



## Learn about Keystone

### Keystone

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# Learn about Keystone

## Supported storage capacities in Keystone

The NetApp Keystone STaaS service capacities include:

### Logical capacity

This is the data placed on 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 a minimum of 1 TiB of capacity should be purchased.

### Committed capacity

The minimum logical capacity billed each month during the subscription:

- Capacity is committed to each service level.
- 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 can be decreased based on certain conditions. For information, see [Capacity reduction](#).
- 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 the BlueXP interface or through Keystone Success Manager (KSM).  
For information about requesting changes, see [NetApp Global Services Support Center](#).

### Consumed capacity

Consumed capacity refers to the capacity (in TiB of storage) currently being consumed on the service. Keystone service considers the sum of the logical used sizes (not the physical capacity used) of all volumes on a particular service level to calculate the consumed capacity for that service level.

### Burst capacity

Any consumption exceeding the committed capacity for a service level is the burst capacity.



Note:

- Keystone service enables you to use additional capacity on top of the committed capacity for a service level. This is the burst capacity.
- Burst capacity can be consumed on an elastic basis and is charged on a daily basis for the consumed average.

- Burst capacity is agreed upon in the Keystone agreement. It is usually set up to 20% above the committed capacity, and is charged at the same rate as the committed capacity.

## 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.

## Metrics and definitions used in Keystone Services

The following terms and definitions are used within the NetApp Keystone (Keystone) STaaS service to measure metrics:

- Capacity measurement units: GiB, TiB, and PiB
- IO density: IOPS/TiB: Number of input/output operations processed per second based on the total space that is being consumed by the workload, in tebibytes.
- Service availability
- Durability in accurate data access
- Latency and speed

## Metrics measurement

- **Capacity measurement in gibibyte (GiB), tebibyte (TiB), and pebibyte (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).
- **Operations counter chart in IOPS/TiB:** The protocol operations per second, requested by the application, divided by the size of the volume used by workloads.
- **Availability:** Measured as a percentage of the number of I/O requests successfully responded to by the service, divided by total number of I/O requests made to the service. This is measured at the service demarcation in a month, and does not include the scheduled service downtime or unavailability of the facilities, network, or other services provided by the customer.
- **Durability:** Percentage of data accessed without loss of fidelity, excluding customer-caused deletion or corruption.
- **Latency:** Time to service an I/O request received from a client, measured at the service demarcation (storage controller I/O port).

## Throughput performance metrics

Throughput performance metrics are applicable only for file and block services based on:

- 32 KB block sizes
- 70% read/30% write I/O mix

## Variations in IO density

IO density calculated in IOPS/TiB and/or MBps/TiB varies based on the following factors:

- Workload characteristics

- Latency, excluding the following:
  - Application latency
  - Host latency
  - Latency in the customer network while transferring data to and from the controller ports
  - Overhead latency associated with data transfer to the object store in the case of FabricPool
  - The latency automatically applied by the QoS to keep IO within service level maximums
- The user and Snapshot copy data that is counted as part of the used capacity
- The allocated absolute minimum IOPS on each ONTAP volume, regardless of the amount of data in the volume:
  - Extreme: 1,000 IOPS
  - Premium: 500 IOPS
  - Performance, Standard, and Value: 75 IOPS
- While using the Advanced Data Protection add-on services, the target latency applies only to servicing IO requests from the local storage.

### Volume AQoS

Each ONTAP volume should have the applicable adaptive quality of service (AQoS) policy applied. Otherwise, the capacity within each volume that does not have an AQoS policy applied is billed at the rate of the highest Service Level.

## Supported storage in Keystone STaaS services

Keystone STaaS services support file and block storage of ONTAP, object storage of StorageGRID platform, and data management capabilities of Cloud Volumes ONTAP.

Keystone STaaS provides standard and optional services for your storage.

**Keystone STaaS standard services:** Standard services are included within the base subscription and are not charged separately.

**Keystone STaaS add-on services:** These are optional, chargeable services that provide additional utilities and benefits on top of standard Keystone STaaS subscription services.

Keystone STaaS services can coexist with each other. For example, a cloud storage subscription can co-term with file, block, and object storage subscriptions. A cloud service can be included at any point during the service term of an existing storage subscription. However, if you do not plan to renew an existing file, block, and object subscription, a cloud storage subscription cannot be added during the last 90 days of the subscription.

### Services for file, block, and object storage

Keystone STaaS services for ONTAP file and block storage, and StorageGRID object storage, support multiple features and protocols, and described in the following table:

Storage	Platform	Protocols	Supported features
File storage	ONTAP	NFS and CIFS	<p>Supported ONTAP features:</p> <ul style="list-style-type: none"> <li>• FlexVol</li> <li>• FlexGroup</li> <li>• Snapshot copies</li> <li>• SnapMirror (Asynchronous)</li> <li>• SnapVault</li> <li>• SnapLock Enterprise</li> <li>• FabricPool/Cloud tiering</li> <li>• SnapRestore</li> <li>• FlexClone</li> <li>• SnapCenter (license is included but is not a part of Keystone services, and management is not guaranteed)</li> </ul>
Block storage	ONTAP	FC and iSCSI	<p>Supported ONTAP features:</p> <ul style="list-style-type: none"> <li>• FlexVol</li> <li>• FlexGroup</li> <li>• Snapshot copies</li> <li>• SnapMirror (Asynchronous)</li> <li>• SnapVault</li> <li>• SnapLock Enterprise</li> <li>• FabricPool/Cloud tiering</li> <li>• SnapRestore</li> <li>• FlexClone</li> <li>• SnapCenter (license is included but is not a part of Keystone services, and management is not guaranteed)</li> </ul>

Storage	Platform	Protocols	Supported features
Object storage	StorageGRID	S3	Supports multiple information lifecycle management (ILM) policies across multiple sites. <b>Note:</b> Each site requires a separate subscription.

## Services for cloud storage

Keystone STaaS provides cloud storage services. Keystone STaaS supports Cloud Volumes ONTAP data management capabilities on Amazon Web Services (AWS), Microsoft Azure, and Google Cloud Platform.



Hyperscalar-based compute, storage, and network services required by Cloud Volumes ONTAP are not provided by NetApp as a part of Keystone STaaS subscriptions; these subscriptions need to be procured directly from hyperscalar cloud service providers.

## Service Levels in Keystone

Keystone STaaS offers data storage capacity at pre-defined performance service levels (service levels) on a subscription basis.

Service levels are defined by:

- Average latency
- Maximum IOPS per logical TiB stored per volume

A volume must be associated with a service level.

## Service levels for supported storage

The service levels for file, block, object, and cloud services are listed here.

### File and block storage

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

Service level	Extreme	Premium	Performance	Standard	Value
<b>Sample workload types</b>	Analytics, databases, mission-critical apps	VDI, VSI, software development	OLTP, OLAP, containers, software development	File shares, web servers	Backup
<b>Maximum IOPS/logical TiBs stored per volume</b>	12,288	4,096	2,048	512	128

<b>Maximum MBps/logical TiBs stored per volume</b>	384	128	64	16	4
<b>Latency</b>	<1 ms	<2 ms	<4 ms	<17 ms	<17 ms

Note the following points for throughput performance metrics (applicable only for file



- File and block service levels are based on ONTAP 9.7 and later.
- IOPS/TiB and latency values for service levels are based on the amount of logical data stored in the volume, 32 KB block size, and a random mix of 70% read and /30% write IO.
- Actual IOPS/TiB and/or MBps/TiB varies based on workload concurrency and usage patterns.
- Latency does not include the following: — The applications, hosts, or customer network latency to or from the controller ports. — The latency automatically applied by QoS to keep IO within service level maximums.
- When using the Advanced Data Protection add-on service, the target latency applies to servicing IO requests from the local Keystone products only.

## Object storage

**Supported protocol:** S3

<b>Service level</b>	Object
<b>Workload type</b>	Media repository, archiving
<b>Maximum IOPS/logical TiB stored per volume</b>	N/A
<b>Maximum MBps/logical TiB stored per volume</b>	N/A
<b>Average Latency</b>	N/A



Latency does not include overheads associated with data transfer to the object store in case of FabricPool storage.

## Cloud storage

**Supported protocol:** NFS, CIFS, iSCSI, and S3 (AWS and Azure only)

<b>Service level</b>	Cloud Volumes ONTAP®
<b>Workload type</b>	Disaster Recovery, software development/testing, business apps
<b>Maximum IOPS/logical TiB stored per volume</b>	N/A
<b>Maximum MBps/logical TiB stored per volume</b>	N/A
<b>Average Latency</b>	N/A





- Cloud native services, such as compute, storage, networking, are invoiced by the cloud providers.
- These services are dependent on the cloud storage and compute characteristics.

## Add-on Services

### Data tiering

Keystone STaaS standard services for file and block storage include tiering capabilities that identify less-frequently used data, and tiers it to Keystone STaaS-supported NetApp cold storage. You can avail data tiering as an add-on service if you want to tier your cold data to any Keystone STaaS-supported, non NetApp storage.

For information about standard and add-on services, see [Keystone STaaS services](#).

For information about Service Levels, see [Service Levels in Keystone](#).

The tiering add-on service is required only when data is tiered to any non NetApp storage such as Amazon Web Services (AWS) S3, Azure Blob, Google Cloud Platform (GCP), and other, Keystone STaaS-supported, S3-compatible, third party object storage.

The tiering capability leverages the NetApp FabricPool technology that enables automated tiering of infrequently accessed data to object storage tiers on and off premises.

The add-on data tiering service enables tiering from Extreme, Premium, Performance, Standard, and Value tier to an object storage target. The ratio of hot:cold data to be tiered is not fixed, and each tier is metered and invoiced separately.

For example, if the target for cold storage tier is:

- Keystone STaaS Value tier, Keystone STaaS StorageGRID Object Tier, or existing SGWS grid (customer owned) - There is no additional charge; it is part of the standard service.
- Public cloud (AWS, Azure, Google) or Keystone STaaS-supported, third party object storage - There is an additional charge for data capacity that is tiered to cold storage target.

The charges for add-on tiering services apply through the entire subscription term.



Hyperscalar-based compute, storage, and network services required by Cloud Volumes ONTAP are not provided by NetApp as a part of Keystone STaaS subscriptions; these services need to be procured directly from hyperscalar cloud service providers.

### Advanced Data Protection

You can subscribe to Advanced Data Protection add-on service as a part of your Keystone STaaS subscription. This add-on service leverages NetApp MetroCluster technology to ensure efficient data protection for your mission-critical workloads at 0 Recovery Point Objective (RPO).



Keystone STaaS standard services for file and block storage offer default data protection services by leveraging NetApp technologies, such as SnapMirror, SnapVault, and Snapshot.

For information about the standard and cloud service, see [Keystone STaaS services](#).

For information about Service Levels, see [Service Levels in Keystone](#).

Keystone advanced data protection service can synchronously mirror data to a secondary site. In case of a disaster at the primary site, the secondary site can take over, without any loss of data. This features leverages the MetroCluster configuration between two sites to enable data protection. You can avail the advanced data protection add-on services for only your file and block storage services.

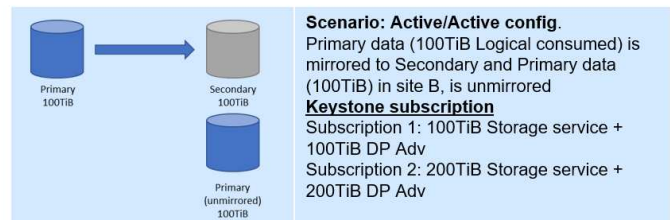
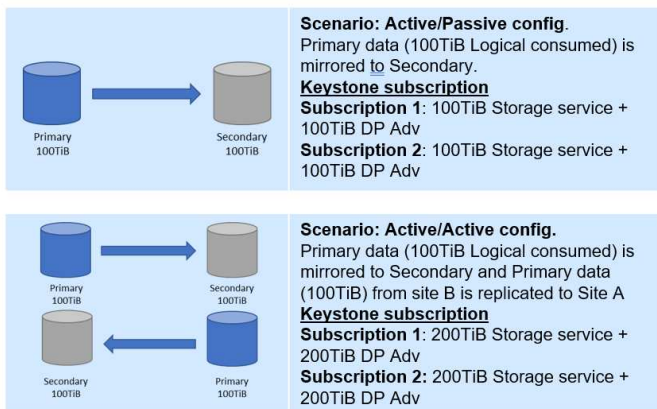
For information about ONTAP MetroCluster, see [MetroCluster Documentation](#).

The add-on charges are applicable to all the capacities in the subscription: the source, mirrored copy, and unmirrored data.



Note:

- For this service, 100% of the committed capacity on an associated storage is configured as committed capacity.
- Storage is charged for both the source and the destination clusters. This add-on service is also charged for both the primary and secondary (mirrored) volumes.
- The charges are applicable only to your file and block storage.  
The following MetroCluster scenarios are supported:



## U.S. Citizen Support (USCS)

United States Citizen Support (USCS) is an add-on offering for NetApp Keystone Subscriptions. 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 (KSM) 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>

## Non-returnable, non-volatile components and SnapLock compliance

As a part of NetApp Keystone subscription, NetApp extends the non-returnable, non-volatile components (NRNVC) offering for your file, block, and object services.

You can subscribe to this add-on services as a part of your Keystone subscription. For information about the standard and cloud services, see [Keystone STaaS services](#).

For information about Service Levels, see [Service Levels in Keystone](#).

NetApp does not recover the physical storage media used during the entire service tenure 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:

- You do not need to return any drives and nonvolatile memory at end of the service term or if they failed or found defective during the service term.
- However, you need to produce a certificate of destruction for the drives and/or nonvolatile memory and cannot be used for any other purpose.
- The additional cost associated with the NRNVC is charged as a percentage of the total subscription service (includes standard service, Advanced Data Protection, and data tiering) monthly bill.
- This service is applicable only to file, block, and object services.

## SnapLock compliance

The SnapLock technology enables the NRNVC feature by making the drive unusable after the expiry date set in the volume. For using the SnapLock technology on your volumes, you need to subscribe to NRNVC. This is applicable only to file and block services.

For information about SnapLock technology, see [What SnapLock is](#).

## Keystone co-location services powered by Equinix

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

Keystone co-location (Co-Lo) services powered by Equinix is unchanged from the standard Keystone service

offering.

In this service:

- Equinix provides space, power, cooling, networking, and invoice, and storage, on a monthly basis.
- Support is provided for certain Keystone sales motions.
- The services are supported in 21 data centers across 11 countries.

Equinix has the data centers at these locations:

<b>Data center</b>	<b>Country</b>
Amsterdam	Netherlands
Atlanta	U.S.
Chicago	U.S.
Dallas	U.S.
Denver	U.S.
Frankfurt	Germany
London	U.K.
Los Angeles	U.S.
Madrid	Spain
Melbourne	Australia
Miami	U.S.
Milan	Italy
Osaka	Japan
Paris	France
Seattle	U.S.
Silicon Valley	U.S.
Sydney	Australia

<b>Data center</b>	<b>Country</b>
Tokyo	Japan
Toronto	Canada
Washington DC	U.S.
Zurich	Switzerland

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[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.