



Service Terms and Description

NetApp Keystone

NetApp
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Overview

- KFS is 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.
- The 100 TiB capacity can be one single performance level or a combination of levels.
- 20% of burst capacity is available at each site; any burst usage is billed only for that billing period.
- Committed capacity or performance levels cannot be altered during a contract term.
- Increasing capacity or changing to higher performance level during term is allowed; however, moving from a higher performance 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.



For any additional burst requirements greater than 20%, please work with your Keystone Success Manager (KSM).

Keystone Service Capacity Definitions

The Keystone service capacities include:

- **Logical capacity.** Data placed into the NetApp Keystone system by a customer:
 - All NetApp KFS capacities refer to a logical capacity.

For example, if a 1 TiB file is stored on NetApp Keystone, then at least 1 TiB of capacity must be purchased.
- **Committed capacity.** Minimum logical capacity billed each month for the duration of the term:
 - Capacity is committed to each performance level.
 - Committed capacity cannot be decreased during the term.
 - Committed capacity and additional performance levels can be added during the term.
- **Burst capacity.** Logical capacity, in excess of committed capacity:
 - NetApp Keystone provides 20% capacity in excess of the committed capacity.
 - Burst capacity can be consumed on an elastic basis and is charged on a daily, average-consumed basis.
 - Burst capacity up to 20% is charged at a same rate as the committed capacity.
 - Contact KSM for any additional burst requirements greater than 20%.
 - Burst capacity greater than 20% of committed is charged at a premium rate.
- **Consumed/provisioned capacity.** Sum of all configured volume sizes:
 - Capacity is provisioned through the creation, modification, deletion, or potential auto-growth of volumes.
 - Includes snapshots and clones.
 - The amount of data stored within provisioned capacity is not considered.

- 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.

Performance

KFS offers capacity at predefined performance levels. Each Performance Service Level is defined by its I/O density, which is the ratio of performance (input/output operations per second [IOPS]) and used storage (TiB of stored data) which is IOPS/TiB.

Each volume within Keystone is associated with a performance service level. All I/O operations and all used storage used on the respective volume are factored into the volume's I/O density calculation.

The below figure defines the performance service levels.

	Keystone File and Block					Keystone Object	Keystone Block		
	Extreme	Extreme w/data tiering ²	Premium	Premium w/data tiering ²	Standard	Object	Extreme	Premium	Standard
Workload type	Analytics, databases		VDI, virtualization apps, SW dev		File shares, web servers, backup	Media repository, archiving	HPC	Video surveillance	Backup
Target IOPS/TiB	6,144	6,144 ¹	2,048	2,048 ¹	128	N/A	N/A	N/A	N/A
Max. IOPS/TiB	12,288	12,288 ¹	4,096	4,096 ¹	512	N/A	5,500	4,000	N/A
Max. throughput MBps (32KB/IOP)	384	384 ¹	128	128 ¹	16	N/A	43	31	N/A
Latency	<1 ms	<1 ms ¹	< 2 ms	< 2 ms ¹	<17 ms	N/A	< 0.5 ms	<0.5 ms	N/A
Minimum capacity	100TiB					1 PiB	100 TiB	100 TiB	300 TiB
Protocols	NFS, CIFS, iSCSI, FC					S3	FC, iSCSI		

¹ Performance SLAs are applicable for data in hot tier
² Max. allowed 25% data in hot tier

I/O density calculations at the volume level are reported to show peak I/O density during the prior week. The peak performance is determined on an hourly time interval. I/O density reports by volume are generated monthly to gauge adherence to the respective service levels.

Terms and Conditions for the Service Tiers

The service tiers terms and condition include:

- No customer infrastructure upon which this service relies has an availability or performance incident, including the customer's network connection to the NetApp service infrastructure, data center power and cooling, the customers DNS, Active Directory service, and Network Time Protocol (NTP).
- The latency SLA applies to a volume only if the average IOPS per volume in an hour is greater than or equal to 100, which is required for the math calculation of IOPS divided by time to derive a number of 2 ms

or lower. Any hourly sample lower than 100 IOPS cannot be considered in a group of 100 samples.

- The Latency SLA applies to a volume only if the percentage of random read is greater than or equal to 30%; more than 70% write may have higher latency.
- Latency SLA applies to a volume only if the average IO block size is less than or equal to 32 k; A volume with an average IO block size greater than 32 k IO block size may have higher latency.
- The latency SLA applies only if IOPS/GB delivered is equal to or less than the greater of the SLA IOPS/GB allocated or the service-level objective (SLO) IOPS/GB stored; the average latency might be higher for I/O consistently above the SLO.
- Minimum volume sizes. The below table provides the minimum and maximum volume sizes available per service level.

Service Level	Minimum Volume Size ¹	Maximum Volume Size ²
Extreme	30 GB	10 TB
Premium	100 GB	30 TB
Standard	300 GB	300 TB

¹ Smaller volumes are resized to these sizes.

² Larger volumes can be provisioned, but the performance SLA does not apply.

Service Level Metrics and Definitions

The following terms and definitions are used within the KFS service:

- **GiB, TiB, and PiB.** Measurements of data storage capacity using base of 1024 (1 GiB = 1024³ bytes, 1 TiB = 1024⁴ bytes, and 1PiB = 1024⁵ 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):
 - Latency is measured at five-minute intervals for each volume.
 - Over a 24-hour period of five-minute measurements, the highest 10% of latency values are discarded and an average of the remaining results are taken.
 - Latency from the network connection between the storage and the client, or latency introduced by quality of service throttling (as mentioned below) are both excluded from latency calculations.

- Latency SLA applies to a volume only if the following criteria is met:
 - The average IOPS per volume in an hour is greater than or equal to 100.
 - The percentage of random reads is greater than or equal to 30%; more than 70% write might have higher latency.
 - The average I/O block size is less than or equal to 32 KB.
 - The IOPS/TiB delivered is equal to or less than the greater of the SLA IOPS/TiB allocated or the SLO IOPS/TiB stored.

Data Protection

NetApp Keystone data protection service refers to methods that support back up of data and the ability to recover if required. Available data protection services include:

- 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 part of the subscription)



Backup and Disaster recovery service are available as add-on service, while snapshot is available as part of basic storage service

	Single Region Snapshots (Available as Part of Basic Storage Service)	Multiregion Backup (Data Protection Add-On)	Multiregion Disaster Recover (Data Protection Add-On)
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 for 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 ¹	n/a	Standard	Same as primary

¹Additional storage capacity to be subscribed



NetApp KFS service does not back up the data by default—it is the customer’s responsibility to subscribe to the add-on data protection services and configure for data backup and disaster recovery services. NetApp also supports protecting the data on to a non-Keystone storage system, and will aid in establishing the relationship. However, NetApp is not responsible for any backup failures.

Tiering

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

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 a cold storage.

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