

# Unleash the Power of Microsoft Azure Intelligent Cloud

with Azure NetApp Files and Cloud Volumes ONTAP

Geert van Teylingen ([aka.ms/akatom](https://aka.ms/akatom))  
ICB EMEA GBB TSP Azure NetApp Files





## Introduction: Digital Disruption

## Microsoft & NetApp: Next Level Partnership

*"This partnership is a significant step toward further enabling hybrid cloud data services for our mutual customers"*

Tad Brockway, CVP, Microsoft Azure Storage

## Connecting Universes

NetApp's Data Fabric Strategy Enables Enterprises to Protect and Manage Data Anywhere by Connecting Cloud and Edge Universes...

## Why Azure NetApp Files

Context – Files in the Cloud

## Azure NetApp Files

(Not So) Deep Dive

## Move Today To Achieve More Tomorrow



# Introduction: Digital Disruption

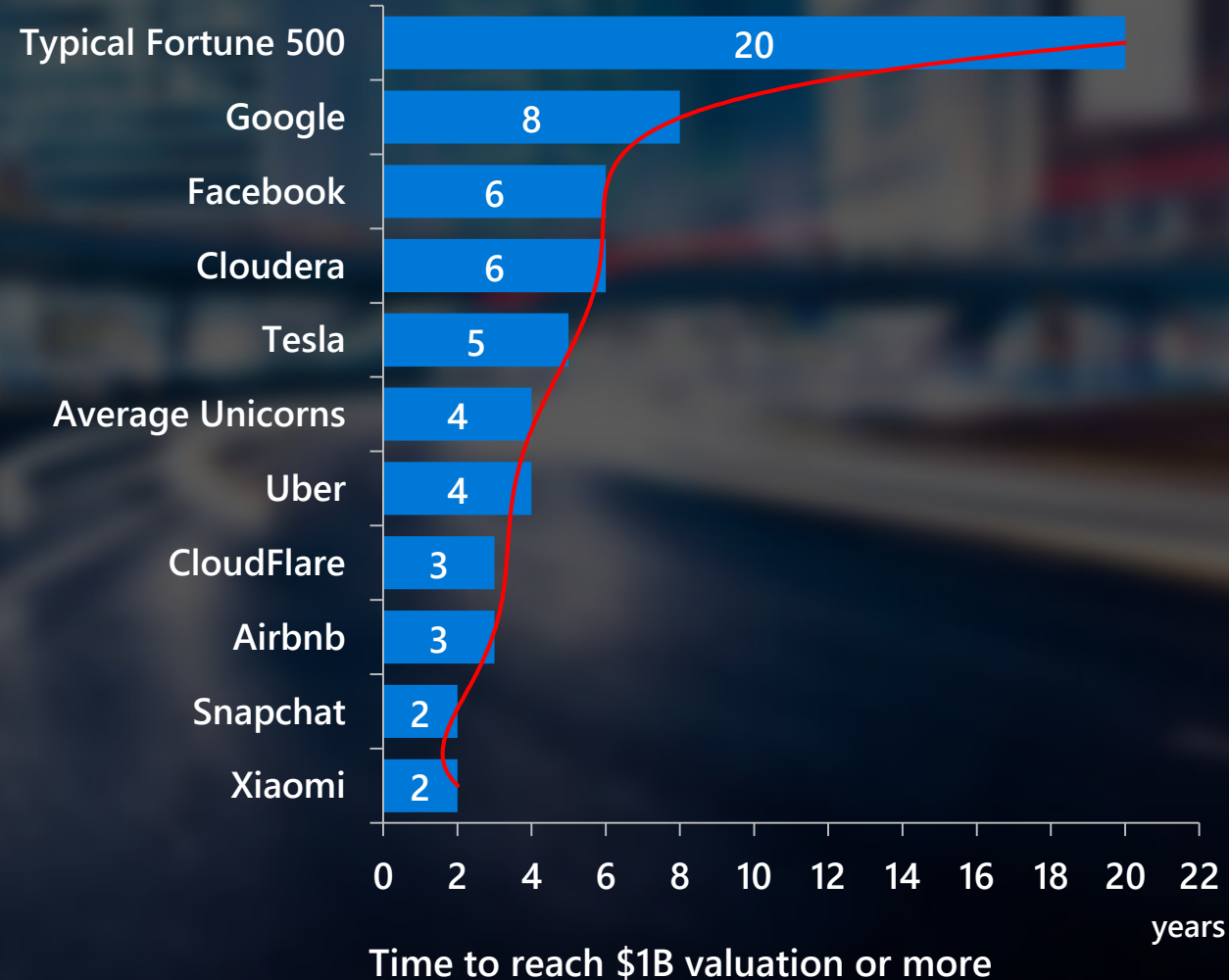
# Digital Disruption and the 4th Industrial Revolution



# The scale and pace of change

An astonishing pace of change is accelerating transformation. Technology is more affordable and accessible than ever before.

	Drones	2007	\$100,000
		2013	\$700
	3D Printing	2007	\$40,000
		2014	\$100
	Industrial Robots	2007	\$550,000
		2014	\$20,000
	DNA	2000	\$2.7bn
		2007	\$10m
		2014	\$1,000
	Solar	1984	\$30
		2014	\$0.16
	Sensor (3D)	2009	\$30,000
		2014	\$80
	Smartphones	2007	\$499
		2015	\$10



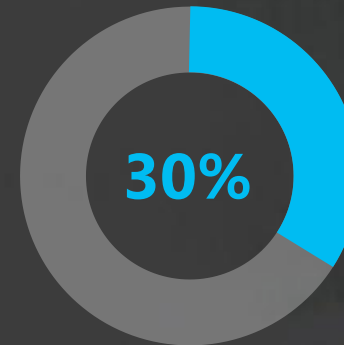
# Leading the digital transformation charge

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You have an unprecedented opportunity to lead digital transformation for your organization, or your customers.

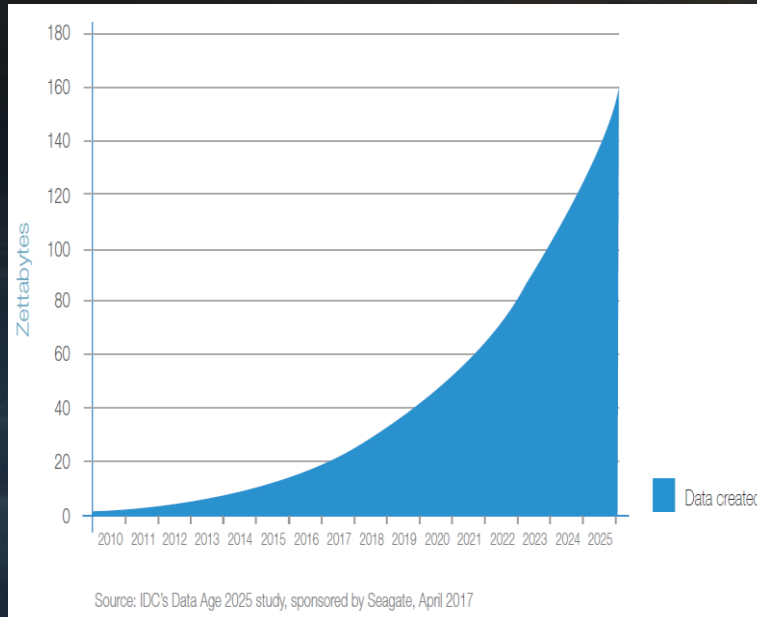


Digital companies generate more in operating income each year



By 2017-18, more than 30% of businesses have begun monetizing their information assets

# Driving forces behind digital transformation



## DATA

**163 zettabytes** annually by 2025



## ANALYTICS

**\$200 billion** global market by 2020

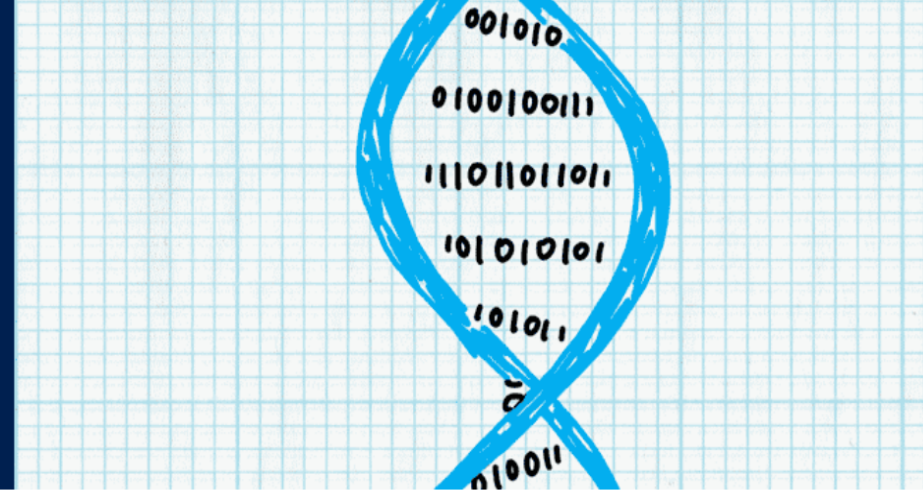


## CLOUD

Cloud shift will affect more than **\$1 trillion** in IT spending by 2020

# DNA Storage

Established: January 1, 2015



[Overview](#) [People](#) [Publications](#) [In the news](#)

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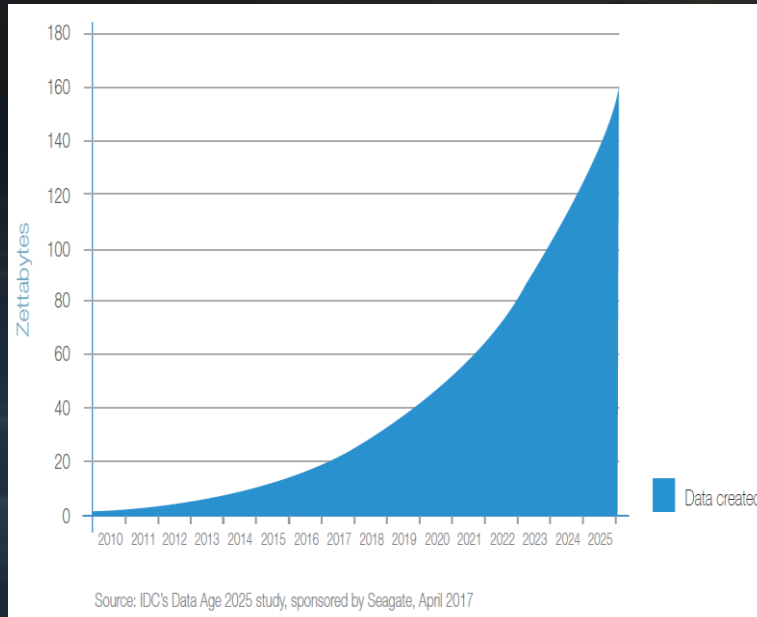
The amount of digital data produced has long been outpacing the amount of storage available. This project enables molecular-level data storage into DNA molecules by leveraging biotechnology advances in synthesizing, manipulating and sequencing DNA to develop archival storage. Microsoft and University of Washington researchers are [collaborating](#) to use DNA as a high density, durable and easy-to-manipulate storage medium.

Demand for data storage is growing exponentially, but the capacity of existing storage media is not keeping up. Most of the world's data today is stored on magnetic and optical media. Despite improvements in optical discs, storing a zettabyte of data would still take many millions of units, and use significant physical space. If we are to preserve the world's data, we need to seek significant advances in storage density and durability. Using DNA to archive data is an attractive possibility because it is extremely dense ([up to about 1 exabyte per cubic millimeter](#)) and durable (half-life of over 500 years).

While this is not practical yet due to the current state of DNA synthesis and sequencing, these technologies are improving quite rapidly with advances in the biotech industry. Given the impending limits of silicon technology (end of Moore's Law), we believe hybrid silicon and biochemical systems are worth serious consideration. Biotechnology has benefitted tremendously from progress in silicon technology developed by the computer industry; now is the time for computer architects to consider incorporating biomolecules as an integral part of computer design.



# Driving forces behind digital transformation



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## CLOUD

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# Helping workers gain insight into GE-made machines

## Objectives

- Build monitoring systems that are constantly updated
- Removing coding commands and man power from machine insights

## Technology

- Cortana Intelligence Suite
- HDInsight
- Azure Machine Learning

## Benefit

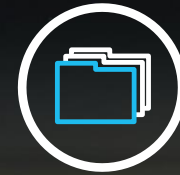
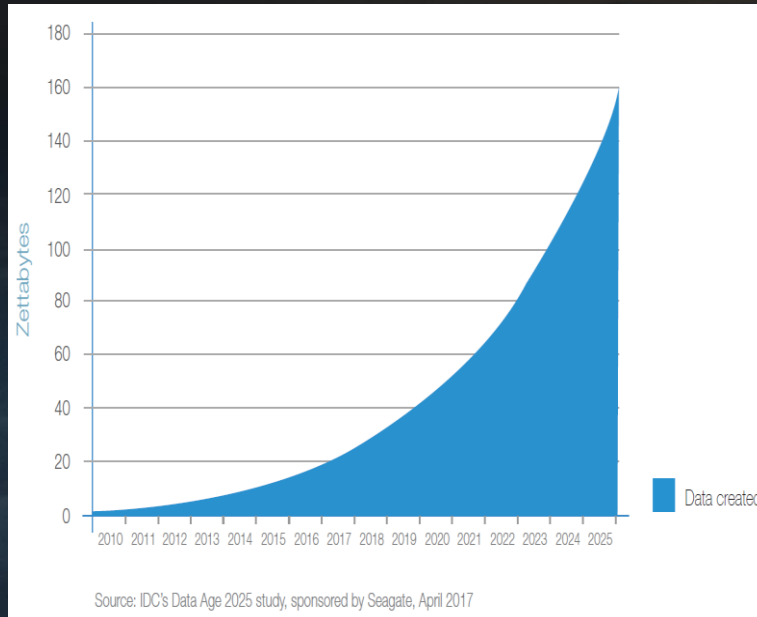
- Workers now have information about parts in need of servicing and other critical information to keep business ops flowing



“GE is helping its customers extract value from the vast quantities of data coming out of machines and is building an ecosystem of industry-leading partners like Microsoft, allowing us to thrive on a global scale.” Jeff Immelt, CEO of GE

[Reference](#)

# Driving forces behind digital transformation



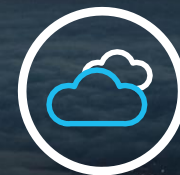
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## CLOUD

Cloud shift will affect more than **\$1 trillion** in IT spending by 2020

Monitoring Location-based Authentication

Serverless Event driven Compute Orchestrators

Machine Learning Compliance Mixed Reality

Haptics Containers Edge GPU

NoSQL Automation DevOps

Quorum

Quantum computing Microservices Log telemetry

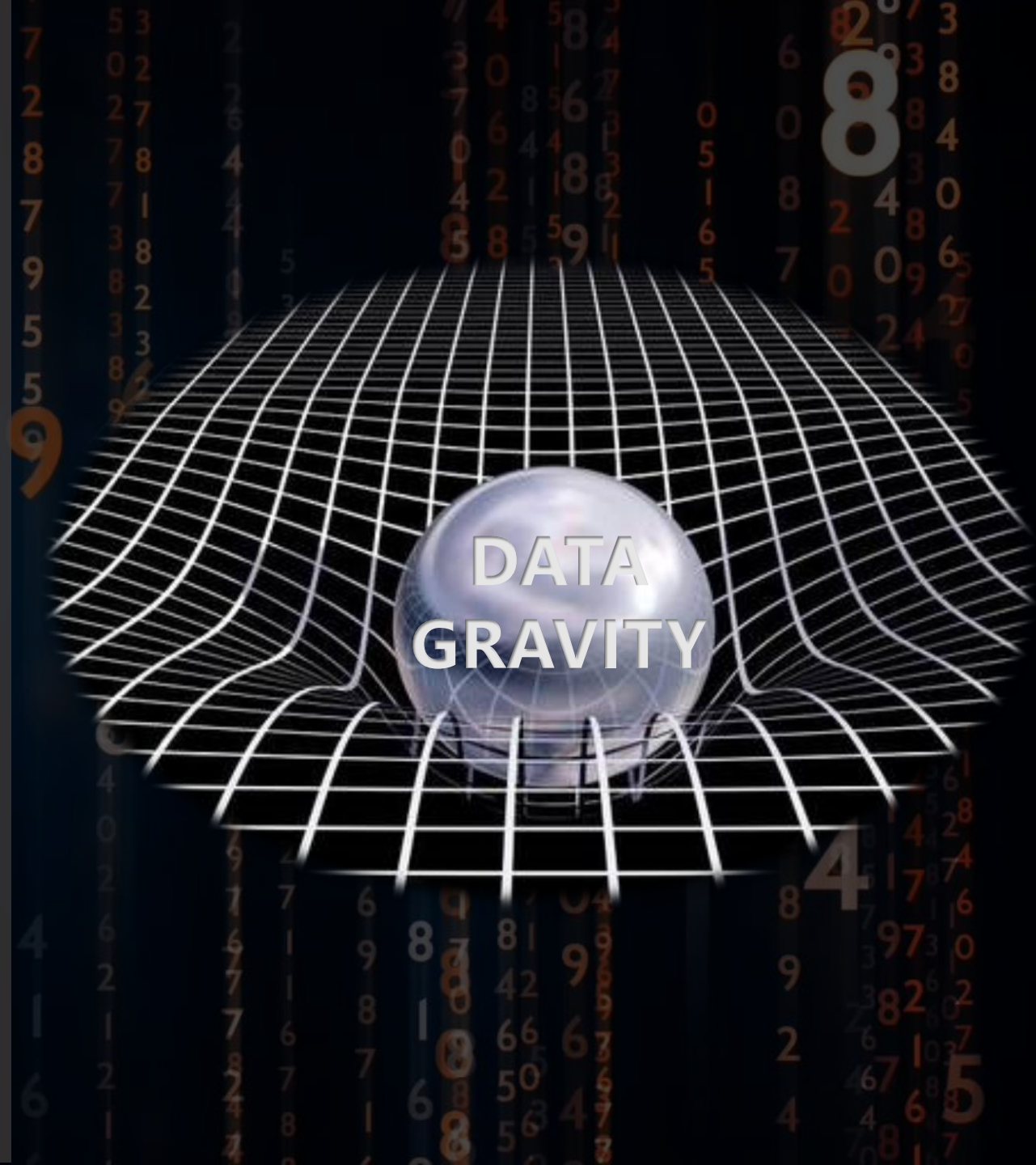
Data privacy IoT Digital Twin Blockchain

Hybrid cloud Beacons Big data Bots

Artificial Intelligence Threat Intelligence

Ambient UX

OUR JOURNEY IS  
POWERED BY  
**DATA**



# Microsoft & NetApp: Next Level Partnership

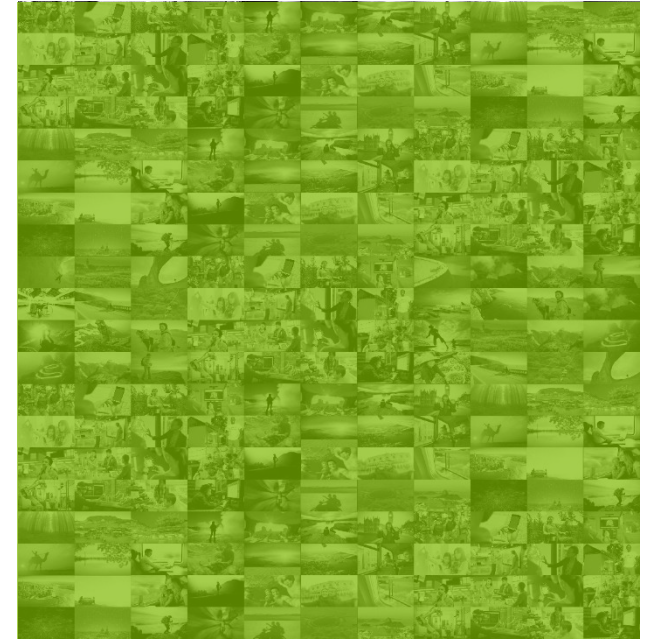
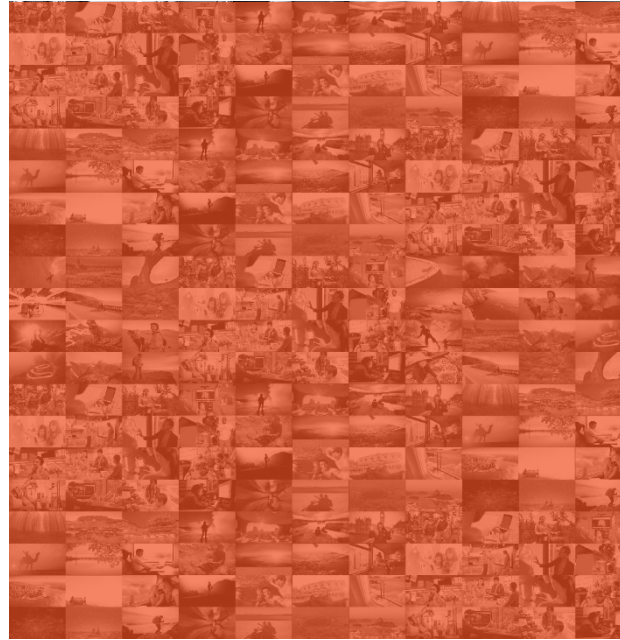
*"This partnership is a significant step toward further enabling hybrid cloud data services for our mutual customers"*

Tad Brockway, CVP, Microsoft Azure Storage



# Microsoft mission

*Empower every person and every organization on the planet to achieve more*

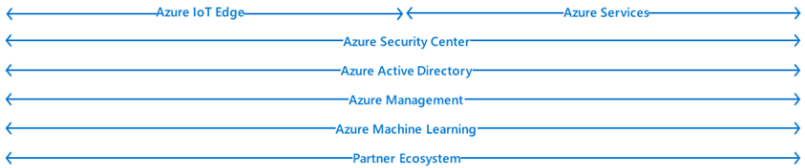
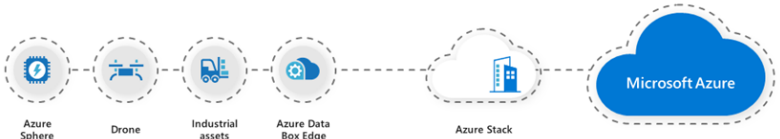


# NetApp<sup>®</sup> mission

*Enabling customers to change the world with data*



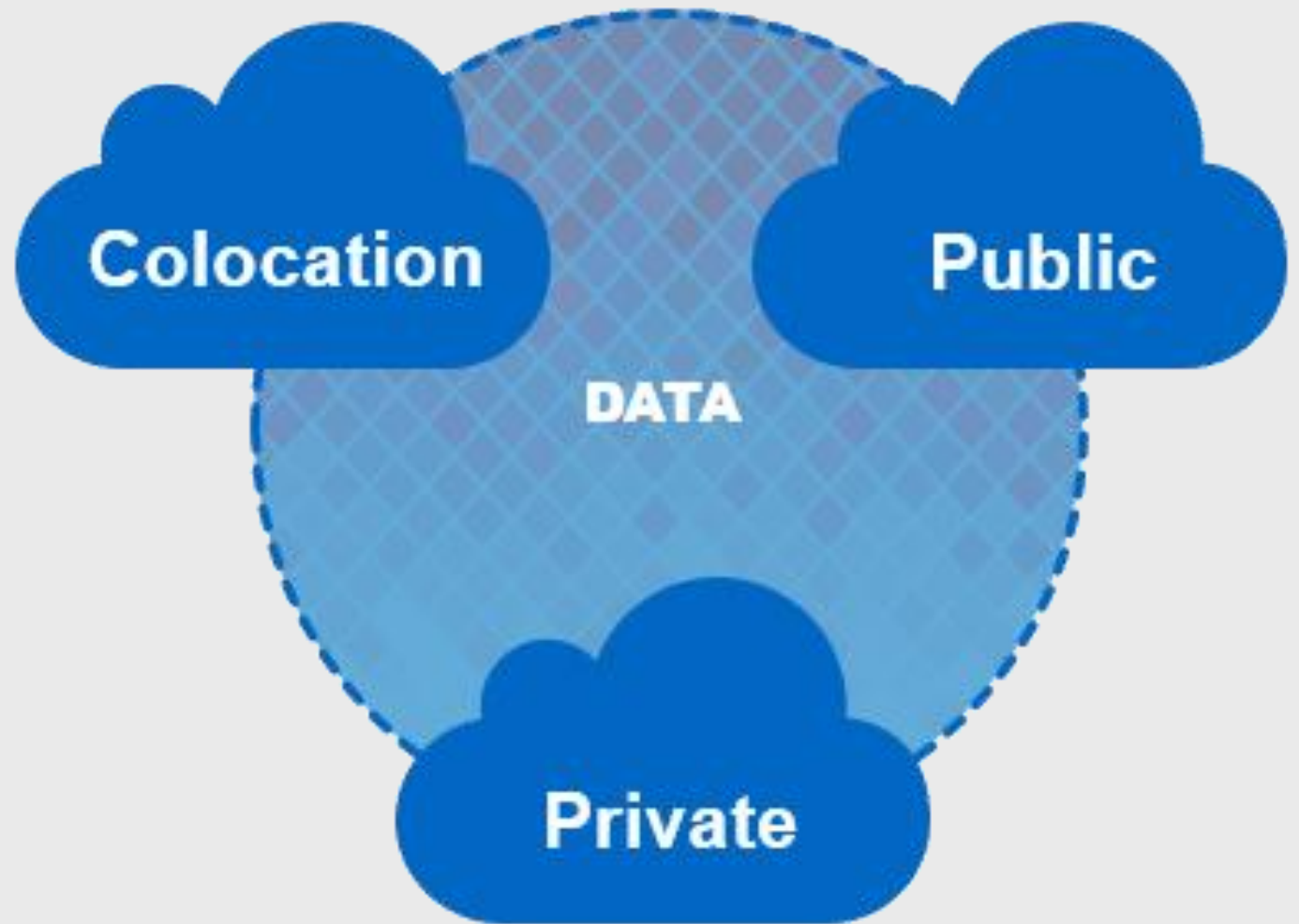
# Microsoft Strategy





# NetApp Strategy

WHEREVER YOU INNOVATE  
YOUR DATA IS READY.  
WELCOME TO DATA FABRIC



## Security & Management

- Security Center
- Portal
- Azure Active Directory
- Azure AD B2C
- Multi-Factor Authentication
- Automation
- Scheduler
- Key Vault
- Store/Marketplace
- VM Image Gallery & VM Depot

## Media & CDN

- Media Services
- Media Analytics
- Content Delivery Network

## Integration

- API Management
- BizTalk Services
- Logic Apps
- Service Bus

## Compute Services

- Container Service
- VM Scale Sets
- Batch
- RemoteApp
- Dev/Test Lab

## Platform Services

### Application Platform

- Web Apps
- Mobile Apps
- API Apps
- Cloud Services
- Service Fabric
- Notification Hubs
- Functions

### Developer Services

- Visual Studio
- Mobile Engagement
- VS Team Services
- Xamarin
- Application Insights
- HockeyApp

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- Azure Search

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- Bot Framework
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- Data Lake Store
- IoT Hub
- Event Hubs
- Data Factory
- Power BI Embedded

## Hybrid Cloud

- Azure AD Health Monitoring
- AD Privileged Identity Management
- Domain Services
- Backup
- Operational Analytics
- Import/Export
- Azure Site Recovery
- StorSimple

## Infrastructure Services

### Compute

- Virtual Machines
- Containers

### Storage

- Blob
- Queues
- Files
- Disks

### Networking

- Virtual Network
- Load Balancer
- DNS
- Express Route
- Traffic Manager
- VPN Gateway
- App Gateway

## Datacenter Infrastructure



54 regions worldwide 140 available in 140 countries

# Azure Regions







MICROSOFT TECH

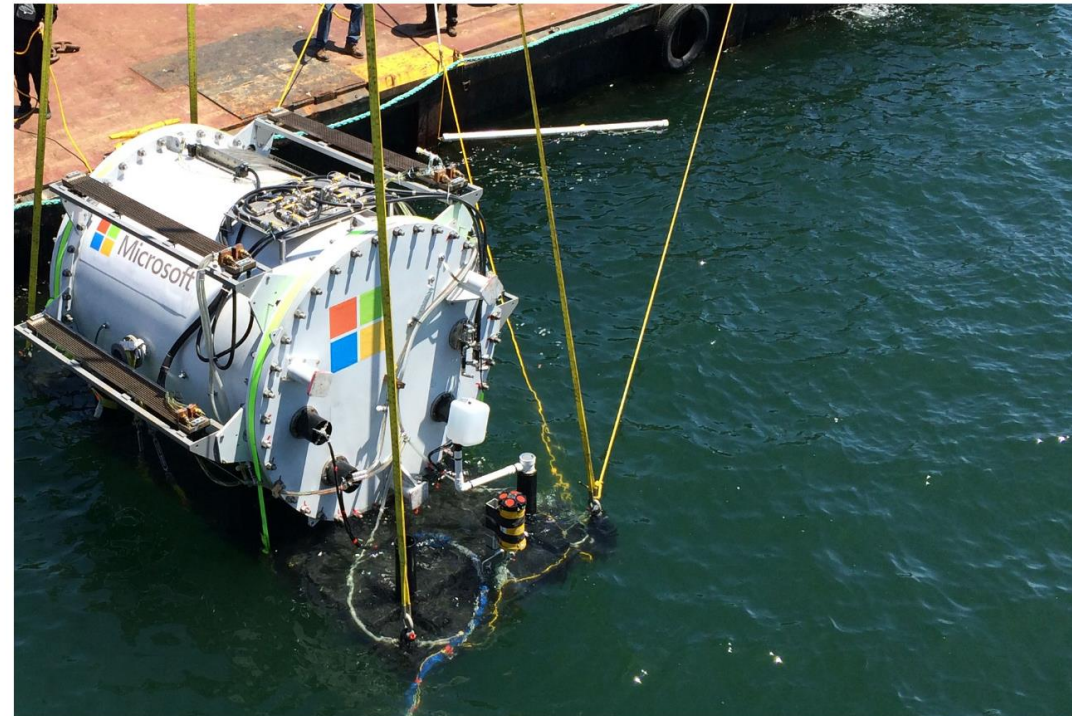
# Microsoft is experimenting with underwater data centers

53

*Is data better down where it's wetter?*

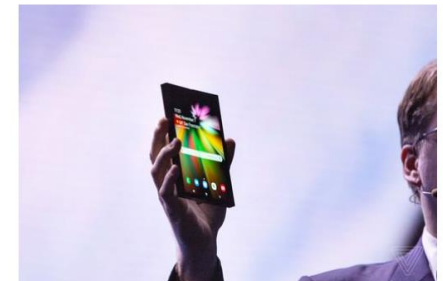
By James Vincent | @jvincent | Feb 1, 2016, 7:28am EST

f 🐦 ↗ SHARE



Microsoft / Project Natick

## MOST READ



Samsung's Galaxy F foldable won't be cheap



# The most trusted and compliant cloud



Trust

GLOBAL



ISO 27001



ISO 27018



ISO 27017



ISO 22301



SOC 1  
Type 2



SOC 2  
Type 2



SOC 3



CSA STAR  
Self-Assessment



CSA STAR  
Certification



CSA STAR  
Attestation

US GOV



Moderate  
JAB P-ATO



High  
JAB P-ATO



DoD DISA  
SRG Level 2



DoD DISA  
SRG Level 4



SP 800-171



FIPS 140-2



Section  
508 VPAT



ITAR



CJIS



IRS 1075

INDUSTRY



PCI DSS  
Level 1



CDSA



MPAA



FACT  
UK



Shared  
Assessments



FISC  
Japan



HIPAA /  
HITECH Act



HITRUST



GxP  
21 CFR Part 11



MARS-E



IG Toolkit  
UK



FERPA



GLBA



FFIEC

REGIONAL



Argentina  
PDPA



EU  
Model Clauses



UK  
G-Cloud



China  
DJCP



China  
GB 18030



China  
TRUCS



Singapore  
MTCS



Australia  
IRAP/CCSL



New  
Zealand  
GCIO



Japan  
My  
Number  
Act



ENISA  
IAF



Japan CS  
Mark Gold



Spain  
ENS



Spain  
DPA



India  
MeitY



Canada  
Privacy  
Laws



Privacy  
Shield



Germany IT  
Grundschutz  
workbook

# Connecting Universes

NetApp's Data Fabric Strategy Enables Enterprises to Protect and Manage Data Anywhere by Connecting Cloud and Edge *Universes*...



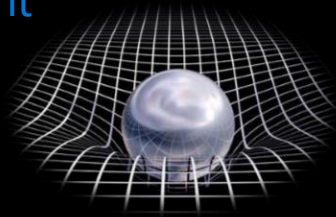


# Intelligent Cloud

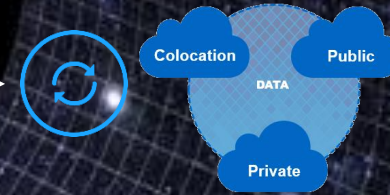
## Business Amplification

Scale, On-demand, IaaS & PaaS,  
AI/ML/Cognitive  
Most Secure and Trusted

The  
Data Gravity &  
Management  
Challenge



Cloud Volumes ONTAP  
(Entry- to mid-range  
marketplace offering)



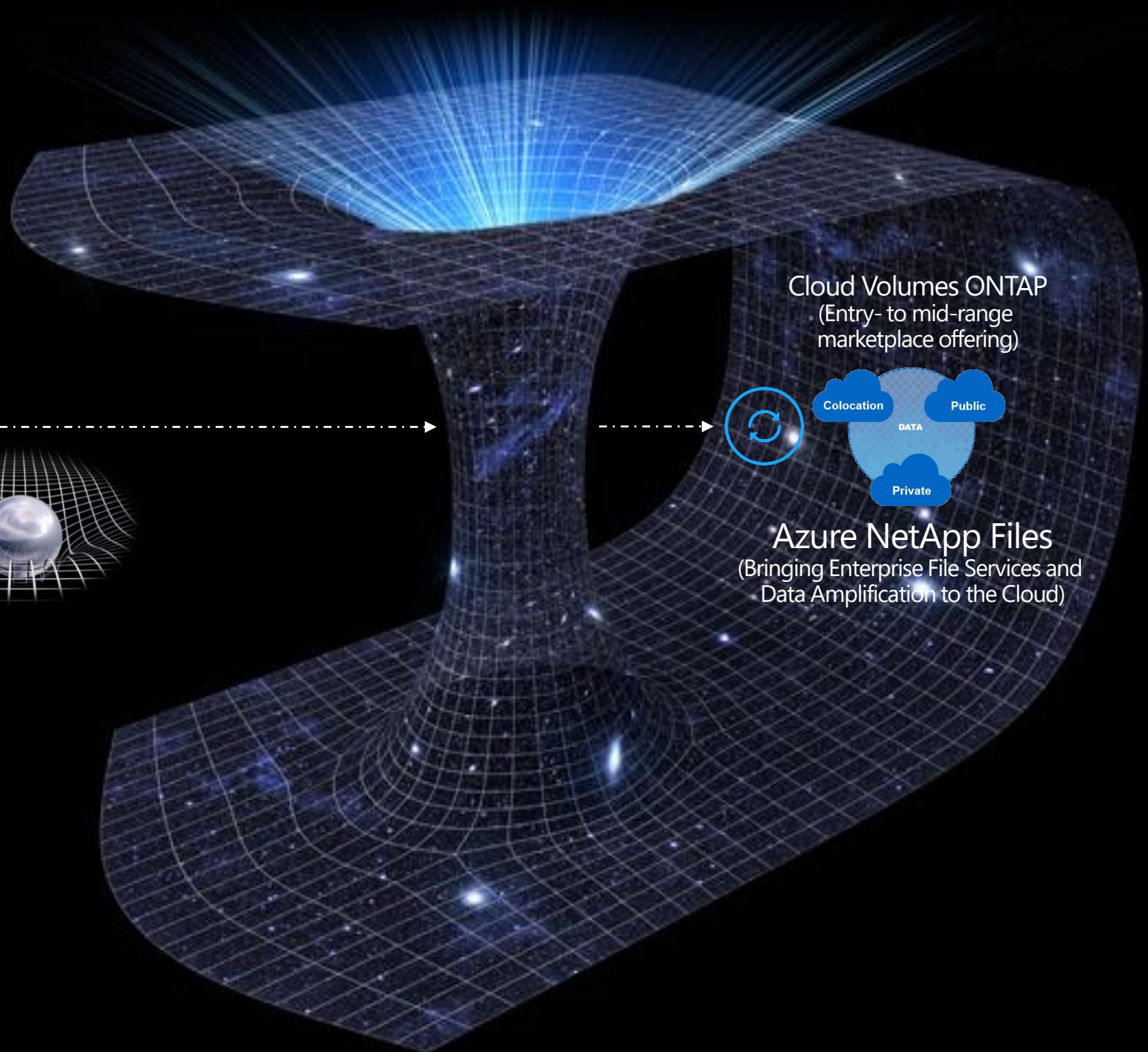
Azure NetApp Files  
(Bringing Enterprise File Services and  
Data Amplification to the Cloud)

## Data Amplification

Snapshots, Cloning, App Integration

Data, NAS/SAN Driven

'Edge'  
on-premises

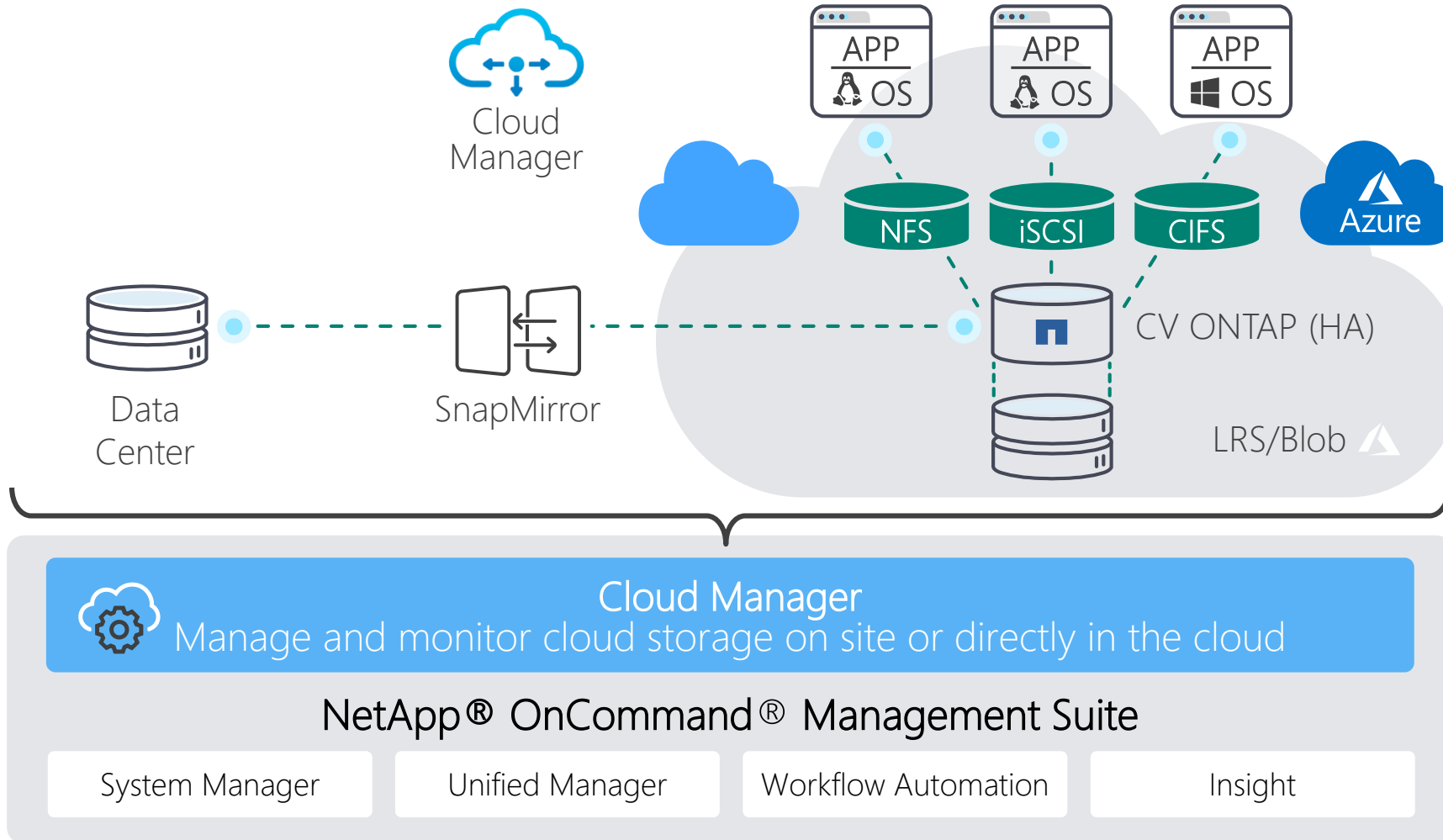


# Azure Marketplace: Cloud Volumes ONTAP

- A fully fledged version of ONTAP running natively in the public cloud
- Consumes native cloud storage
- Utilizes same ONTAP tools and processes
- Mature, proven yet innovative technology
- Implemented successfully with thousands of customers



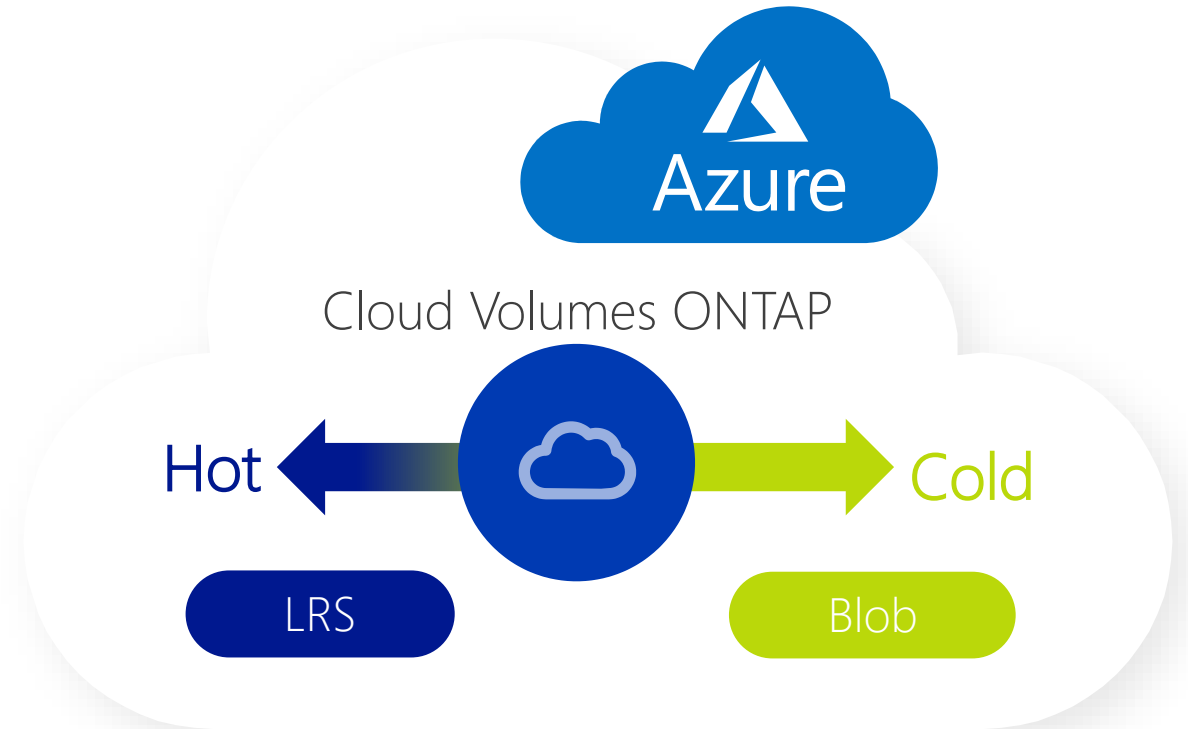
# Enterprise data management in the cloud



- Migrate workloads seamlessly
- Unified management across environments
- Cost-effective **data protection**
- DR and BU to the cloud
- DevOps in the cloud
- Cost-saving cloud storage

# Data Tiering to Object Storage

- Performance tier for “hot” data
    - Azure LRS
  - Capacity tier for “cold” data
    - Azure Blob
  - Reduces LRS footprint
  - Dramatic cost savings
- ✓ As low as 3¢ per GB per month



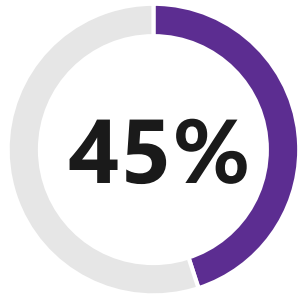
# Why Azure NetApp Files

Context – Files in the Cloud

# Context – Files in the Cloud...



Enterprise workloads continue to be On-Premises<sup>1</sup>



Enterprise workloads on external storage systems are File based<sup>2</sup>



Total File storage by 2020 @ 24% CAGR<sup>2</sup>

<sup>1</sup> [Survey Uptime Institute](#)

<sup>2</sup> IDC Worldwide Storage Workloads

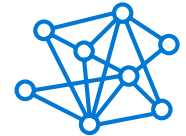
Enterprises are searching for a way to deploy file workloads in the cloud without sacrificing:



Performance

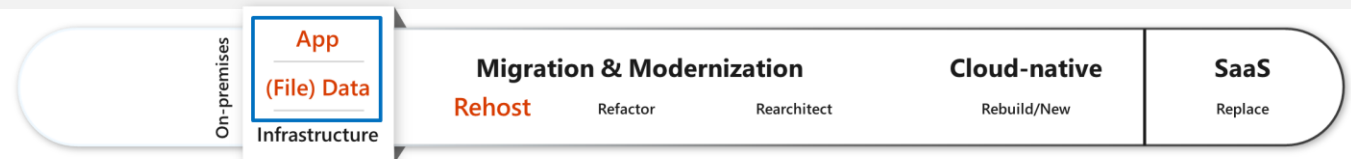


Reliability



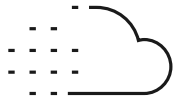
Enterprise Data Management

**No one wants to re-factor !**



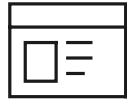
# Scenarios & Workloads

## Current



### Migrate to Azure

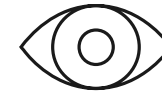
“Lift & Shift” POSIX-compliant  
enterprise file workloads



### Build new apps

Simple, Scalable, Fast apps using  
high performant shared storage

## Future



### Extract insights

Leverage Azure services  
HDInsight, Containers, Machine Learning

## Workloads

Enterprise file apps  
File-shares (incl SAP)  
HPC

DevOps  
Web apps  
Databases

## Industries

Retail  
Electronic Design Automation  
Oil & Gas



Open Source, Windows or Mixed Environment



## Security & Management

- Security Center
- Portal
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## Datacenter Infrastructure





# Azure NetApp Files

(Not So) Deep Dive

# Azure NetApp Files – Value



**Azure NetApp Files**



## Managed

Native Azure integration (Portal/REST/CLI, Billing, Monitoring, Security)



## Powerful

Complete protocol support

HA, Data Protection, Data Management (instantaneous Snapshot and Restore), Performance



## Trusted

FIPS 140-2 compliant Data at Rest Encryption, RBAC



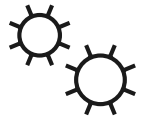
## Hybrid

Data migration and replication capabilities

# Azure NetApp Files – Capabilities



Azure NetApp Files



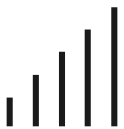
## Compatible

Industry-leading “lift and shift” multi-protocol support



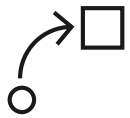
## Simple to configure

Provision at-will storage with a few clicks and a few minutes



## Powerful and highly performant

Deep integration with the Azure infrastructure and multiple performance tiers



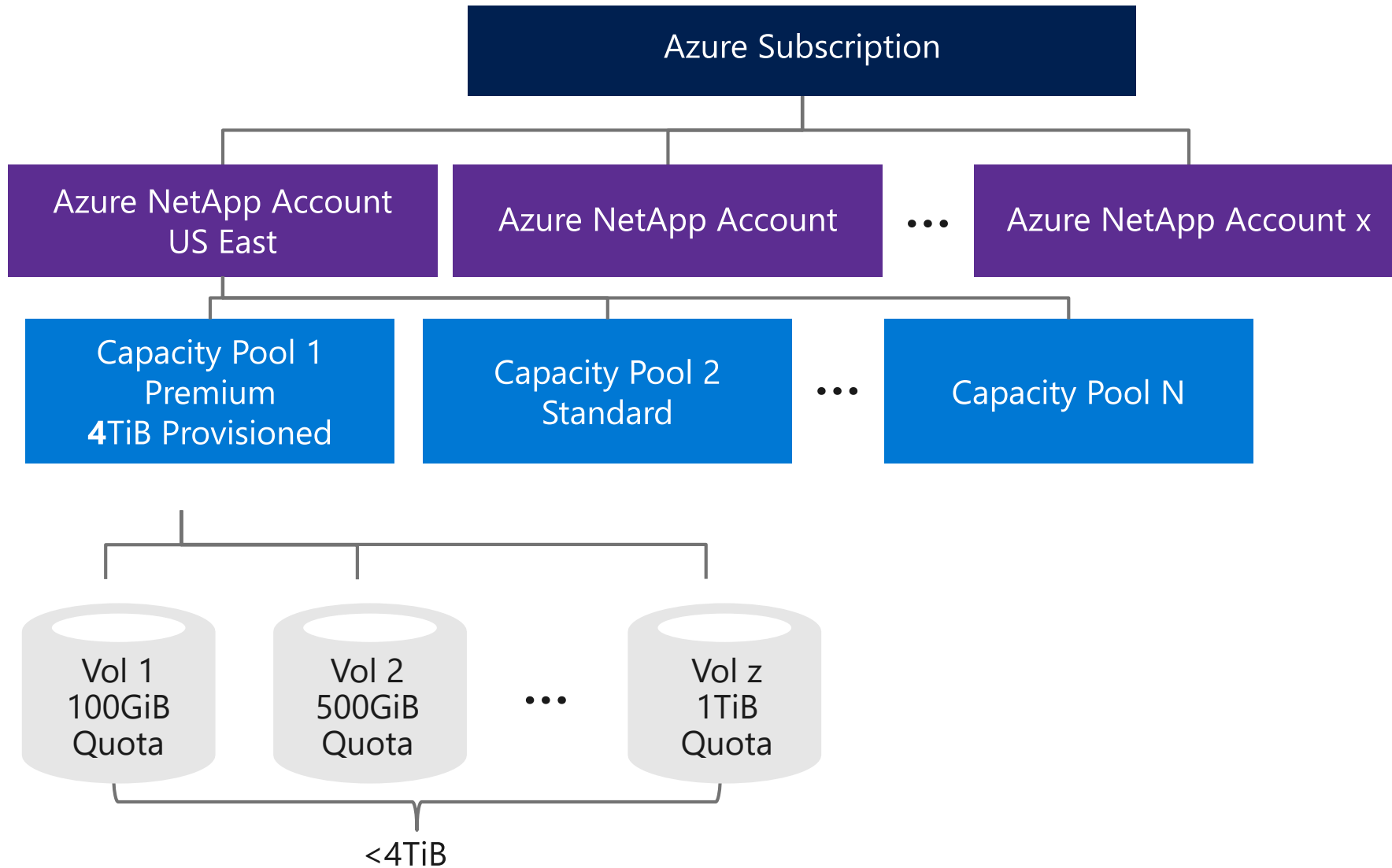
## Integrated data management capabilities

No need for additional solutions to manage snapshots & restore

# Storage Hierarchy



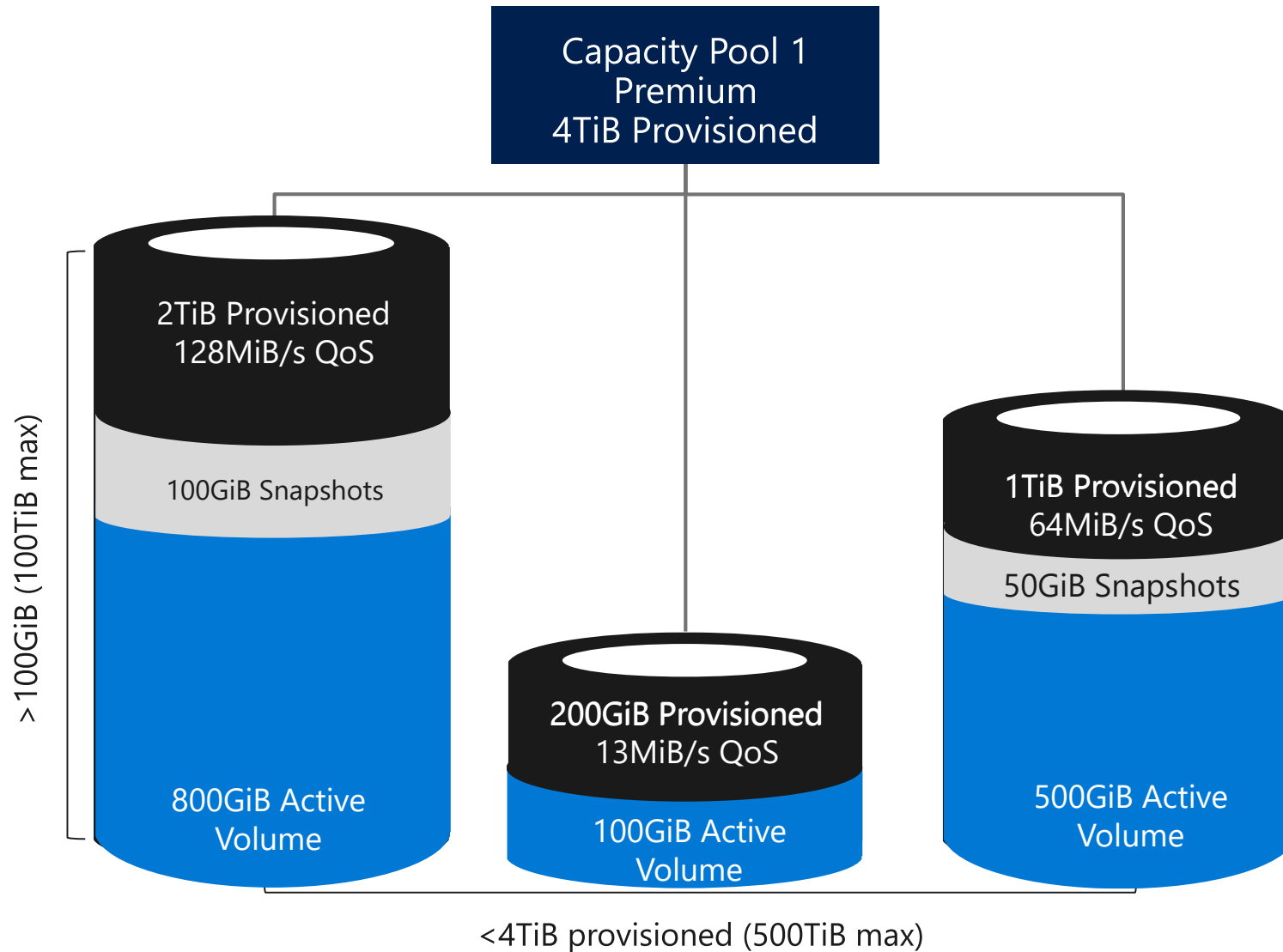
Azure NetApp Files



# Example



## Azure NetApp Files



### 1. Provision Capacity Pool

- Provision Pool (4TiB, premium)
- Billed hourly by provisioned amount

### 2. Create Volumes

- Assign quota (3.2TiB)
- Decrements from pool capacity (0.8TiB remaining)
- QoS per volume assigned based on quota

### 3. Consume Capacity

- Active filesystem at logical (800GiB)
- Snapshots at incremental (100GiB)
- Actual consumption = 1.51TiB

# Service Levels and Performance



## Ultra **Azure NetApp Files**

### Standard

### Premium

#### Performance

Good

- Up to 1,000 IOPS/TiB Quota (16K)
- Up to 16MiB/s per TiB Quota

Better (SSD-class)

- Up to 4,000 IOPS/TiB Quota (16K)
- Up to 64MiB/s per TiB Quota

Best (High Performance Flash)

- Up to 8,000 IOPS/TiB Quota (16K)
- Up to 128MB/s per TiB Quota

#### Workload Types

- Static Web Content
- File Shares
- Database Backups

- Databases
- Enterprise Applications
- Analytics
- Message Queues

- Performance/ Throughput Intensive Applications
- HPC

Performance SLA indexed against Volume quota

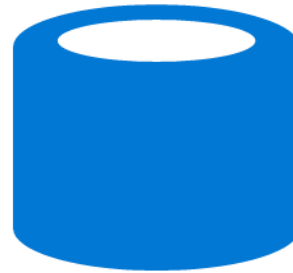
# Performance Sizing

Configurable by 2 factors:

Service Level	Throughput
Ultra	128MiB/s per 1TiB quota
Premium	64MiB/s per 1TiB quota
Standard	16MiB/s per 1TiB quota

Service Level

X



Volume Quota

=



Performance



Azure NetApp Files

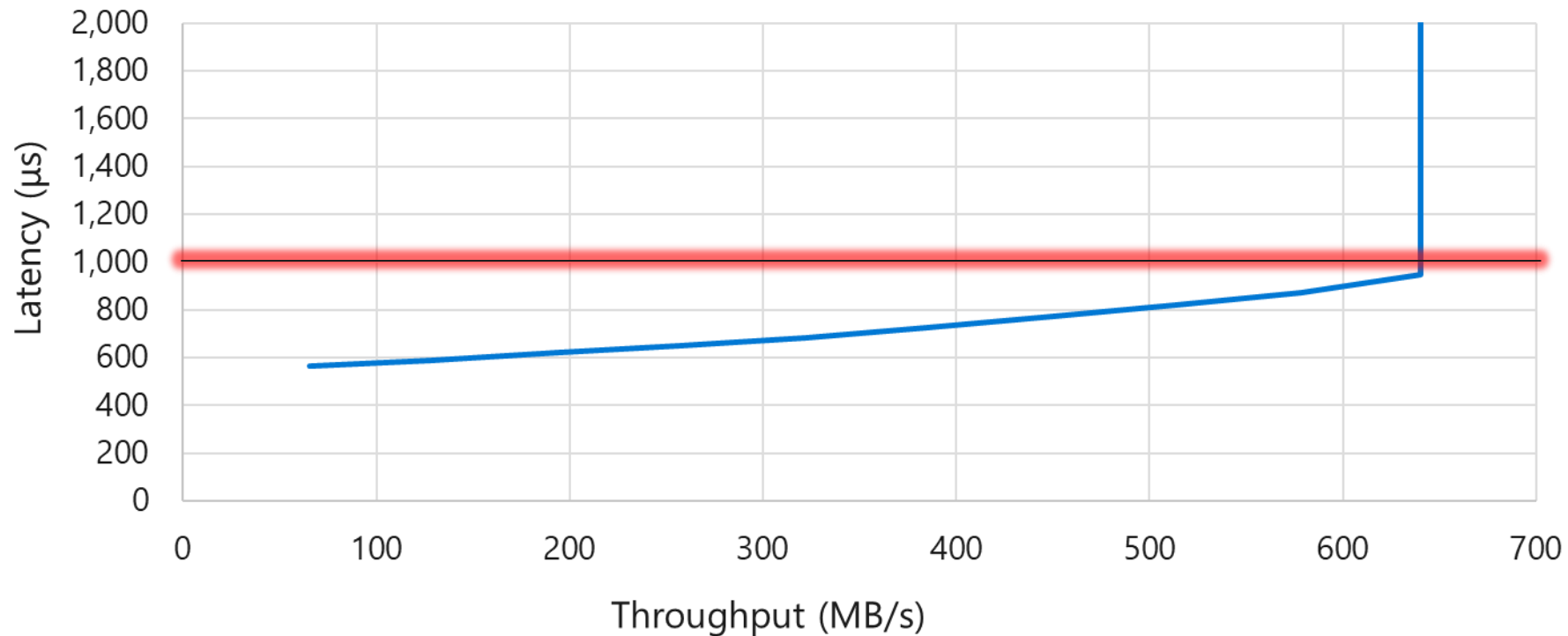
# Performance (Vdbench) - Throughput



Azure NetApp Files

100% Sequential Read - 32k

Throughput vs Latency



— Azure NetApp Files 10TB volume



# Performance (Vdbench) - IOPS



Azure NetApp Files

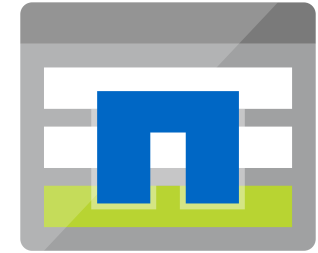
100% Sequential Read - 32k

IOPS vs Latency



— Azure NetApp Files 10TB Volume

# Performance Benchmarks



## Azure NetApp Files

https://cloud.netapp.com/blog/azure-netapp-files-performance-so-good-youll-think-youre-on-premises

NetApp netapp.com Cloud Story API

Cloud Central Products Use Cases Clouds Partners Resources Blog

### Blog

## Azure NetApp Files – Performance So Good You’ll Think You’re On Premises

Feb 14, 2019 11:43:17 AM

Posted by Chad Morgenstern, Senior Cloud Solutions Architect, NetApp Cloud Data Services | Topics: Cloud Volumes Service, Azure NetApp Files

Enterprises are moving to the cloud (or rather, they’re continuing to move), and Azure is hungry to have them. Some companies are being selective in their migration, moving only applications that meet specific criteria—such as those without legal restrictions—while others have an all-in mandate. The task of transforming from custom-built data centers to general-purpose cloud is not easy, especially for applications not born in the cloud. From the retail firm with its enterprise-class databases demanding gigabytes of bandwidth, to the financials firm running I/O-hungry Monte Carlo simulations requiring a single namespace, to the genomics firm running highly demanding scale-out HPC workloads, demands are high—but is the cloud ready? Microsoft Azure certainly is, thanks in big part to Azure NetApp Files!

https://cloud.netapp.com/cloud-volumes-service/azure-benchmarks

NetApp netapp.com Cloud Story API

Cloud Central Products Use Cases Clouds Partners Resources Blog

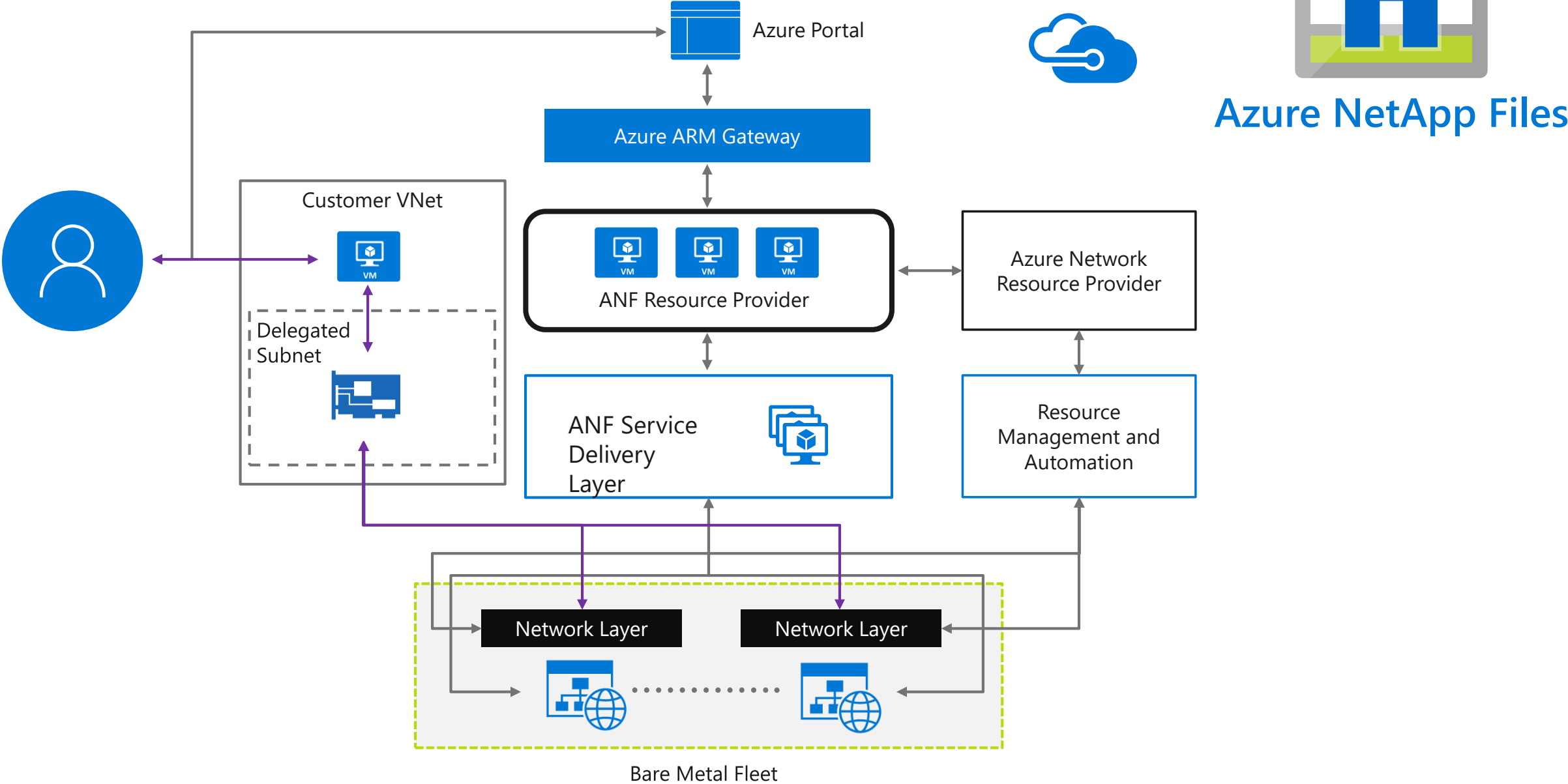
## Azure NetApp Files: Benchmarks

Putting Azure NetApp Files to the test. These benchmarks show the performance that Azure NetApp Files delivers

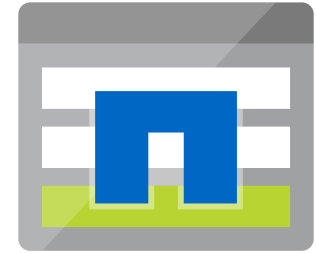
Linux | Oracle

### Linux

# Architecture



# Live Demo



## Azure NetApp Files

The screenshot shows the Microsoft Azure portal interface. At the top, there's a search bar with the text 'azure netapp files'. Below the search bar, a dropdown menu displays search results categorized into Services, Marketplace, Resources, Documentation, and Resource Groups. The 'Resources' section shows 'No results were found.' The 'Documentation' section lists several links related to Azure NetApp Files. Below the search results, there's a 'Recent resources' table and a 'Useful links' section. The 'Recent resources' table has columns for NAME, TYPE, and LAST VIEWED. The 'Useful links' section includes links for Technical Documentation, Azure Services, Recent Azure Updates, and Azure Blog. At the bottom, there's a section for the Azure mobile app with download buttons for the App Store and Google Play.

Microsoft Azure

Report a bug

azure netapp files

Azure services

Virtual machine

Marketplace

Azure NetApp Files (preview)

Azure NetApp Files

Resources

No results were found.

Documentation All 1000+ results

Introduction to Azure NetApp Files | Microsoft Docs

Azure NetApp Files documentation | Microsoft Docs

Set up Azure NetApp Files and create a volume | Microsoft Do...

Create a volume for Azure NetApp Files | Microsoft Docs

Resource Groups

No results were found.

Searching 1 of 2 subscriptions.

Recent resources See all your recent resources > See all your resources >

NAME	TYPE	LAST VIEWED
demo (preview)	NetApp account	3 min ago
ANF	Virtual network	4 wk ago

Useful links

Technical Documentation

Azure Services

Recent Azure Updates

Azure Blog

Azure mobile app

Download on the App Store

GET IT ON Google Play

# Plan of Intent

## Available Now

### Limited Preview

- US East
- US West 2

### Feature Set

- NFSv3
- Snapshots
- Export Policy
- Data at Rest Encryption (MSFT managed keys)

## 1HCY19

### Controlled Availability

- US Central, South Central
- Europe West, North

### Feature Set

- SMB 3.0,
- Standard, Ultra Tiers

## Beyond

### General Availability

- APAC South, Australia
- US Gov (VA)
- + Regions (tbd)

### Feature Set

- Snapshot Policy
- NFS v4.1
- SnapMirror Replication (ANF to ANF)
- FlexClones
- Integrated Backup

*All dates are preliminary and subject to change*

# Service Consumption Model

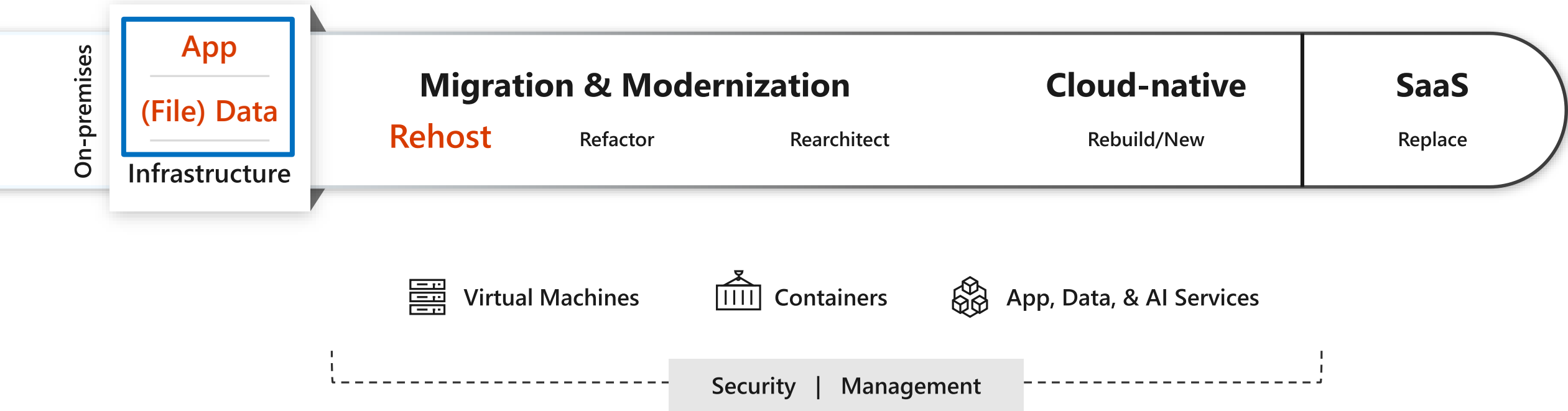
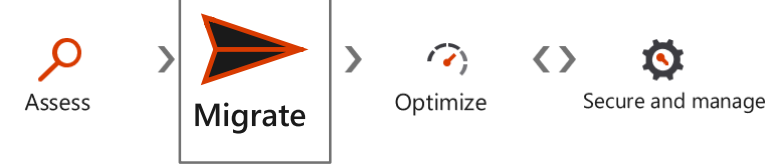


## Azure NetApp Files

	On-Prem ONTAP AFF „Full control & ownership“	Cloud Volumes ONTAP „Full control & SW ownership“	Azure NetApp Files „Service Consumption“
Mount Volumes	Customer	Customer	Customer
Provision Volumes	Customer	Customer	Customer
Performance	High	Low, Medium	High
Space/Time-efficient Snapshots	Yes	Yes	Yes
Space/Time-efficient Cloning	Yes	Yes	Yes
Dedupe & Compression	Yes	Yes	No
Protocols	NFS, SMB, iSCSI, etc.	NFS, SMB, iSCSI	NFS, SMB
Endpoint replication / migration	SnapMirror, CloudSync	SnapMirror, CloudSync	CloudSync
Encryption	Yes (Customer managed)	Yes (Customer managed)	Yes (Azure managed)
Purchasing commitment	Typically 3-5 Years	Paygo (hourly)/BYOL (yearly)	Paygo (hourly)
Disk Capacity Planning	Customer	Azure	Azure
ONTAP Upgrades	Customer	Customer	Azure
ONTAP Service Deployment	Customer	Customer on Azure IaaS	Azure
Hardware Deployment/Refresh	Customer	Azure	Azure

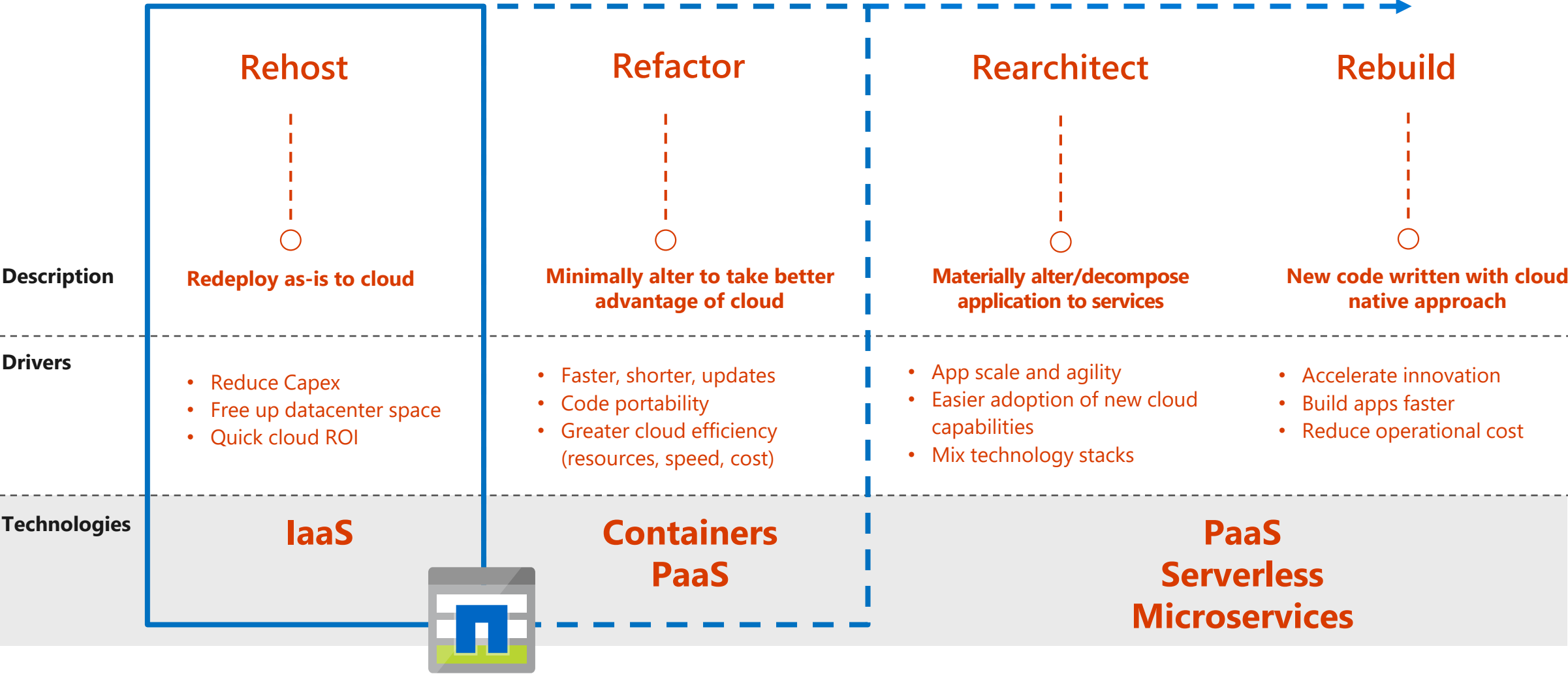
Move Today To  
Achieve More Tomorrow

# Azure migration scenarios





# Applying to cloud migration strategies

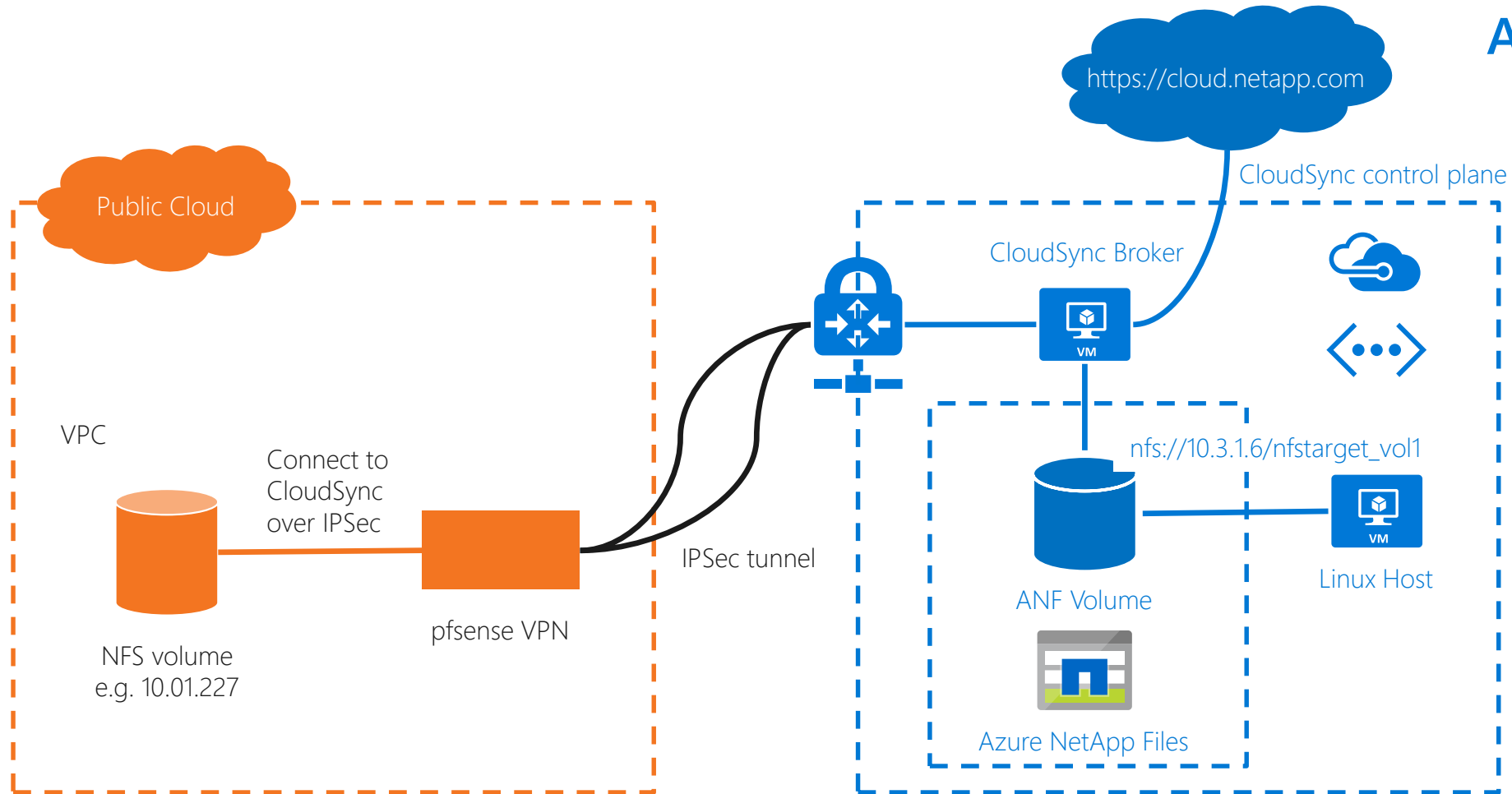


Azure NetApp Files

# CloudSync Data Migration

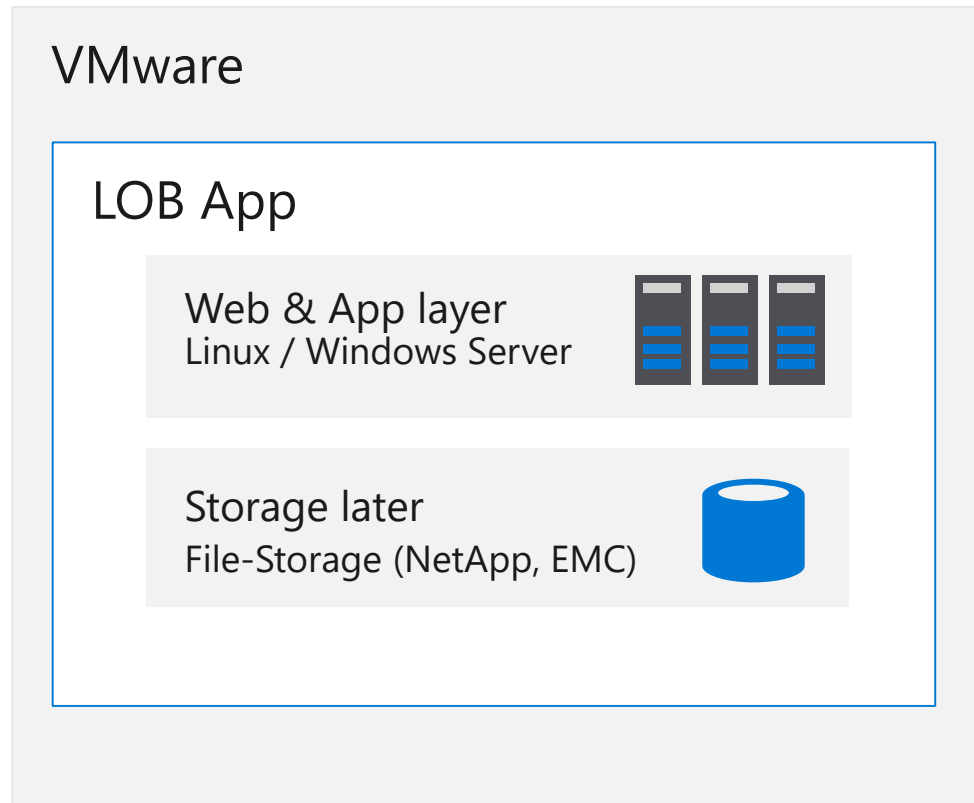


Azure NetApp Files



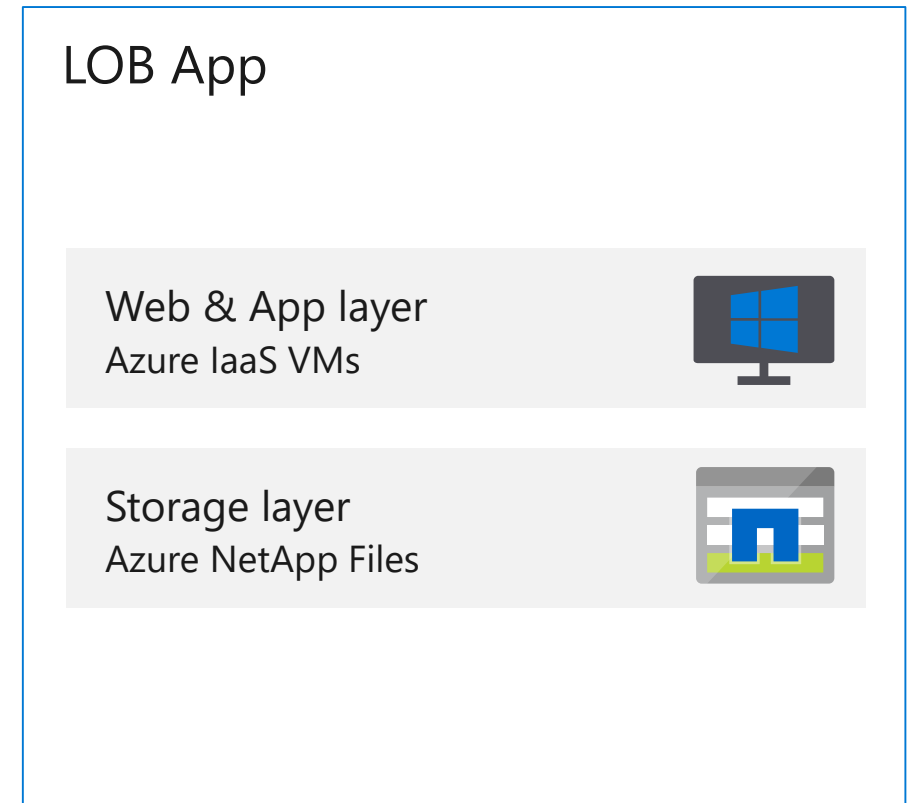
# Lift & Shift File-Based Apps with ANF

- On-premises



  
Cloud Sync

- Azure



# SAP on Azure – Improve Agility with ANF

## Simple to Manage

- Native Azure experience for easy deployment & scale

## Highly Performant

- On-prem like performance
- On-demand scalability

## Ent Data Management

- Space / Time efficient snapshot and cloning

## Hybrid

- Cloud Sync integration for hybrid cloud deployments



## At GA

SAP Application Server



Compute layer  
Azure IaaS VMs



## Planned

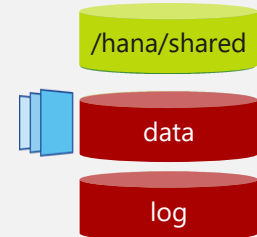
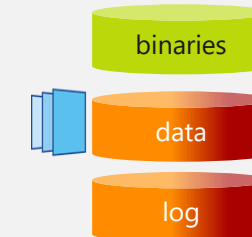
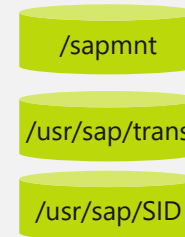
SAP AnyDB



SAP HANA



Compute layer  
Azure IaaS VMs



Storage layer  
Azure NetApp Files



- SAP on Azure w/ Azure NetApp Files <http://aka.ms/tr-4746>

Performance Requirement

Low

Medium

Med-High

High

# Oracle on Azure – Improve Agility with ANF

## Simple to Manage

- Native Azure experience for easy deployment & scale

## Highly Performant

- On-prem like performance
- On-demand scalability

## Ent Data Management

- Space / Time efficient snapshot and cloning

## Hybrid

- Cloud Sync integration for hybrid cloud deployments



## At GA

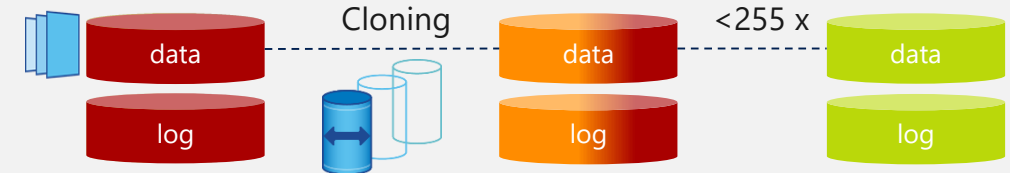
Database layer



Compute layer  
Azure IaaS VMs



## Planned (T&D at Scale)



Storage layer  
Azure NetApp Files



- Oracle on Azure Deployment Best Practice Guide: [aka.ms/tr-4780](https://aka.ms/tr-4780)

Performance Requirement

Low

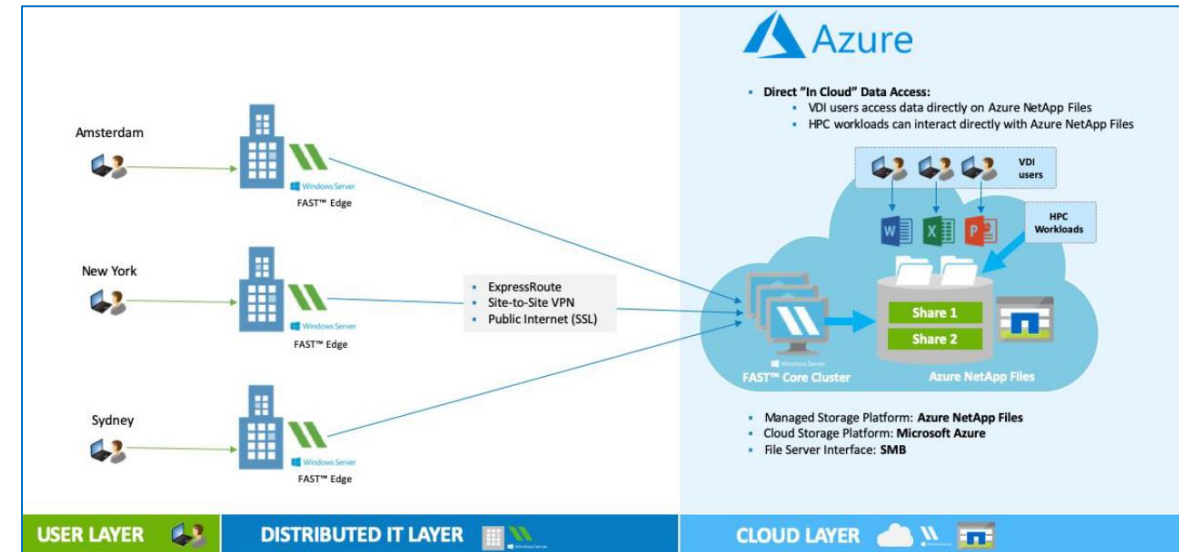
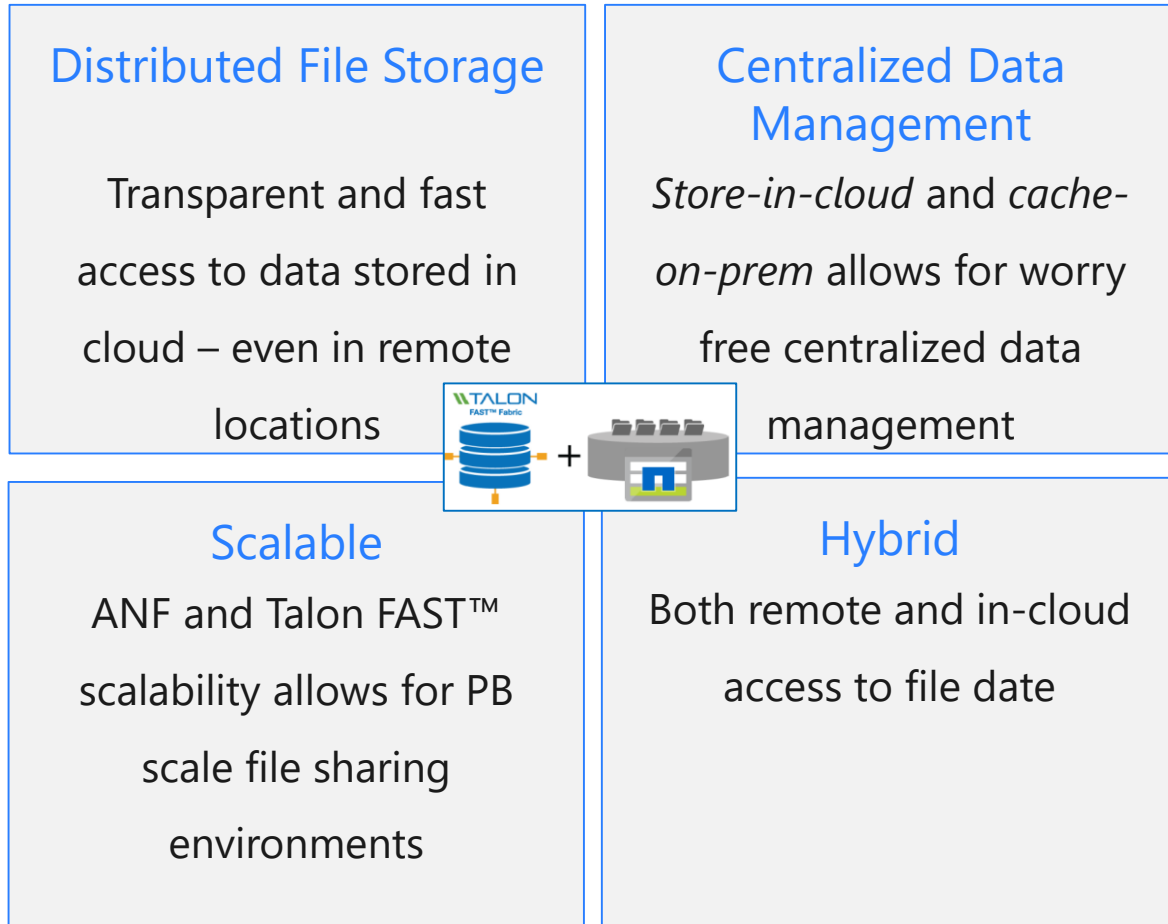
Medium

Med-High

High

# Globally Distributed Enterprise File Sharing

with Azure NetApp Files and Talon FAST™





There has never been a better time  
to migrate to Azure

Start moving NOW!

Get Started NOW:

1. Azure NetApp Files

[azure.microsoft.com/en-us/services/storage/netapp/](https://azure.microsoft.com/en-us/services/storage/netapp/)

2. Cloud Volumes ONTAP (Free Trial)

[azuremarketplace.microsoft.com/en-us/marketplace/apps/netapp.netapp-ontap-cloud/](https://azuremarketplace.microsoft.com/en-us/marketplace/apps/netapp.netapp-ontap-cloud/)

3. Azure Free Trial

[azure.microsoft.com/en-us/offers/ms-azr-0044p/](https://azure.microsoft.com/en-us/offers/ms-azr-0044p/)

