Running NFS and SMB in the Cloud:

Five Points to Consider

NetApp + Google Cloud

Introduction, Market Landscape, and Critical Success Factors

By the Numbers

45EB

Estimated amount of file-based storage capacity that will be deployed in public cloud for file services in 2022. This represents a 38.2% CAGR from 2017 to 2022.[1]

62%

Estimated percentage of workloads running in hybrid cloud within the next 2 years. That's a 24% increase from September 2018. [2]

40%

Estimated increase in spending on data services for hybrid cloud over the next 12 months. [2]

80%

Percentage of enterprise data stored in files. Includes native cloud applications that often use files to structure the information that is stored in the cloud. [3]
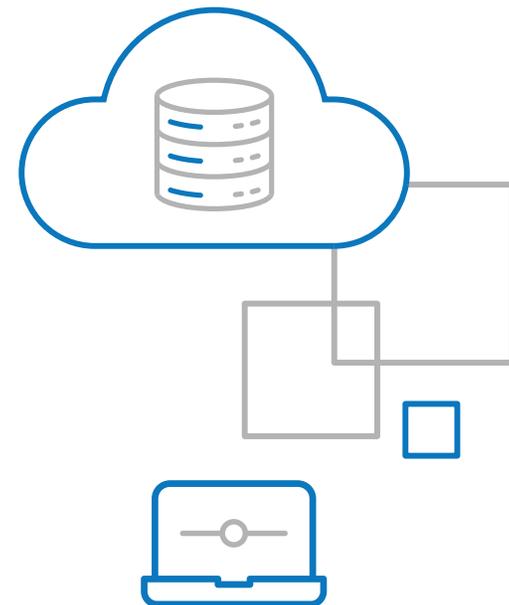
Moving NFS and SMB Applications to the Cloud

The data says it all. Companies are moving their file-based business applications to the cloud to gain flexibility, scalability, and increased performance. This migration includes enterprise applications such as procurement, supply chain management, and customer support, as well as Windows-based applications such as personal finance and design.

Ensuring that these applications and workflows perform to the same standards in the cloud as they do on the premises is key to a successful cloud migration. Many enterprise applications require high I/O performance and need extremely fast storage to read large volumes of data.

It's crucial to simplify migration to the cloud and to minimize cloud migration time and costs.

For transitioning NFS and SMB files to the cloud, that means eliminating or minimizing application development. Cloud service providers often offer native services for migrating data, but these solutions might require significant restructuring of the application during a "lift-and-shift" operation, or they might not be as fast, taking days or even months to move the data.

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NFS and SMB Definitions

Being able to smoothly transition NFS and SMB files to the cloud is crucial to supporting enterprise and Windows applications.

What Is NFS?

Network File System is a distributed file system protocol designed by Sun Microsystems in 1984 that allows network users to access shared files in the same way their computer would access locally stored files. NFSv4, the current version of NFS, delivers the following improvements and new features:

» Enhanced built-in security

» Better namespace handling

» Improved and integrated locking support

» Improved performance over the network

» Cross-platform interoperability, including Microsoft Windows

» Protocol extension to support backward compatibility

» Movement toward an open standard, managed by the IETF (Previous versions of NFS were proprietary.)

NFS is typically used with UNIX and Linux servers. However, with NFS for Windows you can deploy NFS server on Windows Server. This enables both Windows and UNIX and Linux to access the shared resources on the Windows system.

What Is SMB?

Server Message Block is a network protocol that enables shared file access. Common Internet File System (CIFS) is an SMB dialect protocol that was developed by Microsoft to access Windows files. CIFS and SMB are now considered interchangeable terms. Both NFS and SMB are file-sharing protocols that are used to share file data between server and client systems.

Migrating or Running NFS and SMB in the Cloud: Five Points to Consider

1. Maintain your current NFS and SMB file structures

If your application is already relying on NFS or SMB file constructs, you don't want to have to change that. If you are transitioning to the cloud, you want to minimize changes to both file structures and applications. At the same time, you want to optimize performance by maximizing throughput and minimizing latency while also providing high availability.
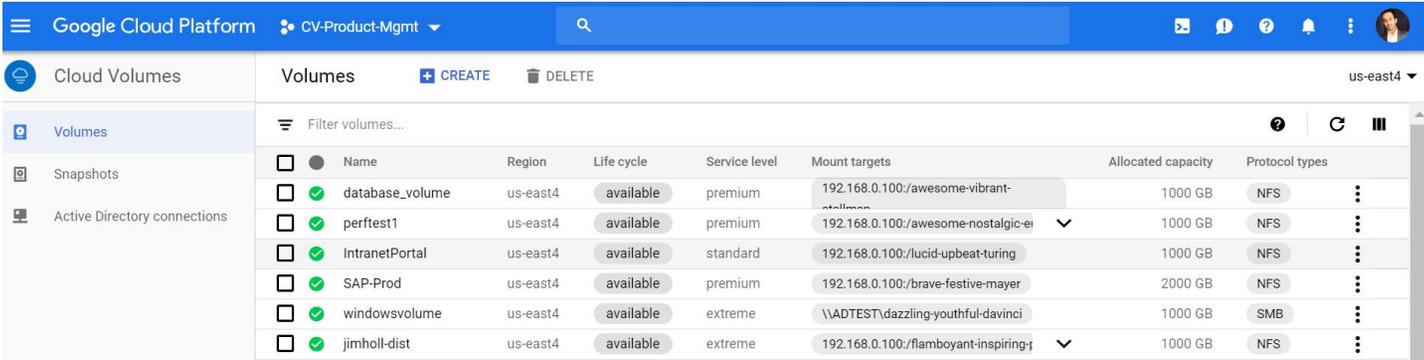

Figure 1. NetApp Cloud Volumes Service for Google Cloud UI showing cloud volumes.

2. Ensure business continuity

When migrating to the cloud, it's important to consider downtime during the migration as well as downtime due to natural disasters and system failures. Ensuring business continuity consists of three components:

» Achieving high availability with no data loss (RPO=0) and short recovery time (RTO)

» Deploying your application so that it's highly available and resilient to disasters or infrastructure failures

» Having complete accessibility during the migration to the cloud and while you continue to sync and update your systems after the initial migration is complete.
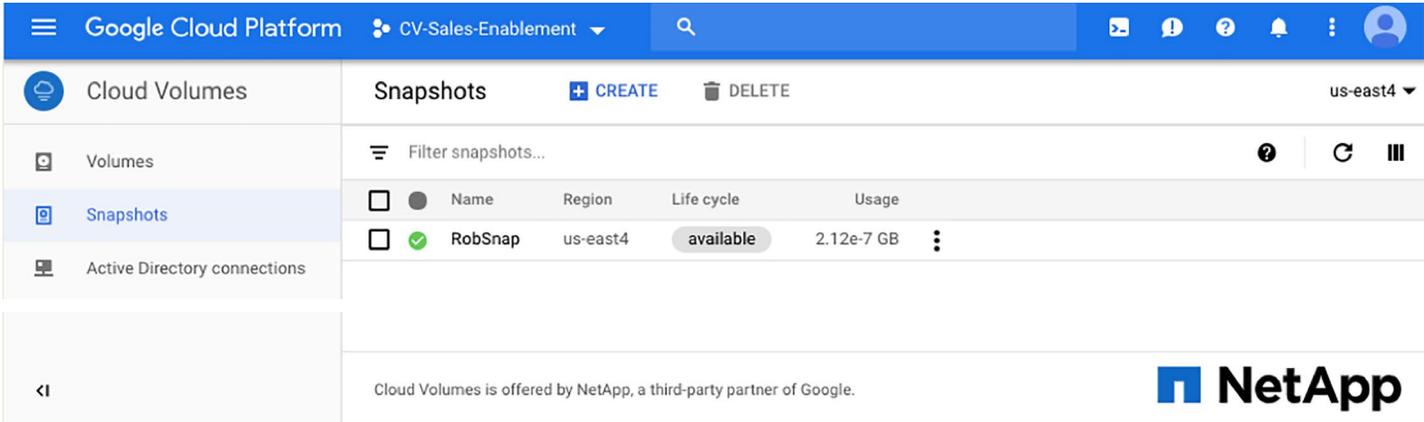

Figure 2. NetApp Cloud Volumes Service for Google Cloud Platform Snapshot.

3. Ensure file data security

Ensuring cloud application security is a top priority, to make sure that access to the file system is in your control at all times. To prevent losses, data security has to be addressed at all levels. And the security of the data at rest in the new environment must meet applicable regulatory compliance laws such as HIPAA and GDPR. If you choose a DBaaS deployment, you must follow the recommended practices for the multitenant solution to protect against other tenants and external attacks.

4. Leverage automation

Automating the cloud migration process and administration tasks can save operational development costs and time to deployment, especially when deploying and managing multiple databases. It's easy to automate administrative tasks such as creating databases, managing backup and restore, and monitoring.

5. Reduce costs

Migrating your NFS and SMB file shares correctly can help reduce costs associated with cloud migration, lower ongoing costs for cloud services, and minimize or eliminate developer costs. Processes such as data tiering let you run infrequently used, low-performance workloads on inexpensive storage, while moving high-performance workloads to higher-performing drives.
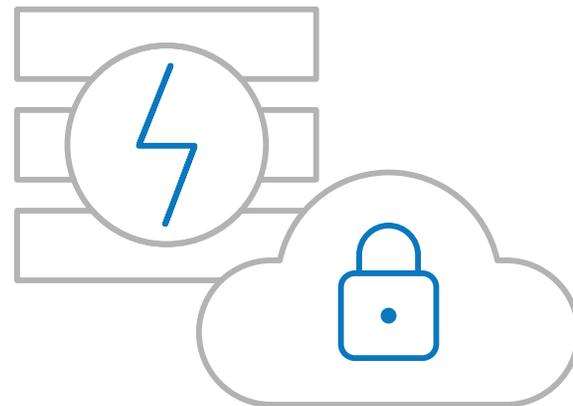
Use Cases

Moving Enterprise Applications to the Cloud

Enterprises typically employ a number of applications that are key to running the company, including systems for procurement, supply chain management, content management, billing, and call center customer support. These applications often run on legacy systems that require a shared file system, access protocols such as NFSv3, and performance and availability characteristics that are not readily available in the cloud.

Rearchitecting these applications to run in the cloud can be complex and expensive, and cloud latency and availability issues can cause these business-critical applications to run slowly, or not run at all. Examples of these workloads include:

» Shared binaries for SAP landscapes that are often accessed by dozens of servers that require low-latency read access

» Rich media store for custom applications that require low-latency read and write access.

» Shared file systems for logs or telemetry ingestion and sharing, which require low-latency writes for ingestion and high-throughput reads

NetApp Cloud Volumes Service for Google Cloud adds simple cloud-native file services with NFSv3 and NFSv4 protocols, and delivers the performance and availability required to run enterprise applications.

Cloud Volumes Service also delivers advanced security features such as Snapshot copies and simplified management tools to make cloud migrations fast and simple.
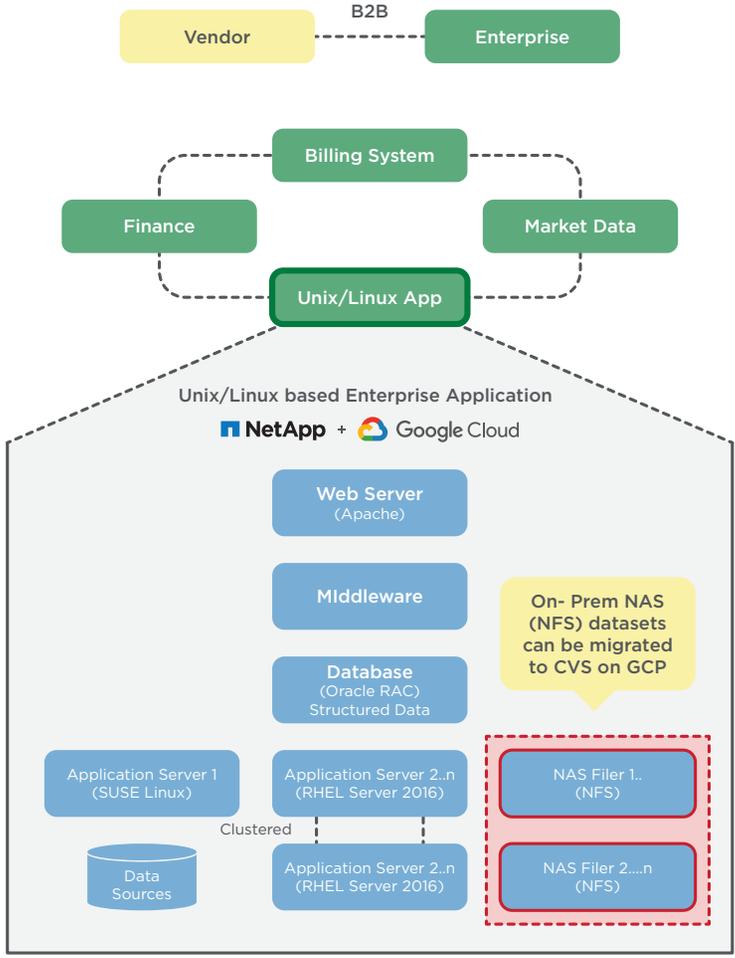

Figure 5. Enterprise application architecture.

Windows Applications

Companies that use Windows-based applications such as personal finance, design, photo and video editing, and 3D modeling often find it difficult to migrate to the cloud. These applications typically use SMB for persistent storage for unstructured data, which is not readily available in public clouds. Significant risk, complexity, and effort are involved in changing (rearchitecting) applications around these requirements in order to deploy them on public clouds. Examples of workloads include:

» SMB file system used by multiple servers hosting custom applications for:
  » Low-performance logs and metadata
  » High-performance ingest and sharing of text-based data, such as real estate property data and trading applications
» Stores for rich media (photos, videos) stored outside of a relational database
» Staging and QA environments (Windows hosts) where the applications being tested use an SMB share to store and retrieve files

NetApp Cloud Volumes Service for Google Cloud provides a cloud-native SMB file service with customer-supplied Active Directory servers. This file service allows businesses to move Windows-based applications that need SMB for persistent storage to Google Cloud.
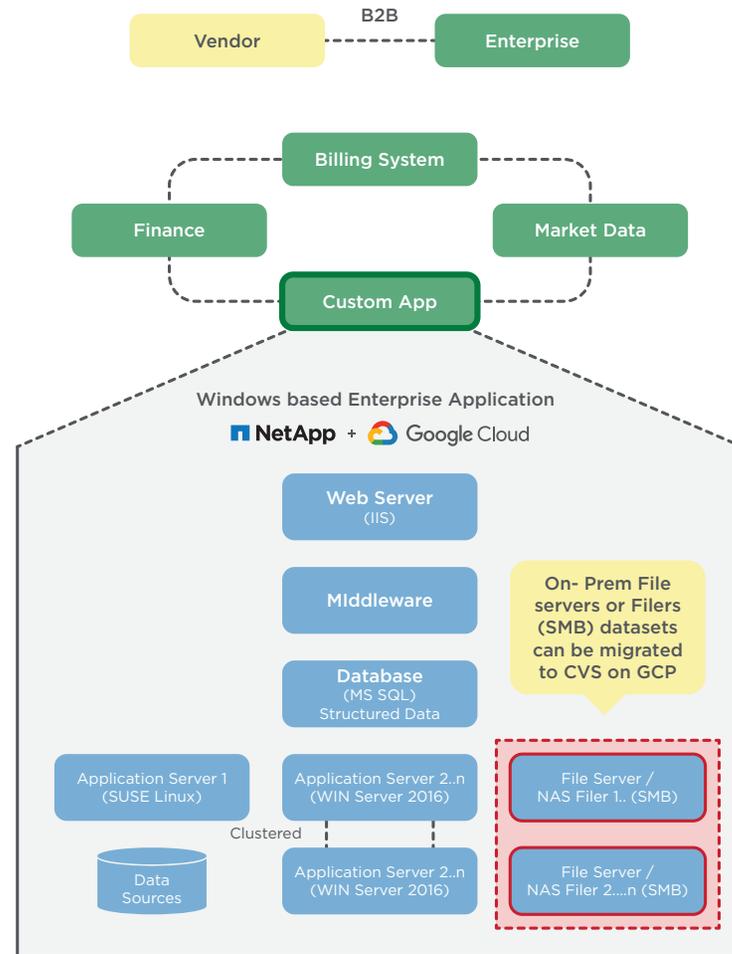

Figure 6. Custom-built apps for Windows-based architecture.

Improved Performance of NFS and SMB with NetApp and Google Cloud

NetApp Cloud Volumes Service for Google Cloud

NetApp® Cloud Volumes Service for Google Cloud is a dynamically scalable and fully managed platform-as-a-service (PaaS) solution for NFS and SMB file services. In addition to providing fast I/O performance and throughput, Cloud Volumes Service for Google Cloud also offers sophisticated data management features, such as NetApp Snapshot™ copies, volume cloning, and data synchronization.

The I/O performance of each cloud volume is determined by its service level configuration setting: Standard, Premium, or Extreme. These settings enable database administrators to create separate storage tiers based on the performance requirements of the data to be stored.

Service Levels	MB Throughput / TB	Workload Types
Standard	16MB	General Purpose, File Shares, Email, Web
Premium	64MB	Databases, Applications
Extreme	128MB	OLTP High Performance Databases

Figure 3. Performance level can be sized to meet workloads.

Cloud Volumes Service helps ensure that your data is durable, encrypted, and highly available.

Cloud Volumes Service lets users deploy new NFS and SMB cloud volumes in seconds, with the ability to immediately scale these volumes up or down in size at any time. Once a cloud volume has been created and contains live data, service levels can be changed instantly. These features make it fast and easy to administer Cloud Volumes Service when supporting a large and growing database environment.

» **Durability.** Your data is protected against multiple drive failures, and also against numerous type of disk errors that could otherwise affect not just your data durability but your data integrity as well.

» **Encryption.** NetApp Cloud Volumes Service storage encryption provides full-disk encryption without compromising storage application performance. This single-source solution can increase compliance with industry and government regulations without compromising your user experience.

» **Availability.** Cloud Volumes Service is built on industry-leading, enterprise-class hardware and software. Each storage node has many paths to its own solid state drives, protecting against path failure, as well as access to a partner storage node's SSDs. Because each storage node has access to its partner's disks, continued productivity in the event of controller failure is ensured. This protects against network failures by redundant network ports and paths all the way up the stack and across the cloud connections.

» **The Undo button.** Snapshot copies are point-in-time representations of your data that act as logical backups. The creation of Snapshot copies can be scheduled, or they can be made manually from the Cloud Volumes Portal. NetApp Cloud Volumes Snapshot copies manipulate block pointers to create a frozen, read-only view of a volume that lets applications access older versions of files and directory hierarchies without special programming. Because the actual data blocks aren't copied, Snapshot copies are extremely efficient, both in the time needed to create them and in storage space. A Cloud Volume Snapshot copy typically takes less than a second to make, regardless of the size of the volume or the level of activity in the environment.

Figure 4. NetApp Snapshot copies reduce performance overhead and minimize data loss.

NetApp Cloud Volumes Service for Google Cloud delivers cloud-native file services that are easy to implement and easy to use:

» **Fully managed service.** Data management is handled entirely by NetApp.

» **Scalability and performance.** Spin up 100TB of high-performance file storage in the cloud in just seconds, and dramatically accelerate many cloud workloads.

» **Multiple protocols.** NetApp Cloud Volumes Service offers support for SMB and NFSv3 file shares. Support for NFSv4.1 is coming soon.

» **Host-client data compatibility.** Works with shared file access across Windows and UNIX and Linux operating systems.

» **Complete integration.** Integrates with file directory metadata and maintains domain credentials, access and authentication, and group memberships, including compatibility with Microsoft Active Directory.

» **Cost savings.** Cloud Volumes Service is priced and structured to reduce costs. With tiered service offerings, customers pay for higher-performing storage tiers only when needed.

» **Data protection.** Prevents data corruption and loss with efficient, automatic NetApp Snapshot copies and disaster recovery.

» **Cloud sync technology.** Makes migration easy by importing data from on-premises and other storage repositories.

» **Business continuity.** High availability ensures business continuity with no data loss (RPO=0) and short recovery times (RTO < 60 seconds).

» **Task automation.** Automation and orchestration capabilities allow users to automate tasks, to meet the most demanding file share requirements.
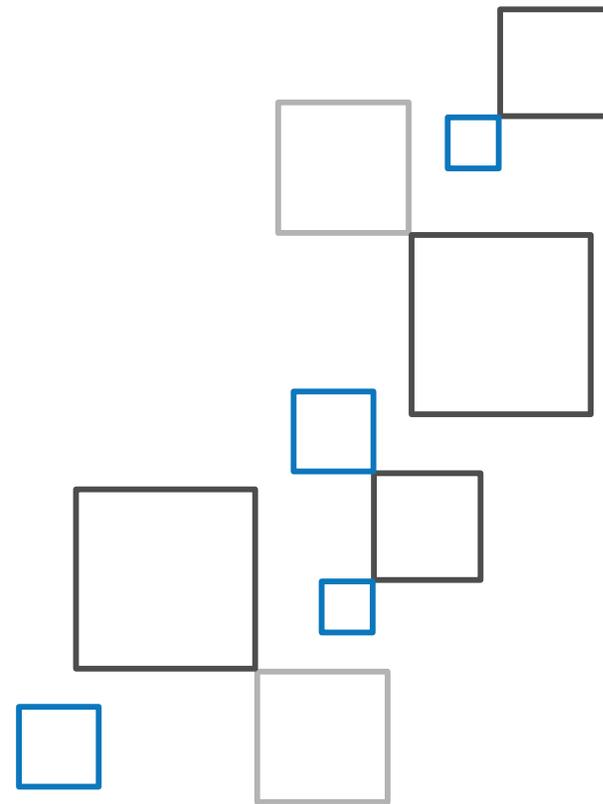
Next Steps

As you continue on your journey to the cloud, consider using NetApp Cloud Volumes Service for Google Cloud as a fully managed, cloud-native file storage service that accelerates migration and simplifies management of NFS and SMB file shares in the cloud.

Simplify your cloud migration, ensure file security, and lower costs with service levels that can be changed on demand, and volumes that can be provisioned from 0 to 100TB in just seconds.

Learn More →
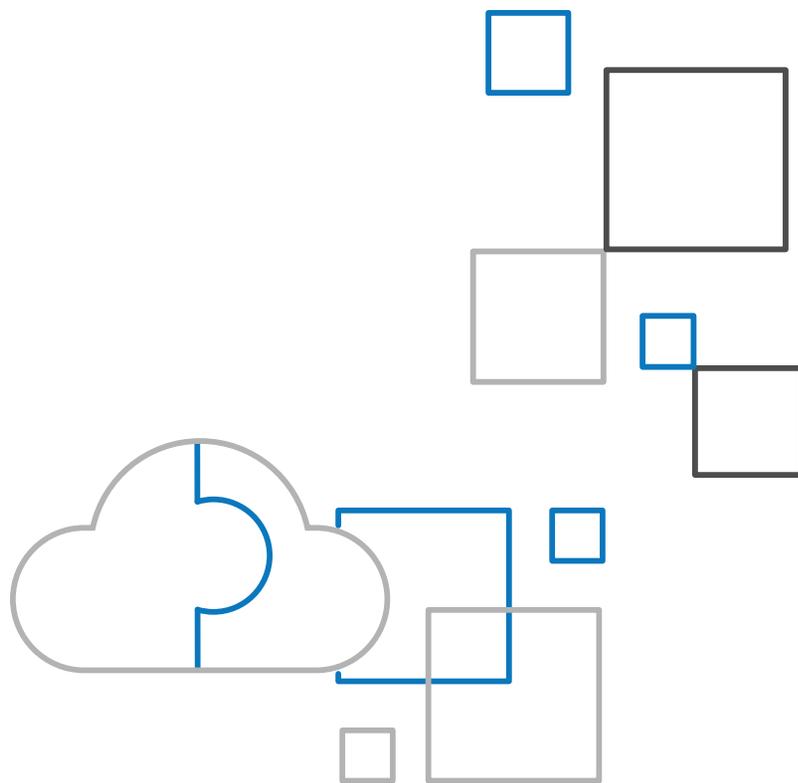
1. IDC 5 year Worldwide File-Based Storage Capacity Forecast, 2018-2022.
2. September 2018 IDC Report: "IDC WW Data Services for Hybrid Cloud Key Players.", Includes a survey of approximately 500 C-level and data executives.
3. NetApp blog: Benefits of Native Cloud File Services for File Shares.

About NetApp

NetApp is the data authority for hybrid cloud. We provide a full range of hybrid cloud data services that simplify management of applications and data across cloud and on-premises environments to accelerate digital transformation. Together with our partners, we empower global organizations to unleash the full potential of their data to expand customer touchpoints, foster greater innovation, and optimize their operations. For more information, visit www.netapp.com. #DataDriven