three operational models in Keystone services. These FAQs are related to those operational models.

**What are the different operating models and who is responsible for the major activities?**

The following chart is an overview of the three operating models that a customer can select: NetApp Operated, Partner Operated, and Customer Operated.

- **NetApp-operated model:** The end-to-end management of installation, deployment, operations, monitoring, optimization and support is performed by NetApp.
- **Partner-operated model:** The share of roles and responsibilities depends on the SLA between you and the service provider or partner. Contact your service provider for information.
- **Customer-operated model:** The following table summarizes the overall service lifecycle model and the roles and responsibilities associated with them in a customer-operated environment.

Task	NetApp	Customer
Installation and related tasks <ul style="list-style-type: none"><li>• Install</li><li>• Configure</li><li>• Deploy</li><li>• Onboard</li></ul>	✓	None
Administration and monitoring <ul style="list-style-type: none"><li>• Monitor</li><li>• Report</li><li>• Perform administrative tasks</li><li>• Alert</li></ul>	None	✓

Task	NetApp	Customer
Operations and optimization <ul style="list-style-type: none"> <li>• Manage capacity</li> <li>• Manage performance</li> <li>• Manage SLA</li> </ul>	None	✓
Support <ul style="list-style-type: none"> <li>• Support customer</li> <li>• Hardware break fix</li> <li>• Software support</li> <li>• Upgrades and patches</li> </ul>	✓	None

### What is a NetApp-operated model?

This operating model allows the customer to subscribe to the offered services, according to the selected performance tiers and storage service types and selects the NetApp operated option at an extra cost. NetApp defines the architecture and products, installs at the customer premises, and NetApp manages the day-to-day infrastructure management operations using our storage and IT resources. Available storage service types are file, block (iSCSI), and object. Cloud Volumes Service for GCP and AWS are also supported.

NetApp also creates and manages the partners, tenants, as applicable, and manages the subscriptions.

### What is a partner-operated model?

The operating model for the partner or service provider is similar to the NetApp-operated model, but with the partner operating the service for their end customer. In this model, the partner is the referenced contracted party. Tenants are customers of the service providers and have no billing relationship with NetApp. They manage their tenancy and customers. The tenants support requests are first triaged by the service provider before being escalated to NetApp.

### What is a customer-operated model?

This operating model allows the customer to subscribe to an offered service, according to the selected performance tiers and storage service types. NetApp defines the architecture and products and installs at the customer premises and allows customers to manage the infrastructure using their storage and IT resources. Available storage service types are file, block (iSCSI), and object. In this model, the customer referenced the contracted party, and this can be an end-user or partner.

### Who owns the equipment?

In all three operating models, NetApp owns the title to all the hardware and software installed at the customer premises.

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