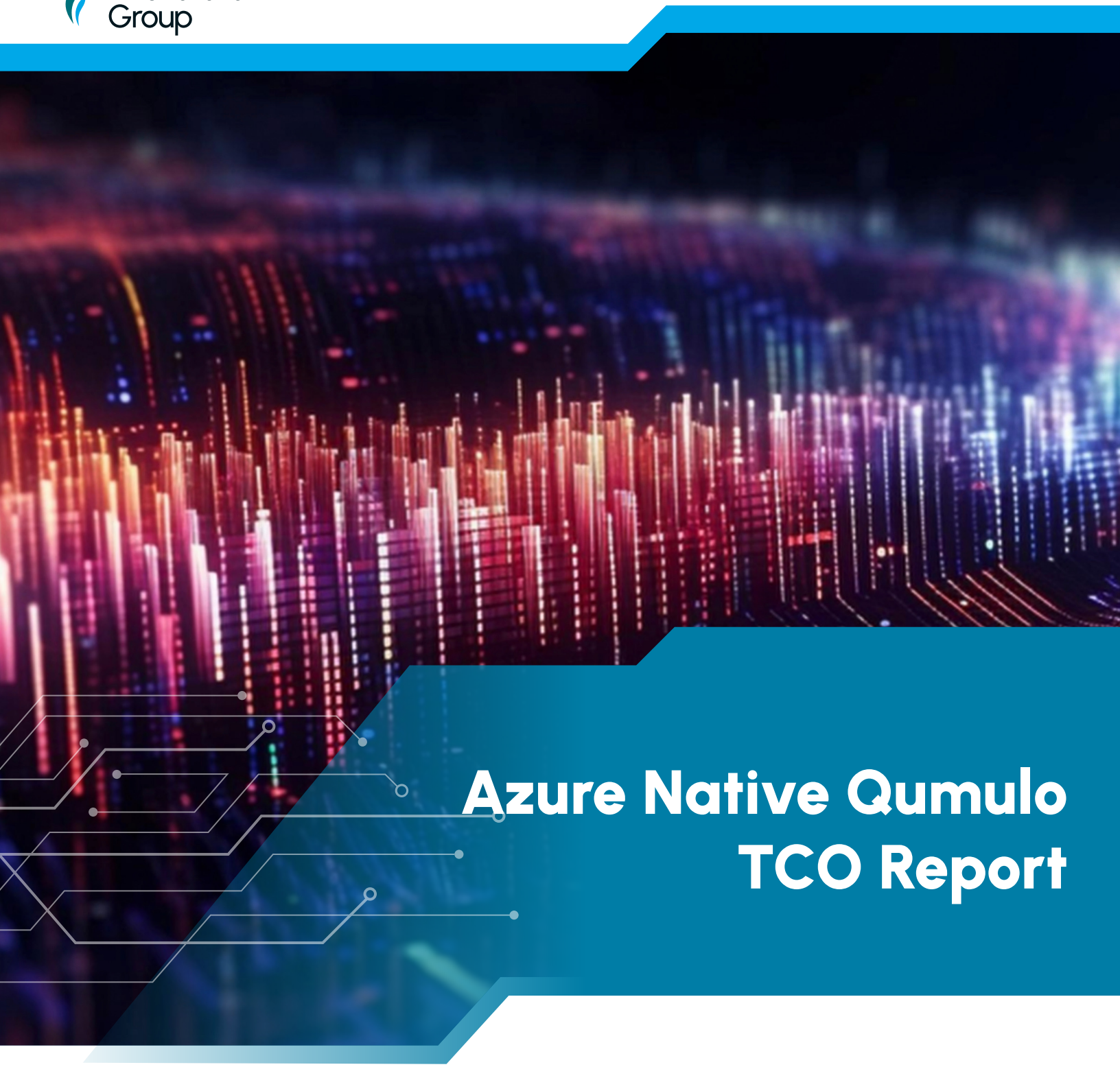

Azure Native Qumulo TCO Report

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Introduction

Today's file storage landscape provides many options for IT organizations from on-premises NAS solutions, to cloud-based file offerings. Requirements for file storage include high scalability, high performance, and advanced enterprise feature sets. For IT organizations requiring file storage, these needs must also be matched with strong economic considerations. The economics of storage systems, both on premises and in the cloud, include several factors and should be evaluated with a Total Cost of Ownership (TCO) evaluation over a projected period of time.

One such file storage offering with a compelling mixture of scalability, performance, features, and economics is Qumulo's Azure Native Qumulo (ANQ). The Azure Native Qumulo solution provides Qumulo's fully featured file storage solution running natively in Microsoft Azure which delivers additional flexibility and elasticity. ANQ has additionally been designed with a predictable cloud pricing model that challenges the economics of both traditional on-premises acquisitions and other cloud storage offerings.

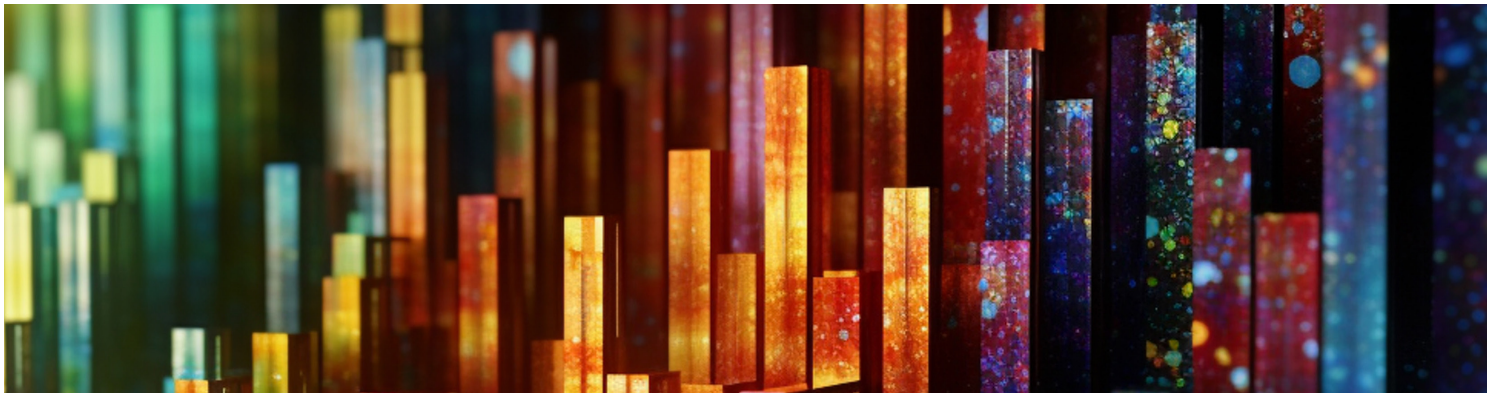
To evaluate the economics of Azure Native Qumulo, The Futurum Group has conducted a TCO analysis of the offering. The analysis compared ANQ to a leading on-premises NAS solution in all-flash and hybrid configurations, as well as a leading alternative cloud file storage solution. The TCO of each solution was modeled based on various cloud or on-premises cost factors and projected for a span of 7 years. The resulting TCO model demonstrates the economic advantages of Azure Native Qumulo when compared to both on-premises NAS storage and other cloud file storage.

TCO Model Assumptions and Decisions

The TCO model created by The Futurum Group calculated the total cost of ownership of four different solutions: Azure Native Qumulo, on-premises SSD based storage, on-premises HDD based storage, and an alternative cloud file storage offering. Each solution has its own distinct cost factors that were modeled to create accurate representations, but to create a fair, unbiased comparison, common assumptions and variables were used in the comparison where possible.

All solutions were modeled to create a cumulative cost over a 7-year time span. The comparison was conducted with a target of 1PB effective capacity in year 7. The capacity growth was modeled at 25% annually for each solution, growing the capacity from a calculated starting point to the targeted 1PB in year 7. This is representative of the planning process required by IT organizations in making a CAPEX acquisition. In a CAPEX purchase, IT decision makers typically project their future capacity needs and purchase the required equipment up front to avoid the challenges involved with completing additional acquisitions. To maintain consistency, the cloud solutions were modeled similarly by establishing a starting capacity that would grow by 25% to reach 1PB in year 7.

Additionally, administrative costs were included in the total cost of each solution. While the total maintenance time was varied between solutions, the fully burdened administrative cost was kept consistent at a $75 per hour rate for all solutions in the comparison.



Qumulo Pricing and Assumptions

The pricing model for Azure Native Qumulo is designed to provide low-cost cloud storage with simple, predictable pricing. To deliver this goal of simplicity and predictability, ANQ's pricing is composed entirely of two components, capacity and throughput. The capacity and throughput pricing tiers are noted below:

CAPACITY	PRICE
0 - 499 TB	$ 37 / TB per month
500 - 1000 TB	$ 33 / TB per month
1 - 5 PB	$ 30 / TB per month

THROUGHPUT	PRICE
0 - 1 Gbps	$ 0 per month
1 - 100 Gbps	$ 0.00011 / Gbps per minute / per consumed TB

In modeling the TCO of Azure Native Qumulo, the cost of throughput exceeding 1 Gbps was omitted due to an assumption that the average customer would not require additional bandwidth above the free tier. Sustained throughput above the free tier would likely only be required by those with exceptional performance demands, and therefore were considered to be an outlier for this analysis[1]. Capacity was calculated according to the above pricing tiers, and while The Futurum Group's TCO analysis evaluated the cost up to 1 PB of data, it should be noted that capacity beyond 1 PB would receive an additional price reduction.

For a target of 1 PB of data in year 7 and a growth rate of 25% annually, the starting capacity was set to 263 TB. The capacity was increased each year by an even percentage over 12 months to a total of 25% annual growth with no data reduction applied. Cost was calculated at the end of each month based on the calculated capacity and the resulting pricing tiers. A total cost calculation was then taken at the end of each year.

[1] ANQ Customers will be eligible for annual committed spending which will include additional discounts from the standard pricing listed. While not modeled in this TCO analysis, customers with high throughput workloads are likely to receive discounts which may significantly reduce the listed throughput cost.

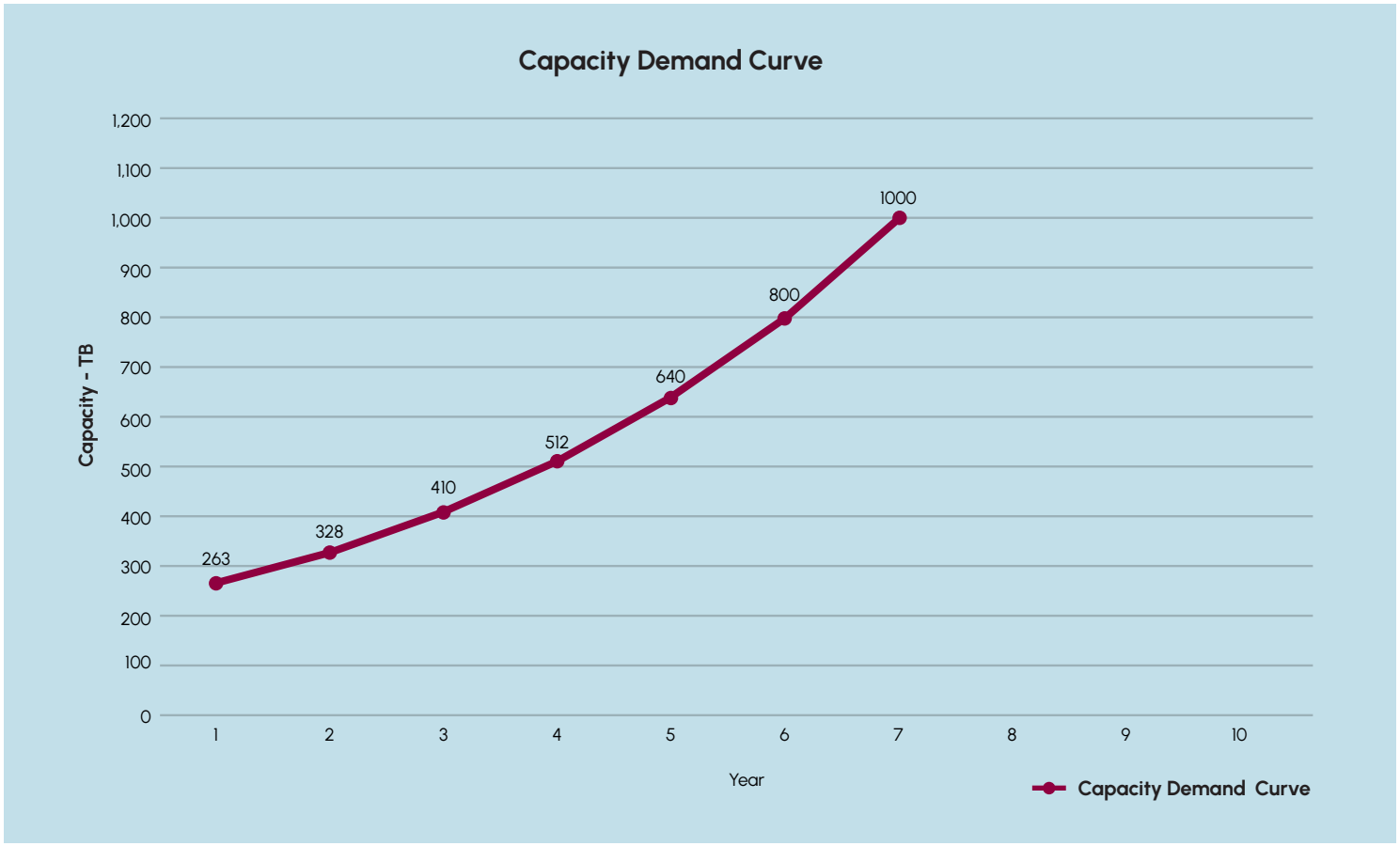


Figure 1: Cloud Storage Capacity Demand Curve

As a cloud service, there were no additional hardware or software costs included in the calculation. Since ANQ is a managed service, administrative time was assumed to be low, and was calculated at 1 hour per week at the established cost of $75 per hour. This administrative time was maintained as a flat rate over the 7-year duration, as an increase in stored capacity would not likely require an additional increase in administrative effort for a managed service.

Alternative Cloud Service Pricing and Assumptions

To evaluate the cost of ANQ compared to other cloud services, a leading alternative cloud file service was also modeled. Where possible, assumptions were kept the same as the ANQ model. This includes the capacity growth from 263 TB to 1 PB over 7 years with no data reduction and an assumed administrative cost of 1 hour per week at $75 per hour.

The alternative cloud solution was priced according to its own pricing model. The service includes multiple performance and price tiers with an ability to move between tiers, however, the TCO calculations assumed use of the lowest price tier for the entire 7-year duration to achieve the most competitive price. The alternative cloud service was priced at a rate of $137.33 per TB per month, based on publicly available pricing information.

On-Premises NAS Pricing and Assumptions

Comparison to on premises NAS was achieved by modeling a leading scale-out NAS solution in both all-flash and HDD based configurations. The HDD based system included additional SSD cache devices. The modeled capacity of both systems was set to achieve 1 PB of effective capacity in year 7. This capacity was calculated using a utilization rate of 68% and the manufacturer's guaranteed data reduction ratio of 1.6:1. To achieve 1 PB of effective capacity, given the impact of data reduction and utilization, the model calculated a total raw capacity of 920 TB.

The TCO analysis for the on-premises solutions modeled a CAPEX purchase with an assumption that all hardware and software would be purchased initially in year 1. This assumption is based on experience of Futurum Group analysts working with IT end users during purchasing decisions. Justifying and receiving approval for spending can be a significant challenge for IT organizations making storage purchases. In order to scale granularly with capacity growth, this process must be repeated for each purchase, with no guarantee of approval. To avoid this, IT organizations will commonly make a single purchase upfront that will cover their projected future capacity needs. This strategy avoids the challenges associated with repeated spending requests and allows organizations to meet their future capacity needs while requiring only a single spending approval.

The hardware configuration was modeled based on the required chassis, nodes, devices, and networking equipment to support the year 7 target of 1 PB effective capacity. Software was configured per node with base licenses, as well as a bundled software package to include the standard enterprise features likely to be found in such a configuration. Prices for all hardware and software components were taken from a publicly available pricing list. The public pricing list specified a standard 25% discount for all hardware and software components. This 25% discount was applied to the modeled hardware costs, while software discounts were raised to 50% to account for the additional sales negotiations that are common in these purchases. A one-time deployment cost was also factored into the calculation.

While hardware and software costs were purchased in year 1, the cumulative costs of the on-premises systems continued to increase due to support, staffing, and facilities costs. Ongoing support for both hardware and software were included with hardware support calculated annually as 5% of the hardware purchase and software support calculated as 20% of the software purchase. Staffing was assumed as 2 hours of administrative time per week per node at a fully burdened rate of $75 an hour. The administrative time for on-premises solutions was assumed to be greater than the 1 hour a week calculated for cloud services, due to the additional maintenance required of on-premises systems. Power, space, and cooling costs were calculated using industry standards.

For the HDD-based system, additional hardware and migration costs were included in year 5 due to the expected 5-year lifespan of HDDs. The cost of migration effort was derived from a Hitachi research study that concluded the cost of a storage virtualization-based migration for block storage to be $635/TB[2]. Based on Futurum Group research and experience working with IT customers, the effort and cost of replacing nodes in a scale out NAS system, such as the one modeled, could be significantly lower than in a block-based migration. To account for this difference, the cost of migration was calculated as one third of the $635/TB figure and set to a more conservative rate of $212/TB.

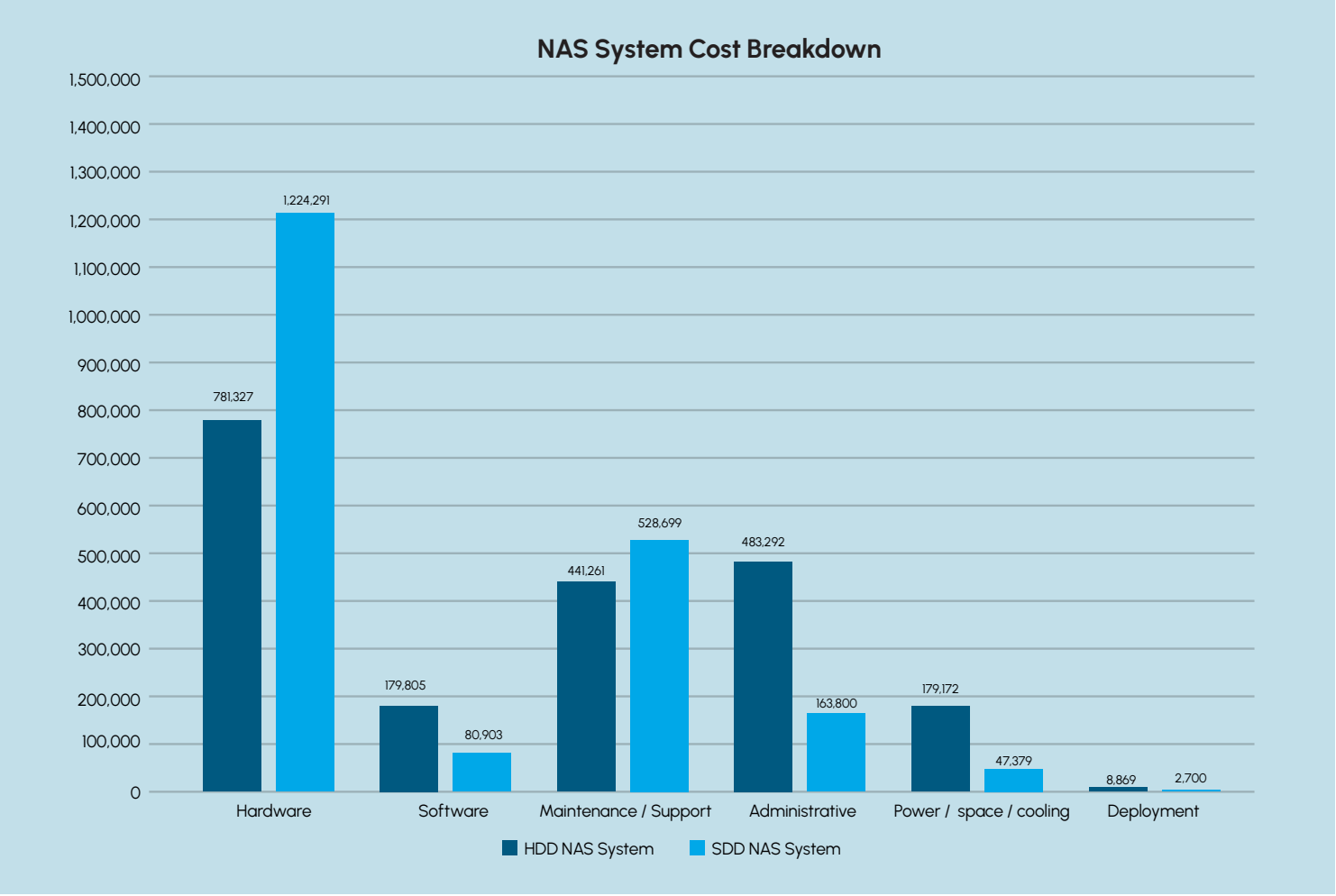


Figure 2: Cost Breakdown of On-premises NAS Systems

[2] Patrick Allaire et al., *Reducing Costs and Risks for Data Migrations*, February 2010, https://www.hitachivantara.com/go/cost-efficiency/pdf/white-paper-reducing-costs-and-risks-for-data-migrations.pdf.

TCO Analysis Findings

A visualization of the cumulative TCO for each of the 4 solutions over a 7-year span can be seen in the chart below.

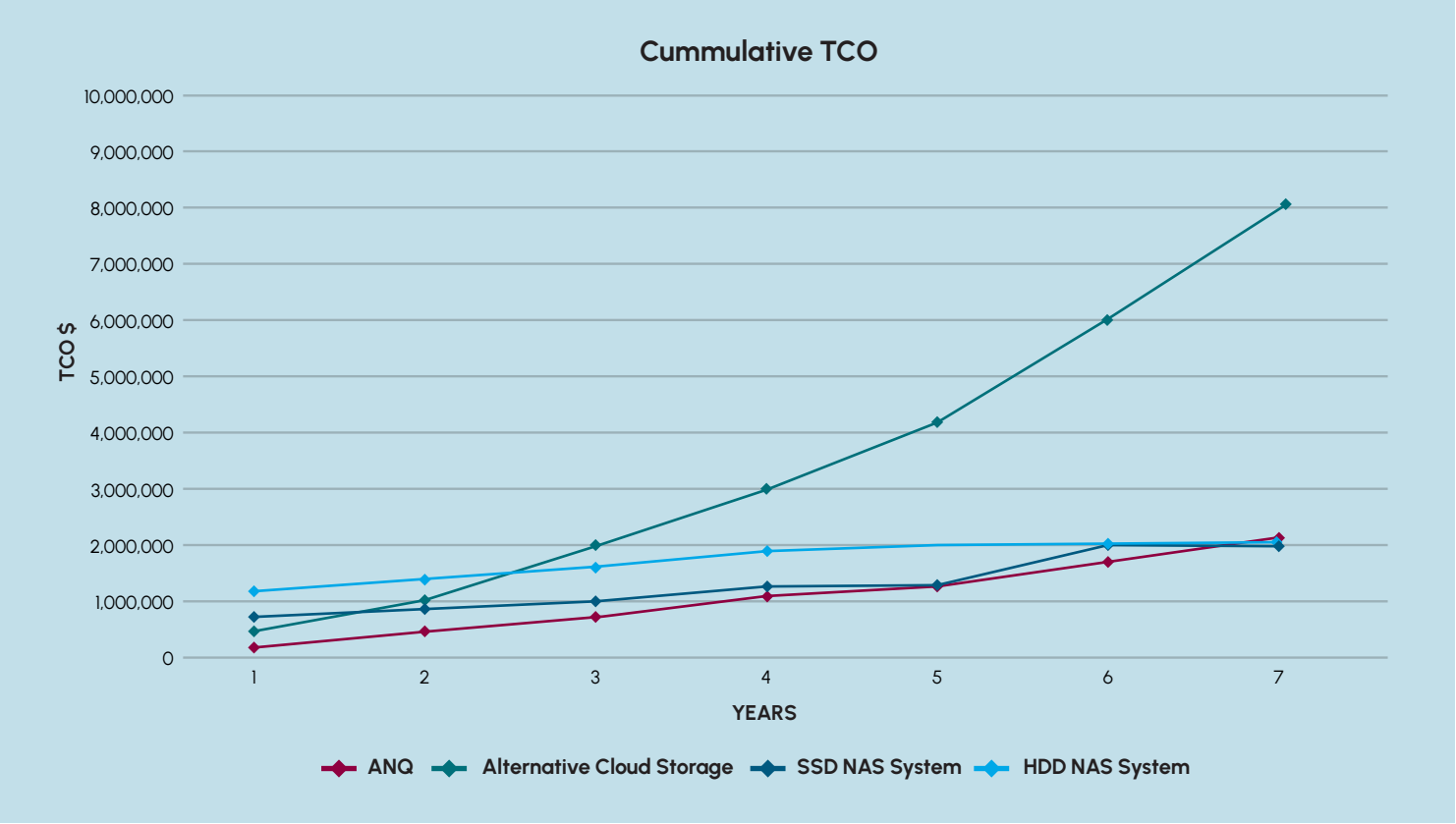


Figure 3: Cumulative TCO

The cumulative cost of the solutions in year 7 were calculated to be as follows:

SOLUTION	CUMULATIVE COST - YEAR 7
Azure Native Qumulo	$ 2,144,397
Alternative Cloud File Storage	$ 8,260,805
All Flash NAS	$ 2,056,772
HDD - based NAS	$ 2,073,725

Comparison:
Azure Native Qumulo vs Alternative Cloud File Storage

The cost advantages of Azure Native Qumulo are easily visible in the TCO comparison chart. ANQ was found to be 3.63X less expensive in year one, up to 3.85X less expensive in year 7. While variables such as capacity growth and maintenance costs were assumed to be the same between both cloud solutions, the difference in capacity-based pricing led to a dramatic cost difference. The growth in price efficiency between ANQ and the cloud alternative can be attributed to ANQ's tiered capacity pricing model vs the flat rate pricing of the alternative. While this TCO model targeted 1 PB of capacity, it should be noted that the cost efficiency would diverge further at higher capacities where ANQ breached the third tier of its capacity-based pricing.

The TCO model additionally ignored transaction costs incurred by the alternative cloud solution that would further increase its total cost in a real-world scenario. Alternatively, the ANQ pricing model is solely based on capacity stored and throughput consumed. ANQ does not incur transaction fees the way that alternative solutions do, and therefore may see additional cost benefits and greater predictability during a real deployment. Additional ANQ costs, due to throughput exceeding 1 Gbps, were considered rare for most customers, and at a price of $0.00011 / Gbps per minute/ per consumed TB, they are statically insignificant to this model.

Comparison:
Azure Native Qumulo vs On-Premises NAS

The TCO comparison additionally demonstrates significant economic advantages of ANQ when compared to traditional on-premises NAS deployments. While it can be seen that the cost of both NAS solutions and ANQ are relatively similar in the final year, ANQ demonstrates significant cost savings over the course of the 7 years.

The key cost saving differentiator from the two on-premises solutions is the elasticity and "only pay for what you use" nature of ANQ. In year 1, the CAPEX acquisition of the NAS systems cost $1,347,062 and $654,484 for the SSD and HDD based systems respectively, due to the expectation of a 1PB requirement in year 7. Comparatively, the ANQ solution only required the capacity needed in year one, and was calculated to cost $137,818. This represents a year one savings of around 5X compared to the HDD system and just under 10X compared to the SSD system.

The flexibility of ANQ provides it with a significant cost advantage over both systems for the majority of the 7-year TCO analysis. It can be seen that the cost of the HDD system approaches that of ANQ at year 5, however, the 5-year lifespan of HDDs requires a hardware refresh, once again creating a significant cost disparity between the solutions.

Significant cost savings over the 7-year period are also apparent when examining the administrative costs of the solutions. The total administrative cost for ANQ was calculated to be $27,720, while the administrative costs for the on-premises systems were calculated to be $163,800 for the SSD system and $483,292 for the HDD system. The low administrative cost of ANQ can be attributed to the low administrative time required when using a managed cloud service. Comparatively, on-premises solutions require a greater administrative effort, which scales proportionally to the number of physical nodes required. The large administrative cost associated with the HDD-based system is attributed to the additional nodes required to meet the capacity as well as the required hardware refresh. The hardware refresh was calculated to add an additional $155,692 in migration related costs.

It should be noted that in year 7, the on-premises systems do gain a slight cost advantage over ANQ. This cost advantage, however, would likely be short lived due to the necessary technology refreshes of both systems. Based on the lifespan of storage devices, the SSD system would require a refresh somewhere between year 7 and 10, and the HDD system would be approaching its second hardware refresh. While this additional technology refresh cycle was not modeled due to the unknowns in estimating future hardware costs and configurations, it can be assumed that this refresh would represent another significant CAPEX acquisition and a large administrative cost to complete the migration.

Only evaluating the cost advantage of the NAS systems at year 7 also ignores a significant savings in opportunity cost achieved by ANQ over the prior 7 years. By only paying for the capacity that is actually used, ANQ was calculated to save significant cost over the 7-year period in which such cost savings could be strategically re-purposed by the purchasing organization as needed.

It should also be noted that the on-premises solution model did not include a remote replication target at an additional site. Remote replication would likely be utilized for many deployments to provide additional data resilience. The addition of a replication target would add an additional hardware and software cost; however, the exact price of the replication target may vary. In some scenarios, organizations may opt to deploy an identical configuration as a replication target, effectively doubling the original hardware and software costs. In other situations, a less performant, and therefore more cost-effective solution may be deployed, still increasing the total on-premises cost, however less significantly.

Key Takeaways

In creating a TCO analysis of multiple cloud and on-premises solutions over a 7-year period, the Azure Native Qumulo solution demonstrated its ability to provide significant cost savings. The key factors in ANQ's economic advantage over other solutions are a low cost per TB combined with cloud native flexibility and elasticity.

When compared with a traditional CAPEX acquisition, ANQ demonstrates the economic advantages of cloud solutions. The economic advantages of ANQ over an on-premises acquisition are seen in the flexibility to pay only for the currently used capacity, and grow as needed. Comparatively, the significant up-front acquisition cost of on-premises solutions was found to incur a significantly higher total cost for the majority of the projected timespan. The on-premises solutions only appeared to reach a cost advantage over the ANQ deployment around the same times they would soon need another significant acquisition for a technology refresh.

This flexibility to pay for what is needed and grow over time has long been the allure of cloud storage services, however in reality the economic advantages have not always materialized. This can be seen in the TCO modeling, in which the alternative cloud solution becomes costlier than the HDD system between the first and second years and costlier than the SSD system within the second and third year. By year 7, the alternative cloud solution takes on a cumulative cost greater than the other three solutions combined. The low cost per terabyte, along with the absence of unpredictable transaction fees, not only makes ANQ significantly more cost effective than other cloud solutions, it allows the service to deliver on the economic advantages cloud storage has long promised over on-premises solutions.

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