

eBook

The NAS Backup Challenge:

Move Past NDMP Limitations with
NetApp Cloud Backup



Executive Summary

For ONTAP users, finding a backup solution for their network-attached storage (NAS) data has largely meant relying on Network Data Management Protocol (NDMP) technologies. While that has worked in the past, there were drawbacks to the use of NDMP that makes the technology less than ideal for backing up enterprise-grade data.

What are these limitations and how can they affect your organization? In this guidebook we'll take a closer look at NDMP technology and the reasons why it can fail to meet an organization's backup needs.

We'll also introduce [NetApp Cloud Backup](#): the ONTAP native solution to backing up NAS data without the drawbacks of NDMP.

Cloud Backup creates incremental-forever, block-level backups that are encrypted end-to-end and stored in cost-effective object storage in the cloud or StorageGrid appliances. To help you see how it works, we'll also provide you with three customer success stories to see how Cloud Backup is making backup easier for three enterprise organizations.

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Introduction

Network attached storage (NAS) has been a reliable option as a storage architecture since it was first created almost 25 years ago. Since then, all types of organizations have implemented NAS for a variety of use cases. From centralized file sharing and virtualization datastores to database applications, NAS has been broadly used to satisfy data storage requirements of all sorts.

The most common way to interact with a NAS is by using the NFS and CIFS/SMB protocols. Typically known and used for their network file sharing capabilities, these two interface protocols are intrinsically associated and often referred to synonymously with the NAS storage architecture concept.

Hand-in-hand with the widespread adoption of NAS usage came the problem of backing up all of that data. As every storage admin and data protection team knows, backing up NAS has always presented a level of challenge. **Network Data Management Protocol (NDMP)** came to solve and standardize the initial shortcomings presented by a diverse NAS landscape. However, NDMP itself presents limitations which makes things, let's say, not optimal. In response to this there have been some enhancements to NDMP and the NAS backup experience.

In this article we want to walk through these challenges and some of these general evolution steps the NAS backup experience has gone through in order to set a basis of why NetApp Cloud Backup is the best option for backing up ONTAP NAS environments.

NAS at a Glance

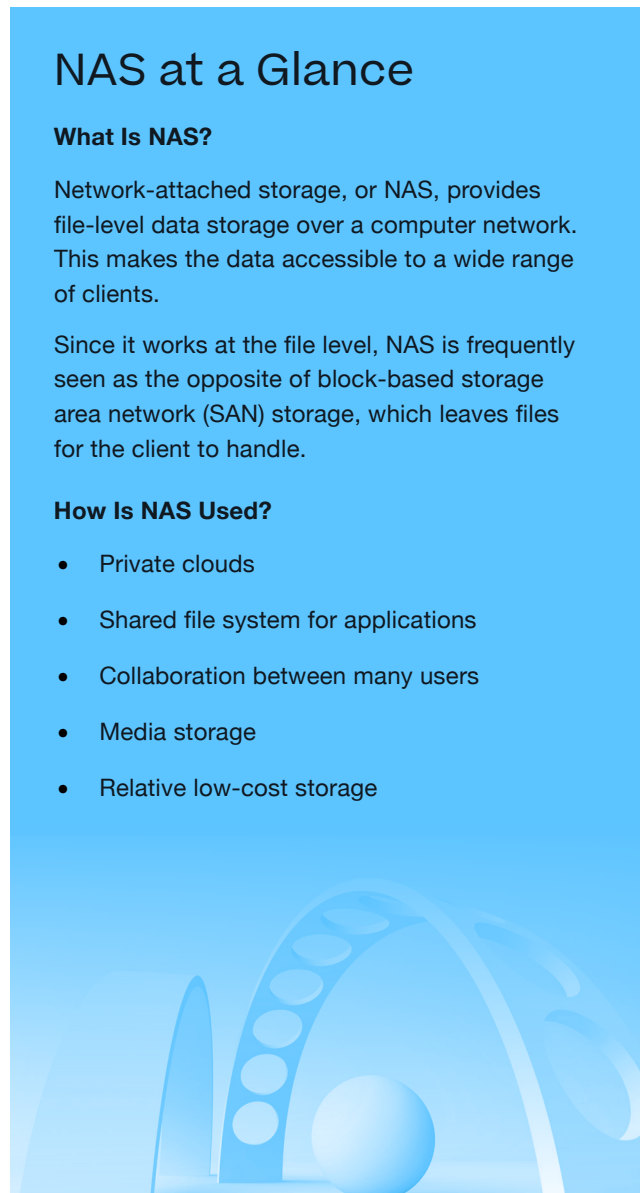
What Is NAS?

Network-attached storage, or NAS, provides file-level data storage over a computer network. This makes the data accessible to a wide range of clients.

Since it works at the file level, NAS is frequently seen as the opposite of block-based storage area network (SAN) storage, which leaves files for the client to handle.

How Is NAS Used?

- Private clouds
- Shared file system for applications
- Collaboration between many users
- Media storage
- Relative low-cost storage



What Are The Challenges With NAS Backups?

A Quick History of NAS Backups

Let's take a quick historic glimpse at NAS backups that will help us better understand the current context.

Back when NAS started being widely adopted in the market, backing up NAS servers entailed a few challenges. Corporate networks were not as fast as they are now and the lack of a standardized protocol made it necessary to use the IP networks to stream the data to the tape media from the backup server. This of course, congested the network and represented a hurdle. The different backup applications needed different agents to talk to the NAS multi vendor equipment, adding another hurdle and making it more difficult to backup NAS. This, in a nutshell, is how things worked back then.

To address these and other challenges, the NDMP protocol was implemented. NDMP allowed for a separation of the control traffic of the backup application from the actual data being backed up. So now, instead of streaming everything through the IP network, the NAS server could receive the control commands from the backup application via NDMP and then send the backup data to a directly attached tape or through a SAN network.

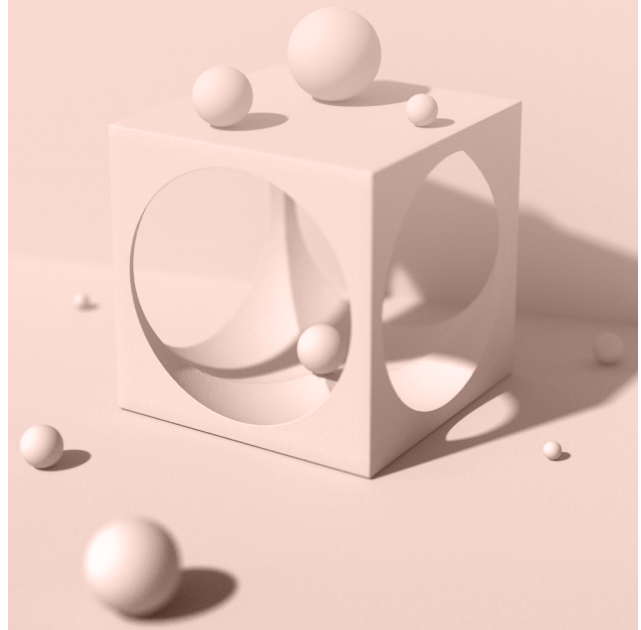
Additionally, different backup applications could now talk to multi-vendor NAS without having to configure agents and specific drivers for each vendor. Clearly, NDMP was a game changer which came to enhance and standardize the NAS backup experience. Incidentally, this revolutionary technology was initially developed by NetApp.

NDMP

What Is NDMP?

Network Data Management Protocol

- Used to create NAS backups
- Separates backup and source data traffic
- Allows backups to stream over the IP network
- Eliminates the need for additional agents/vendors
- Backups are created on tape



NDMP Drawbacks

NDMP is still widely used in the market today. However, the landscape has changed since NDMP first appeared. There are still many organizations out there for which using NAS filers as isolated departmental units satisfies their storage requirements. But complicating that is the fact that the amount of data held by companies today has grown considerably, meaning those NAS data volumes can easily reach petabyte-scale dimensions.

In this context, NDMP presents some limitations that are worth mentioning as they can be a headache for both NAS backups that don't necessarily hold massive volumes of data (such as departmental NAS filers) and for scale-out NAS environments.

Let's take a look at the main limitations inherent to the NDMP protocol:



High overhead costs. The management overhead involved when running NDMP as part of your backup policy. The NDMP architectures require at least a dedicated management server on which the backup software is installed. Installation of the backup software, training on how the NDMP-based software works and maintenance of this backup server, these all add to additional admin work.

To find more about the hidden costs of NDMP, [check out how the costs add up using our TCO calculator here](#).



System stress. NDMP backups can put a lot of stress on the production environment due to the amount of processing required to create backups. The increased computational capacity that is needed to prepare NDMP backups can be especially challenging when it's done within mission-critical production systems since it negatively affects the overall system performance. Because of that overburden on the system, some organizations need to rely on deploying a dedicated backup infrastructure and that can become very costly.



Slow performance. NDMP was designed for single stream backups per NAS node. This can slow down performance if your backup application does not have a multiplexing solution for this or if you are dealing with an NDMP version which doesn't support it. For example, to back up 10 TB of data using NDMP, it can take you as long as two weeks.



Inefficient. NDMP requires users to recreate the full, baseline copy of the dataset on a fairly frequent basis, not just the delta data. That takes a lot of time and can cause a backup window to be missed. ONTAP users who rely on NDMP-based backups also face the loss of ONTAP's cost- and space-reducing storage efficiencies, such as data deduplication and compression. Without these efficiencies in place, NDMP backups take longer to create, longer to transfer, and consume more storage space—all of which add up to increase your costs.



Reliability. Due to the longer backup time required for NDMP backups, there is a good chance that you will miss your backup window in the process. This means that the backups that you do retain are likely to have significant amounts of data missing. This can make NDMP backups an unreliable way to replace your primary data set if something goes wrong.



Restore issues. NDMP has poor restore performance when restoring from long chains of incremental backups. That's the reason behind having to perform a periodic full backup for every 9 incremental backups. This impediment strains the network resources and makes it very inefficient for large volumes of data.



Cloud Adoption. Backing up to the cloud using only NDMP is not possible. Topologies supported by NDMP backup vendors require backup media to be directly connected to the NAS server, to the NDMP MediaAgent server, or to a remote third server connected to the main NAS filer. These more complex setups are known as the NDMP-2 Way, NDMP Remote, or NDMP-3 Way topologies, respectively.



Indexing. Like all backup solutions, NDMP-based backup indexes are databases that keep a record of all the metadata of the data in each backup. This includes file name, creation date, the file size, and more. This indexed data is important because it can be used by certain operations, such as search functions and file browsing, without going to the actual backup. It also allows for some restore operations. However, this indexed database requires a robust infrastructure, including the storage required in the local server, and consumes network bandwidth.



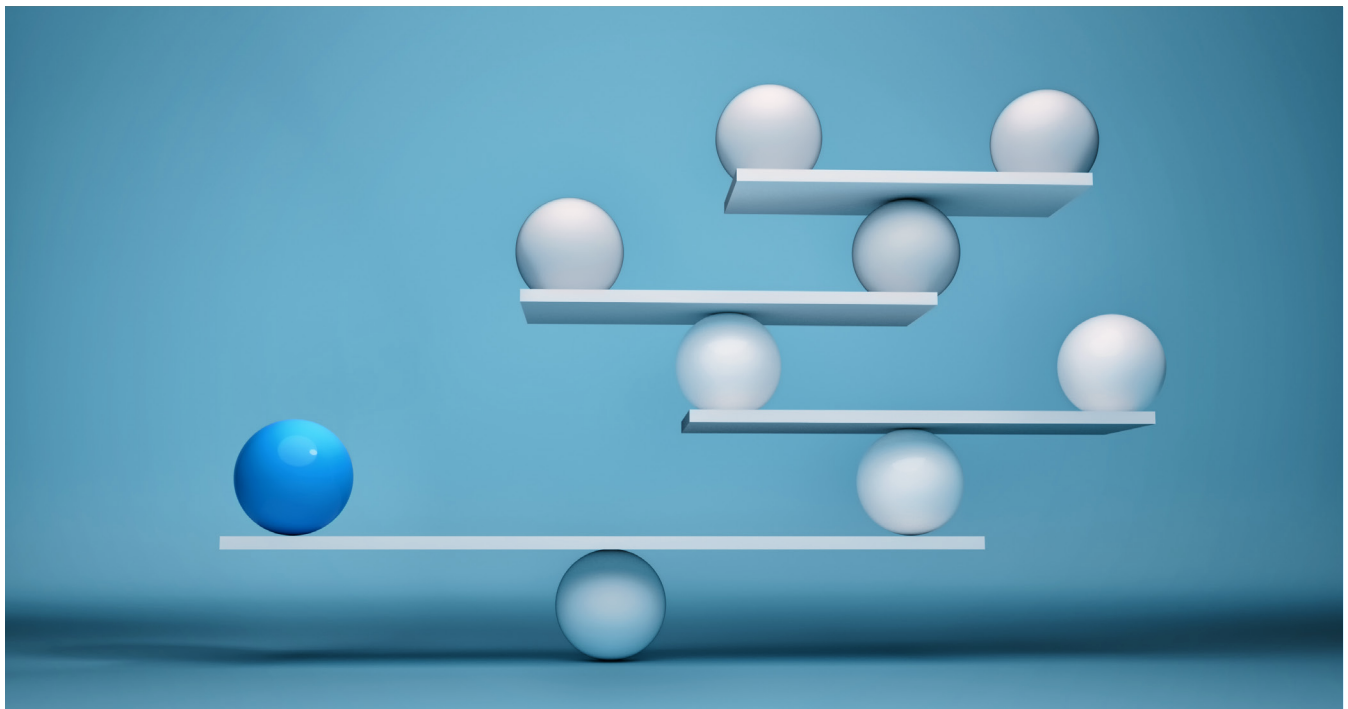
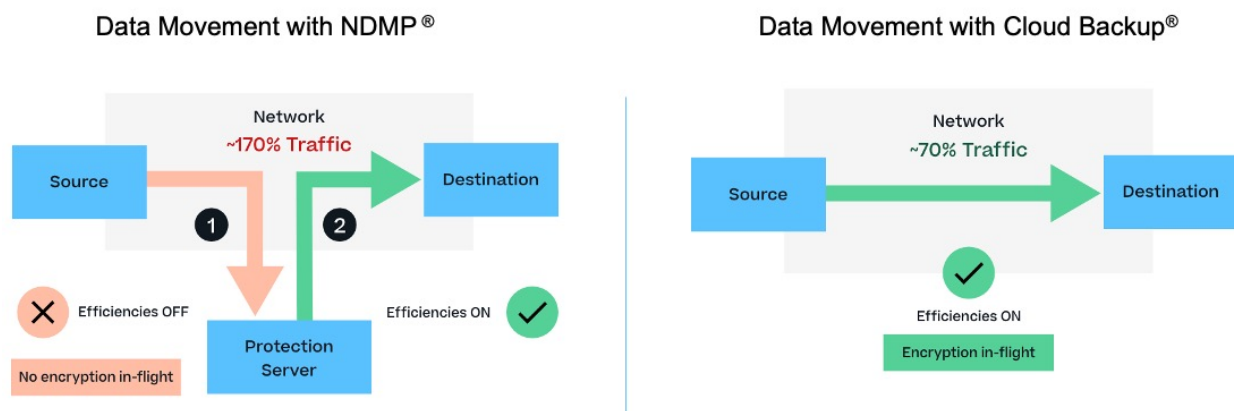
Security. NDMP doesn't encrypt your data while it's in transit, only when it's at rest. Without this kind of end-to-end encryption, your data is left unencrypted and exposed while it's being transferred via the network, making you vulnerable to data theft, viruses, ransomware attacks, and other cyber threats.



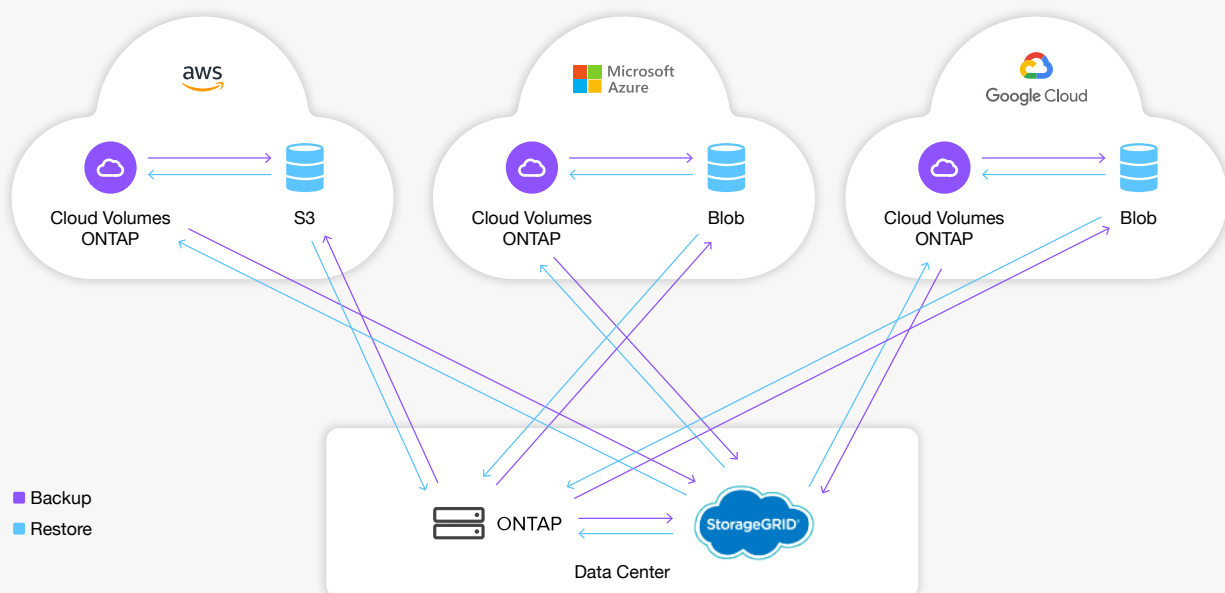
Solving NDMP-Based Backup Challenges With NetApp Cloud Backup

We've seen how NDMP-based backup solutions can present some serious challenges when it comes to creating quick, dependable backups. NetApp, in line with today's evolved NAS backup solutions, has developed a solution for backing up ONTAP NAS data in NetApp Cloud Backup.

Cloud Backup creates block-level, incremental forever backups that are stored in object format in the cloud on AWS, Azure, or GCP or on-prem in NetApp StorageGrid appliances. The Cloud Backup service offers you all of the advantages of a modern NAS backup solution fully incorporated into the Cloud Manager ecosystem and your NetApp ONTAP environment.



NetApp Cloud Backup



Check out this demo video to see how Cloud Backup works



Cloud Backup Benefits

- **Incremental forever backups.** With incremental forever backups, Cloud Backup cuts down your operational complexity, shortens the backup window, reduces costs.
- **Retaining storage efficiencies.** ONTAP users can be assured that the same efficiencies that keep footprint and costs low for their data are retained in the backup copies of the data. This makes restores faster than with file-level backups.
- **Direct backups.** Cloud Backup copies are directly created from the original data source to the backup target on object storage, with no intermediary.
- **Set and forget.** Automatic backup schedules and policies mean that Cloud Backup helps you meet the most demanding recovery objectives without additional overhead.

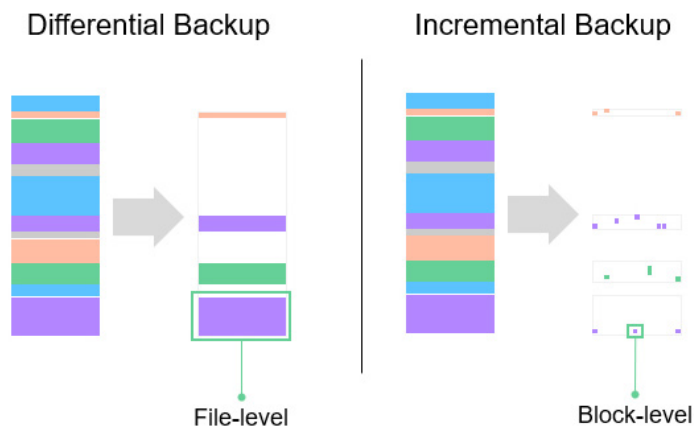
Let's take a look at exactly how Cloud Backup stacks up against NDMP will accomplish this from different angles:

Efficacy:

There are a number of important features Cloud Backup has that makes it very efficient, which makes it superior to solutions based on NDMP:

- 1 **Block-level backups:** Only data blocks that have been added or changed since the last backup are included in the next one. This has important benefits worth mentioning:
 - ▶ Because Cloud Backup copies are both block level and incremental forever, they can be created in nearly no time at all, virtually eliminating the backup window. Your files are instantly updated on demand. This is a huge advantage over NDMP backups.
 - ▶ Average scanning times and backup times are much shorter than with NDMP. This advantage becomes even more valuable when the number of files in your file system is high or when you have a lot of unstructured data, such as media files or all types of office documents. In an era of scale-out NAS this is definitely beneficial. These faster backup windows apply both for full backups and incremental ones.
 - ▶ Faster backup times allow for more frequent backup cycles. This means that you can shorten your Recovery Point Objective and make restores even more granular.

Compare NDMP's larger, file-level backup size vs. Cloud Backup's more efficient incremental backups:



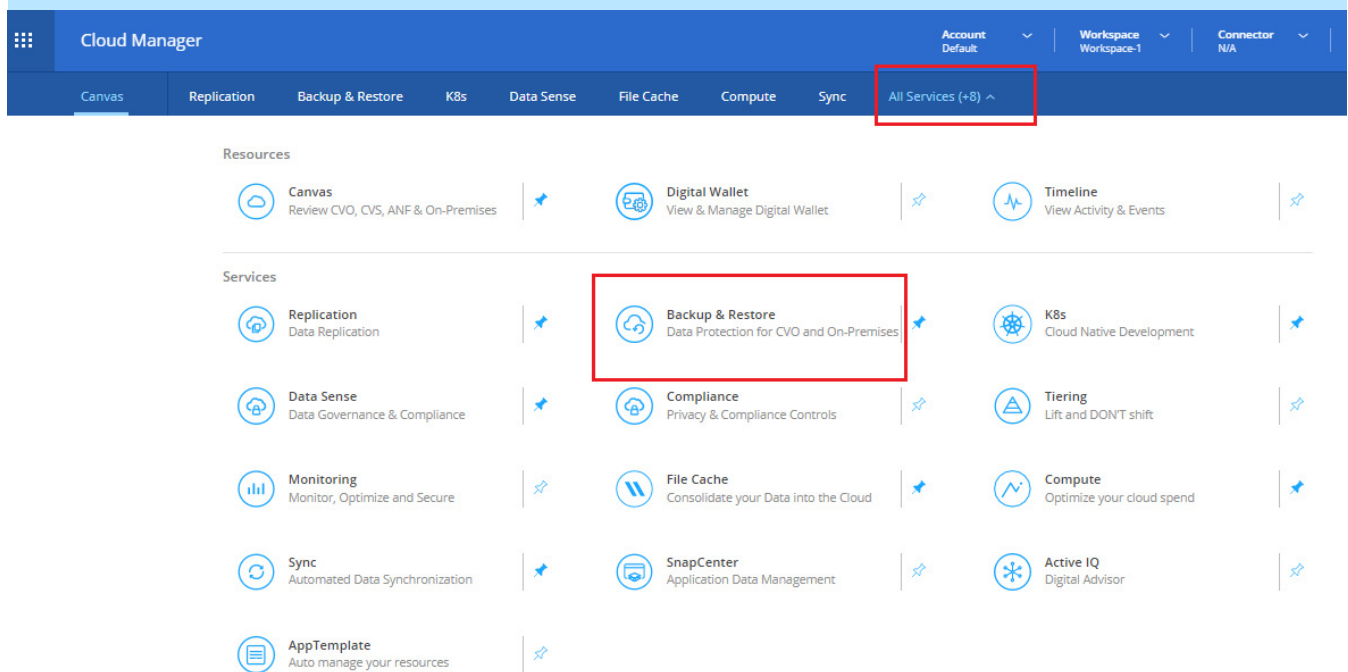
- 2 **Incremental-forever approach:** no need to worry about taking a full backup for every other nine incremental updates the way it is with NDMP-based solutions. Incremental-forever chains allow you to skip long and error-prone full backups. This makes life easier for data protection teams and storage admins, especially when dealing with large datasets.
- 3 **Storage Efficiencies:** Cloud Backup preserves all your ONTAP storage efficiencies. This not only reduces data storage footprints at the destination but also reduces the network bandwidth when transferring the data to the cloud. Compare this to an NDMP-based scenario where a separate index server has to be kept in order to perform deduplication on the data before transmitting it to the backup media. That would represent an additional layer of management even if it is a product aligned with ONTAP's deduplication and compression. Cloud Backup integrates seamlessly with your existing ONTAP storage efficiencies, meaning you backup with no hops instead of two hops.
- 4 **Restores:** Restores can be done to a different ONTAP system—both in the cloud and on-prem— and can be done at a volume level or at a file level through a browsable catalog. These restores preserve the original access permissions on the files. There's no need for a client, extra permissions, or a dedicated service account.

Simplicity:

The streamlined architecture of Cloud Backup eliminates the stress that NDMP-based backup solutions put on applications. Since backups are easily automated, you also can reduce the complexity in your existing backup creation process.

Integration and ease of use:

Unlike many ad-hoc NDMP solutions, using Cloud Backup doesn't require an additional UI because it is fully integrated with the entire NetApp ecosystem via NetApp Cloud Manager. This is the same UI used by all of NetApp's cloud services which makes it an easy way to integrate your backup capabilities with other services. It has a main canvas where you will see all of your storage nodes and if you want to enable any additional service, such as Cloud Volumes ONTAP, you can activate it from this same UI:



Cloud Manager's simple interface means that you can have an entire NAS backup solution up and running in just a few minutes. Compare this to having to deploy an NDMP-based solution that requires additional knowledge of the software and training, dedicated hardware (which also needs to be maintained), and extra networking setup. Some of these solutions are not fully-managed, which means dedicating time for upgrades and patches to the solution.

Cloud Backup is much easier to manage since the entire backup process is automated, eliminating the need to keep up with backup best practices

day to day. And as the software runs entirely in the Cloud Manager SaaS, there is no need for additional integrations, logins, or billing reports—you always have the latest and best version. You can also choose to maintain updates manually if you want to keep full control over the system.

If you aren't interested in using Cloud Manager through the SaaS, Cloud Backup also provides a software-only option. With the software-only option, users are able to back up their data to dark sites in the AWS and Azure secret regions, AWS C2S and Azure IL6.

Cloud Adoption:

NetApp Cloud Backup adopts a hybrid-cloud approach:

- The backup source can be on-prem ONTAP, ONTAP Select, or Cloud Volumes ONTAP in AWS, Azure, or Google Cloud Platform.
- The backup destination can be either AWS S3, Azure Blob, Google Cloud Storage, or an NetApp StorageGRID private cloud.
- Built-in data governance. For on-prem users, Cloud Backup comes with an option to activate a free subscription to Cloud Data Sense, the AI-driven data mapping and governance tool to help identify the sensitive data stored in your backups so you can manage it.
- The restore can be to ONTAP on-premises, ONTAP Select, or to Cloud Volumes ONTAP (AWS, GCP, or Azure) and it can be restored to a different location than the original source.
- Backups are transmitted to the cloud with the TLS 1.2 HTTPS protocol to secure your data while in-transit. The destination bucket is protected with AES-256 bit encryption.
- Since Cloud Backup is a fully managed service, there is no need to create or maintain separate compute instances in the cloud, all is done automatically behind scenes by Cloud Backup.
- Different subscription models available, including pay-as-you-go, annual subscription or BYOL.





Case Studies: Real-World Experiences From Our Customers

Multinational Insurance Company Backs Up Petabytes of Data to Azure

This US-based multinational insurance company offers plans for general liability, workers' compensation, business owners, cyber liability, and more. This company is leveraging Cloud Backup Service to back up critical on-premises data to Azure.

The company relies on its on-premises ONTAP storage systems to manage their considerable volume of application data and legal files. This data needs to be backed up—as an insurance company, backups of data need to be retained for 7 years or more. To meet this requirement, the company had previously been relying on an NDMP-using vendor, which would send the backups to Azure.

This solution was not efficient for the company. Due to the large amount of data—some 1.3 PBs of data—backups were slow, and in some cases backup windows were missed because of restarts and backup operational failures. The impact of these issues was that they were not able to meet their RTO and RPO service levels. They needed a better solution, and they found it in NetApp Cloud Backup.

Cloud Backup offered a better solution for this company because it was able to provide them with a number of clear benefits:

- **Familiar technology:** The company's IT architecture already relies on NetApp SnapMirror® and SnapVault® technology, two technologies that they could extend to the cloud with NetApp Cloud Backup.
- **Faster Backups:** The previous NDMP solution could only back up entire files and required a two-step process, sending backup files to a mediator before they could reach the cloud. Cloud Backup Service in comparison only backs up changed data blocks after the initial backup is created, and sends data directly to the cloud in a single step.
- **Lightweight solution:** Traditional NDMP backup solutions require multiple appliances that need to be sized in advance and managed. Cloud Backup is activated with one click via Cloud Manager, and it is a SaaS offering with no sizing or ongoing management overhead.
- **More cost effective:** Traditional backup solutions are required to perform full backups of the entire volume periodically in order to support long-term retention policies. Cloud Backup Service is 'incremental forever', which means that no interim full backups are required. This translates to a lower backup storage footprint and reduced network requirements.

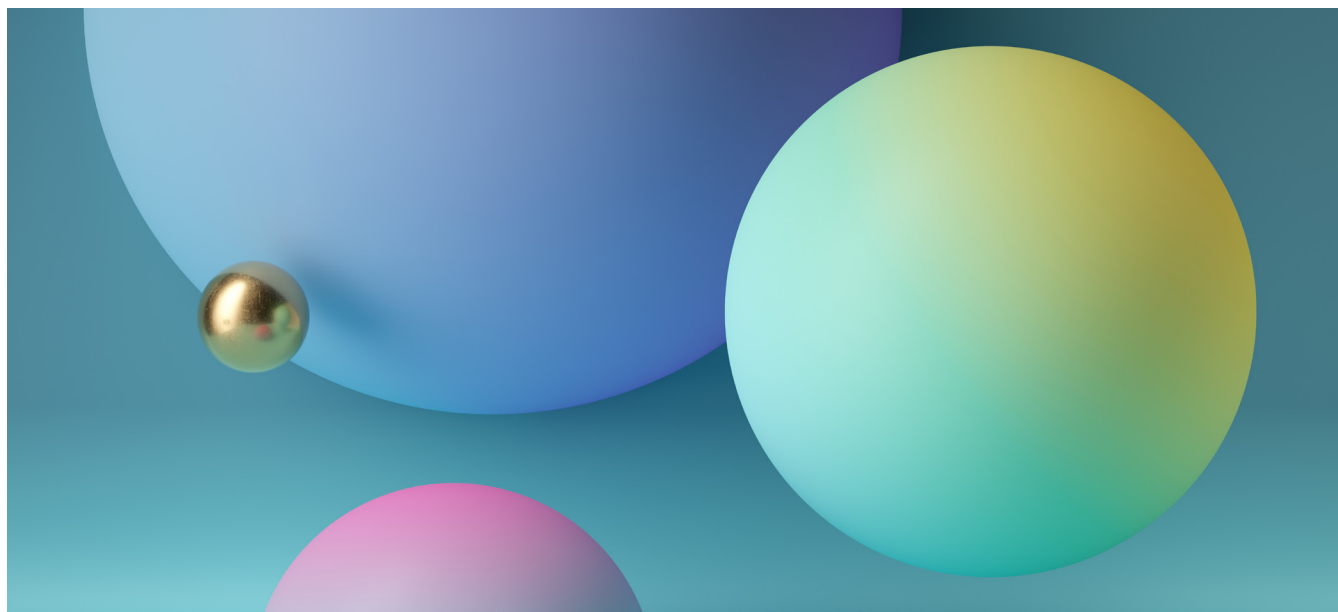
An EU-Based Pharmaceutical Company Backs Up to AWS

One Cloud Backup user is one of the world's largest pharmaceutical companies. Operating across the globe, this company produces medications that assist with respiratory diseases, metabolism, immunology, oncology, and diseases of the central nervous system. Their annual sales total more than €19 billion. Alongside a Cloud Volumes ONTAP deployment for OpenShift containerized applications on AWS, this company relies on Cloud Backup.

To adapt to the shifting healthcare industry standards of digitalization, this company uses OpenShift to accelerate their application development, with the goal of running new applications on the public cloud. The Cloud Backup service provides highly efficient and cost-effective automatic backups for these applications.

There are a number of benefits to Cloud Backup they are receiving:

- **Full service integration:** Instead of having separate solutions to manage, Cloud Volumes ONTAP and Cloud Backup are controlled centrally through Cloud Manager providing a simple management endpoint between their on-prem systems and the cloud.
- **Code-based automation:** Additionally, the company uses Cloud Manager APIs for automating common operational tasks as part of their Infrastructure-as-Code strategy.
- **Flexibility:** The company is currently conducting a POC with StorageGRID for on-premises object storage. One of the use cases being considered is expanding the usage of Cloud Backup service to on-prem and backing up on-premises ONTAP data to StorageGRID.



A Multinational Tech Manufacturer and Service Provider

Cloud Backup is being used by an American-based multinational technology company. One of the largest such companies in the world, this tech giant produces consumer electronics, software, PCs, and many industry and consumer targeted SaaS products. By revenue, it is one of the top 25 largest companies according to a popular magazine rating system, and is counted as one of the major IT companies in the US.

This company is using Cloud Backup with Cloud Data Sense to back up their on-prem ONTAP arrays. Cloud Data Sense helps them sanitize product files before moving from development to production.

Prior to Cloud Backup, the company's product team was frustrated with their NDMP-based backup solution. This product was too complex, operationally inefficient, and overall cost too much to operate effectively. With the introduction of Cloud Backup Service support for on-prem ONTAP arrays, the team had found a better solution.

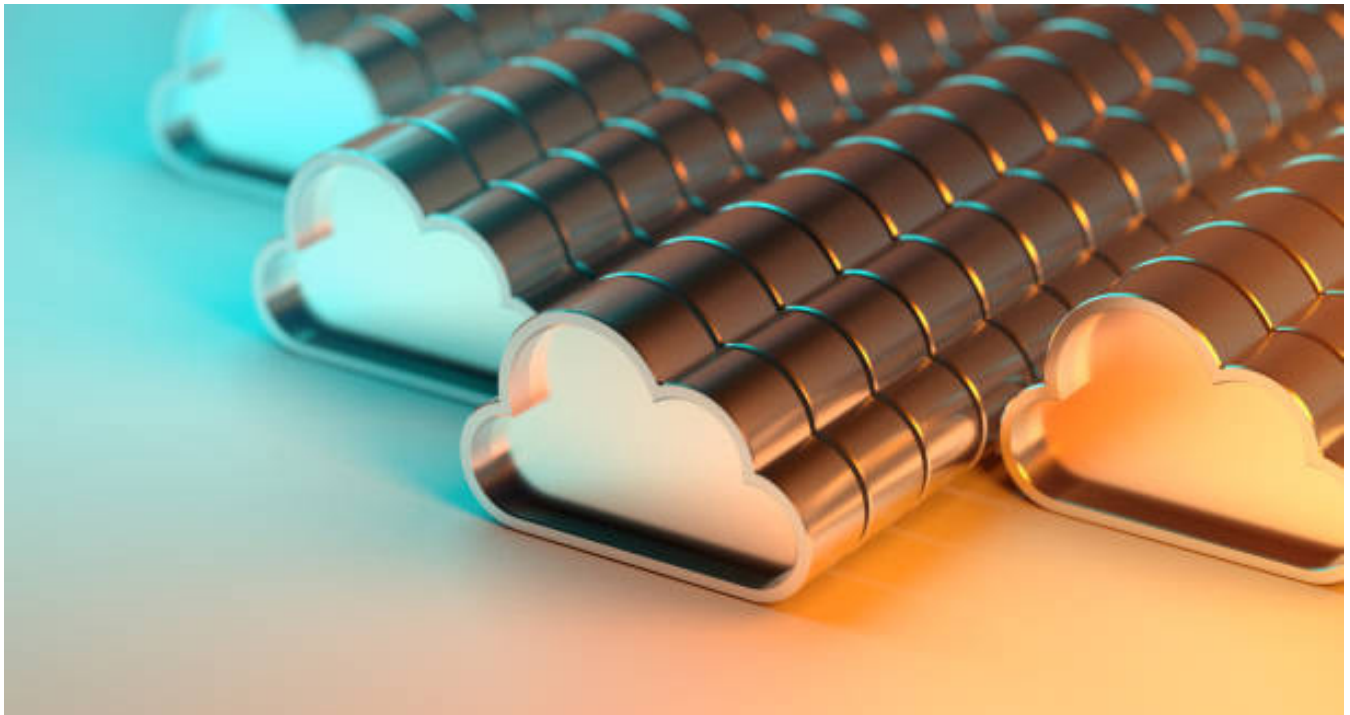
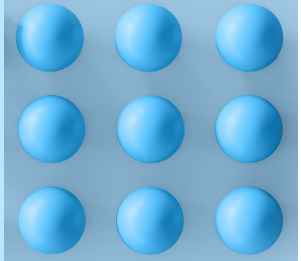
The benefits they gained with Cloud Backup included:

- **Native ONTAP support:** With the Cloud Backup service, the company solved a long-lasting backup pain by eliminating the need for a third-party solution to backup their NAS data. It also meant that they could preserve block-level incremental forever data mirroring and the original storage efficiencies.
- **Low-cost storage:** Cloud Backup allows the company to back up directly to low-cost object storage on Azure Blob, as well as on-premises in StorageGRID devices, allowing them to achieve a 3-2-1 data protection approach.
- **Less operational overhead:** Cloud Backup helps the company eliminate the additional operational overhead that all their prior solutions required. Cloud Backup takes just minutes to deploy and doesn't require any additional appliances to manage or maintain, with all the operations controlled via the intuitive, API-driven Cloud Manager SaaS.
- **Azure GovCloud support:** Parts of the company's product line are used by both commercial and government customers, with each having specific data requirements. Cloud Backup provides Azure GovCloud support to address the company's requirements.
- **Freed up primary storage space:** Cloud Backup leveraged cost-effective object storage in the cloud, allowing the company to free up their existing Cloud Volumes ONTAP systems on Azure that had been serving as part of their backup solution. These volumes could now be better utilized to handle additional Azure workloads.
- **Data governance with Cloud Data Sense:** Cloud Data Sense is bundled with every instance of Cloud Backup, providing the company with an AI-driven data mapping technology to better determine the type of data owned in backups. Prior to a product release, the developers needed to scrub any leftover files or logs containing sensitive data. Cloud Data Sense allows them to pinpoint that data automatically, saving time and effort.

Don't Let NDMP Backups Slow You Down. Try Cloud Backup

In a present context where NDMP is still widely used and NAS backups applications have also shortened gaps left by this protocol, Cloud Backup jumps in as a fully-managed solution that tackles the challenges presented by NDMP architectures and that has also gone post-NDMP and incorporated the newest advantages of a NAS backup solution. Since Cloud Backup integrates seamlessly with your existing ONTAP environment and also provides flexibility through a hybrid cloud approach, this makes it your best option to backup ONTAP NAS.

- **SEE YOUR SAVINGS:** Try the Cloud Backup TCO calculator here →
- **WATCH A DEMO:** Check out Cloud Backup in action →
- **START A FREE TRIAL:** Sign up here to get started with Cloud Backup today →



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NA-000-0621