ONTAP and the cloud

ONTAP 9

NetApp
January 11, 2023

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ONTAP and the cloud overview

Administrators of on-premises ONTAP systems can start using “the cloud.” ONTAP features are compared to the equivalent products and features in the cloud.

If you are already familiar with ONTAP but are not as familiar with cloud-based products, the following information helps you understand what you can do in the cloud and points you to other resources to learn how:

- Cloud Volumes ONTAP

  A software-only storage appliance that runs ONTAP data management software in the cloud.

- Cloud Volume Services

  Cloud native file services that provide metered file storage for NAS volumes. Three options are offered:

  - Azure NetApp Files
  - Amazon FSx for ONTAP
  - Cloud Volumes Service for Google Cloud

Related information

Whether you are new to these cloud products or already familiar with them, you can find more information at NetApp Product Documentation.

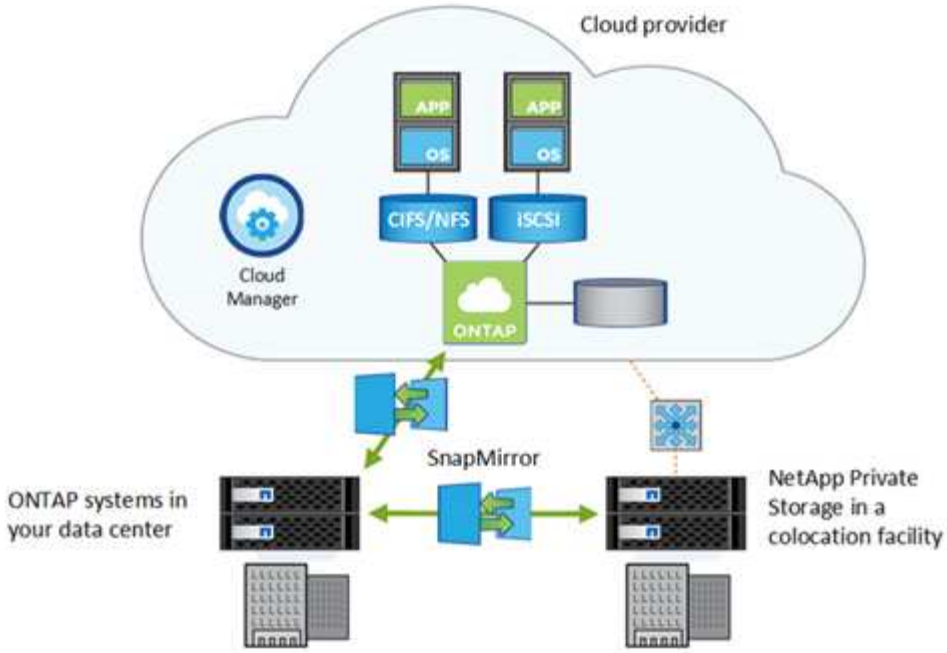
Data protection and the cloud

Data protection and the cloud overview

Data protection is often the first thing customers try when they begin their cloud journey. Protection can be as simple as asynchronous replication of key data or as complex as a complete hot-backup site. Data protection is based primarily on the familiar NetApp SnapMirror technology.

Data replication

SnapMirror technology keeps your data synchronized between on-premises and cloud installations by using ONTAP Snapshot copies. SnapMirror performs block-level incremental data transfers to ensure that only the data that has changed is sent to your destination replica.



Similarly, you can use a SnapMirror vault relationship to create a data archive for the local Snapshot copies created on a Cloud Volumes ONTAP system.

NetApp Cloud Backup delivers seamless and cost-effective backup and restore capabilities for protecting and archiving data to object storage in the cloud. Cloud Backup is available for both cloud-based data and for on-premises data.

Related information

Setting up a disaster recovery in the cloud with Cloud Volumes ONTAP

Efficient Data Replication Using Cloud Volumes ONTAP and SnapMirror

ONTAP Data Protection with the CLI

NetApp Cloud Backup

High availability

In an on-premises data center, physical nodes are configured in high-availability (HA) pairs for fault tolerance and nondisruptive operations. If a node fails or if you need to bring a node down for routine maintenance, its partner takes over its storage and continues to serve data from it.

In a cloud environment, you can create an HA pair of Cloud Volumes ONTAP instances for the same fault tolerance and non-disruptive operations as an on-premises HA pair. These recovery objectives are available with cloud HA pairs:

- The recovery point objective (RPO) is 0 seconds. Your data is transactionally consistent with no data loss.
- The recovery time objective (RTO) is 60 seconds. In the event of an outage, data should be available in 60 seconds or less.

Each cloud provider offers its own HA architecture and configuration options. For Cloud Volumes Service, high

availability is guaranteed in the service level agreement.

Related information

High-availability pairs in AWS

High-availability pairs in Azure

Encryption of data at rest

ONTAP uses the same encryption technology to secure data in the cloud that you use to secure your on-premises data.

Cloud Volumes ONTAP supports NetApp Volume Encryption (NVE) and NetApp Aggregate Encryption (NAE) with an external key manager.

Cloud Volumes ONTAP also supports the following encryption technologies:

- AWS Key Management Service
- Azure Storage Service Encryption
- Google Cloud Platform default encryption

Data is always encrypted at rest when using Azure NetApp Files and NetApp Cloud Volumes Service for Google Cloud.

Related information

Encryption of data at rest in Cloud Volumes ONTAP

NetApp Volume Encryption and NetApp Aggregate Encryption

Encrypting volumes in Cloud Volumes ONTAP with NetApp encryption solutions

Antivirus protection

You likely use the integrated antivirus functionality on-premises to protect data from being compromised by viruses or other malicious code. This same antivirus protection is available in the cloud when you use Cloud Volumes ONTAP.

The ONTAP Antivirus Connector, installed on a local server, handles communication between the storage system and the antivirus software. For Cloud Volumes ONTAP, you install the Antivirus Connector on a virtual machine in the same cloud as ONTAP.

Related information

Antivirus configuration

Move entire workloads to the cloud

Storage protocols

Some customers choose to move entire workloads to the cloud. This can be more complicated than just using the cloud for data protection. But ONTAP makes the move

easier because you do not have to rewrite your applications to use cloud-based storage. ONTAP in the cloud works just like your on-premises ONTAP does.

ONTAP offers the same NFS, SMB, and iSCSI protocols in the cloud that you are using today.

File sharing with NFS and SMB

The NFS and SMB protocols are used to make shares and files available to client applications over a network. Cloud Volumes ONTAP enables you to provide files from a public cloud using either or both of these protocols.

If you choose to move an entire workload to the cloud, Cloud Volumes ONTAP enables your application to work with storage in the cloud exactly as it does on premises. There is no need to change your application, and if you decide to move to a different cloud provider, there is no worry about provider lock in. The same commands and scripts you use to manage file services on premises work in the cloud.

In the cloud, you can scale file shares rapidly, by adding or removing storage and compute instances or by adjusting your service level as needed to respond to changes in client demand without incurring capital expenses. The more resources you use, the more you pay, but only when you are using the resources.

NetApp SnapMirror technology moves and synchronizes your file data between your on-premises ONTAP system and Cloud Volumes ONTAP. You can easily move the data to and from the cloud, and between cloud providers.

Related information

BlueXP: Provisioning Storage

Managing volumes for Azure NetApp Files

Managing Cloud Volumes Service for AWS

iSCSI

The iSCSI protocol provides block-level storage to clients such as databases and other applications that want block storage instead of files. ONTAP provides the iSCSI protocol in the cloud.

Once iSCSI storage has been provisioned, there is no difference between on-premises iSCSI access and cloud-based iSCSI access.

The same iSCSI SAN features that are available on-premises such as Snapshot copies, deduplication, compression, and thin provisioning are also available and work the same way in the cloud.

Related information

Provisioning block storage with BlueXP

Provisioning iSCSI LUNs in Cloud Volumes ONTAP

Deploying Oracle Databases on Azure/AWS

AutoSupport and Active IQ Digital Advisor

AutoSupport proactively monitors the health of your system and automatically sends telemetry to NetApp technical support. You can get detailed actionable information about your systems from NetApp Active IQ Digital Advisor.

The same AutoSupport and Active IQ Digital Advisor features you use on-premises are also available in the cloud. While AutoSupport can't collect data about the underlying hardware that powers Cloud Volumes ONTAP, you still get significantly useful information in Active IQ.

Related information

NetApp Active IQ

AutoSupport for Cloud Volumes ONTAP

Storage VMs

A storage VM (SVM) serves data to clients and hosts. Like a virtual machine running on a hypervisor, an SVM is a logical entity that abstracts physical resources.

In an on-premises ONTAP environment, you use SVMs to separate workloads. In Cloud Volumes ONTAP, you can use multiple SVMs, or you can use multiple instances of Cloud Volumes ONTAP.

Related information

Cloud Volumes ONTAP default configuration

FlexGroup volumes

FlexGroup volumes enable you to present a single volume of virtually unlimited size to an application. FlexGroup volumes are supported for Cloud Volumes ONTAP, enabling you to deploy a FlexGroup volume in Cloud Volumes ONTAP.

Related information

FlexGroup volumes management

Performance and efficiency in the cloud

Performance and efficiency in the cloud overview

Your on-premises ONTAP system offers data efficiency features that enable you to store more data is less physical space, and to tier rarely used data to lower cost storage. Whether you use a hybrid cloud configuration, or you move an entire workload to the cloud, ONTAP enables you to maximize storage performance and efficiency.

FabricPool

Many NetApp customers have significant amounts of stored data that is rarely accessed. We call that *cold* data. Customers also have data that is frequently accessed, which we call *hot* data. Ideally, you want to keep your hot data on your fastest storage for best

performance. Cold data can move to slower storage as long as it is immediately available if needed. But how do you know which parts of your data are hot and which are cold?

FabricPool is an ONTAP feature that automatically moves data between a high-performance local tier (aggregate) and a cloud tier based on access patterns. Tiering frees up expensive local storage for hot data while keeping cold data readily available from low-cost object storage in the cloud. FabricPool constantly monitors data access and moves data between tiers for best performance and maximum savings.

Using FabricPool to tier cold data to the cloud is one of the easiest ways to gain cloud efficiency and create a hybrid cloud configuration. FabricPool works at the storage block level, so it works with both file and LUN data.

But FabricPool is not just for tiering on-premises data to the cloud. Many customers use FabricPool in Cloud Volumes ONTAP to tier cold data from more-expensive cloud storage to lower-cost object storage within the cloud provider. Beginning with ONTAP 9.8, you can capture analytics on FabricPool-enabled volumes with File System Analytics or temperature-sensitive storage efficiency.

The applications using the data are not aware that data is tiered, so no changes to your applications are needed. Tiering is fully automatic, so there is no ongoing administration needed.

You can store cold data in object storage from one of the major cloud providers. Or choose NetApp StorageGRID to keep your cold data in your own private cloud for highest performance and complete control over your data.

Related information

FabricPool System Manager doc

Cloud Tiering Service

FabricPool playlist on NetApp TechComm TV

Storage Efficiency

The same storage efficiency features of on-premises ONTAP are available in the Cloud. SnapShot copies, deduplication, compression, compaction, thin provisioning, and FlexClone data clones are all available in NetApp Cloud offerings.

When you move data from on-premises ONTAP to the cloud, the existing storage efficiency is preserved. Whether you are moving an entire dataset, or just tiering cold data to the cloud, you won't move uncompressed or duplicate data.

Related information

Cloud Volumes ONTAP Feature Spotlight: Storage Efficiency Case Studies

Using a volume usage profile in BlueXP to manage cloud storage efficiency

Manage ONTAP in the cloud

Manage ONTAP in the cloud

Whether you use ONTAP in your own datacenter or in the cloud, you use the same interfaces to manage your storage. This means you already know how to manage ONTAP in the cloud. Additionally, NetApp BlueXP is a modern, easy-to-use graphical

interface for deploying and getting started with Cloud Volumes ONTAP. There are situations when you need to perform advanced management of Cloud Volumes ONTAP or Cloud Volumes Service. You can do so using System Manager, the command line interface (CLI), or REST APIs.

System Manager runs on the Cloud Volumes ONTAP or Cloud Volumes Service system, enabling you to perform management tasks.

The ONTAP CLI enables you to execute all administrative commands and is a good choice for advanced tasks or if you are more comfortable using the CLI. You connect to the CLI using Secure Shell (SSH).

ONTAP REST APIs enable you to create and manage cloud volumes and develop provisioning scripts and tools. The ONTAP capabilities that are available through the Web user interface are also available through REST APIs. For some situations, this programmatic interface is more useful, especially for developers because they can automate processes involving BlueXP operations.

Related information

Connecting to Cloud Volumes ONTAP

Cloud Automation with Cloud Volumes ONTAP and REST

BlueXP REST API

Event and performance monitoring

When you move your on-premises workloads to the cloud, you can continue to rely on ONTAP event monitoring. EMS messages, NAS native auditing, FPolicy, and SNMP are all available in the cloud.

If you are already using System Manager or Active IQ Unified Manager for on-premises performance monitoring, you can continue to do so in the cloud. Both System Manager and Unified Manager provide detailed reporting and alerting of Cloud Volumes ONTAP health, capacity, and performance.

Related information

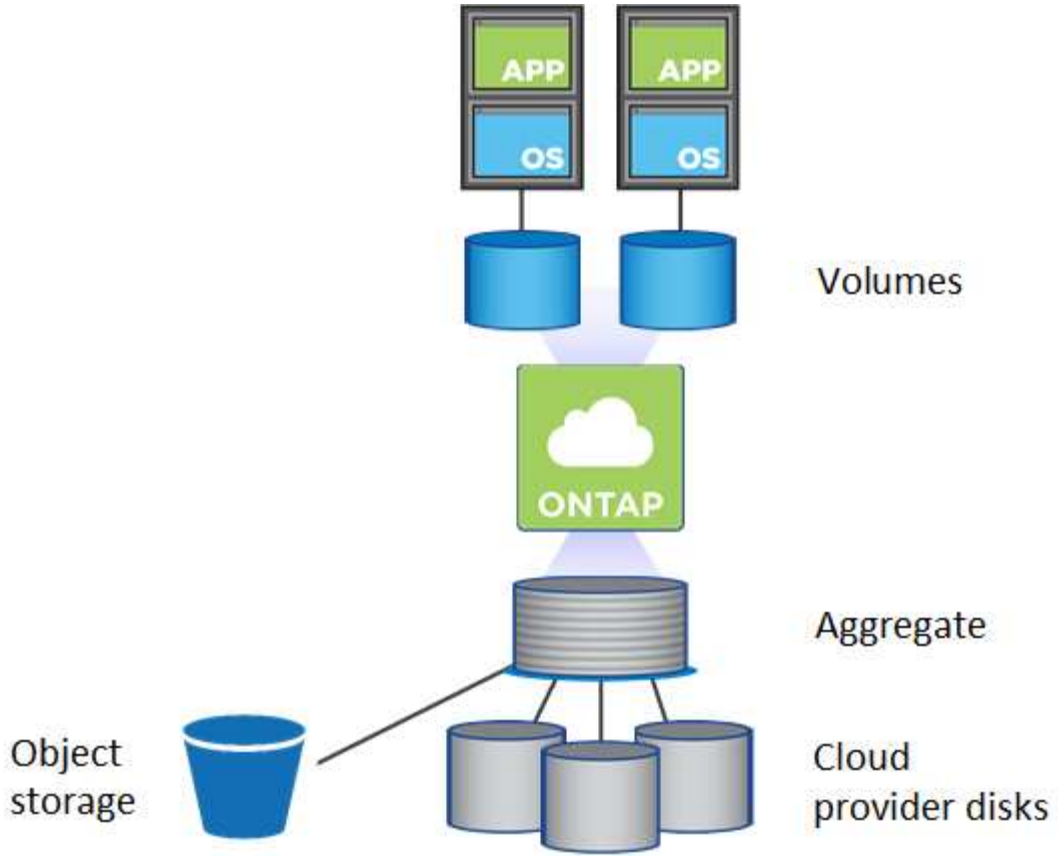
How to Define an Effective Cloud Monitoring Strategy

10 Cloud Monitoring Tools You Should Know

Volume management

Flexible and efficient volume management is the heart of the ONTAP cloud solution. ONTAP FlexVol volumes offer the same data fabric benefits, with the same data management processes, regardless of whether they are configured on-prem in the cloud. You can also take advantage of cloud capabilities to rapidly scale workloads, increasing or decreasing capacity as needed.

Cloud volumes provide the same storage efficiencies as on-prem volumes: deduplication, compression, compaction, thin provisioning, and data tiering. In a cloud environment, this means that you pay less for underlying cloud disk usage.



There are two ways to provision volumes in the cloud:

- Create new cloud volumes.
- Replicate existing on-prem volumes to new cloud volume destination using SnapMirror technology or the Cloud Sync service.

Related information

BlueXP: Provisioning storage

Managing volumes for Azure NetApp Files

Managing Cloud Volumes Service for AWS

Cloud Sync service

Volume move

Using ONTAP, you can move a FlexVol volume to a different local tier (aggregate), node, or both within the same storage VM (SVM) to balance storage capacity after you determine that there is a storage capacity imbalance. With Cloud Volumes ONTAP, you can move one or more volumes to another Cloud Volumes ONTAP system or to another aggregate to avoid capacity issues. You might need to do this if the system reaches its disk limit.

Related information

Cloud Volumes ONTAP: Moving volumes to another system to avoid capacity issues

Cloud Volumes ONTAP: Moving volumes to another aggregate to avoid capacity issues

ONTAP updates

NetApp releases regular updates to ONTAP to add new features and to fix known issues. You can update ONTAP in the cloud in a similar way to updating your on-premises ONTAP release. For HA configurations in the cloud, the process is nondisruptive.

Related information

Upgrading Cloud Volumes ONTAP

Compliance and the cloud

NetApp Cloud Data Sense

Each industry and each country has different compliance requirements. Whether you have an on-premises system or are working in the cloud, ONTAP helps you maintain compliance.

Powered by artificial intelligence, NetApp offers Cloud Data Sense (formerly Cloud Compliance service) to keep your cloud resources in compliance with many regulations. This always-on service is the best way to navigate complex compliance regulations.

Related information

Learn more about NetApp Cloud Data Sense at NetApp BlueXP Classification

Data sovereignty

Data sovereignty refers to national laws concerning the collection, storage, and transmission of data. The General Data Protection Regulation (GDPR) in Europe and the Health Insurance Portability and Accountability Act (HIPAA) in the US are examples of these laws. Data residency refers to where data is physically stored and is often specified by data sovereignty laws. Personal data about individuals is a primary target of regulations, but other data can be regulated too.

When you store data on premises in your own data center, you have complete control over how and where the data is stored. When you store data in the cloud, you are responsible for understanding how and where that data is physically stored, and you are responsible for ensuring you comply with applicable data sovereignty laws. For hybrid cloud configurations, you need to pay attention to where both the on-premises tiers and the cloud tiers are stored.

The good news is that all the major cloud providers are fully aware of the laws and have procedures and information to help you comply. But it’s still important that you select the appropriate products and procedures for your specific needs.

In many cases, storing your data in the cloud makes it possible to keep data within the boundaries of a country where your company has no physical presence.

Here are some examples of the compliance information from NetApp and from cloud providers:

- Architecting GDPR- and HIPAA-Compliant Storage
- Questions on data residency and compliance in Microsoft Azure
- General Data Protection Regulation (GDPR) Center for Amazon Web Services
- Compliance resource center for Google Cloud
- Alibaba Cloud Security & Compliance Center

Cloud WORM storage

An important aspect of compliance is being able to guarantee that certain data is maintained unchanged for a required period of time. You can activate write once, read many (WORM) storage on a Cloud Volumes ONTAP system to retain files in unmodified form for a specified retention period. Cloud WORM storage is powered by SnapLock technology, which means WORM files are protected at the file level.

Once a file has been committed to WORM storage, it can't be modified, even after the retention period has expired. A tamper-proof clock determines when the retention period for a WORM file has elapsed.

You can activate WORM storage on a Cloud Volumes ONTAP system when you create a new working environment. This includes setting the default retention period for files. You can't activate WORM storage on individual volumes—WORM must be activated at the system level.

Related information

WORM storage

Archive and compliance using SnapLock technology

NetApp Cloud WORM: Enhancing Data Protection with Locking Features

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