White Paper

Unified Hybrid Cloud Definition Evolves with the Release of Pure Storage's New Evergreen Storage Service Program

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IDC OPINION

As enterprises modernize their information technology (IT) infrastructure as part of digital transformation (DX) initiatives, the use of hybrid cloud and multicloud environments has increased significantly. Hybrid cloud environments are those where an enterprise's application workloads and IT services are spread across a combination of cloud and noncloud environments that can include traditional on-premises infrastructure, private cloud, hosted/colocated cloud, and public cloud. Multicloud refers to the ability to connect cloud storage to multiple public cloud compute environments. While public cloud-based storage-as-a-service options can improve IT agility, help lower costs, and move IT assets off balance sheet, managing a hybrid cloud environment presents some significant challenges. Public cloud-based storage-as-a-service offerings do not offer all the enterprise-class storage capabilities available in on-premises infrastructure, and as a result, most IT organizations opt to maintain many primary mission-critical workloads in their own datacenters. Licensing models vary between cloud and noncloud options as well, introducing additional complexity when IT organizations want to move workloads between different locations.

On-premises storage infrastructure, on the other hand, may not offer certain features of the public cloud that are attractive to IT organizations: easy worldwide access through cloud APIs; simple storage provisioning/elasticity/scalability; nondisruptive, multigenerational technology refresh; and the ability to move assets off the balance sheet. While some enterprise storage vendors have offered "pay per use" licensing models for on-premises equipment, recent International Accounting Standards Board (IASB) 2019 changes have forced assets purchased under most storage utility pricing models back onto the balance sheet. The complexity of hybrid cloud environments is driven by the fact that, to date, no vendor can offer unified technology and a unified subscription model across on- and off-premises locations that also delivers the advantages of a common, true cloudlike experience.

Enterprise storage vendor Pure Storage has supported hybrid cloud environments with its storage offerings for several years, but recent introductions now make it possible for this vendor to offer unified technology, a common cloud experience, and a unified subscription model across both cloud (public and private) and noncloud (traditional on-premises infrastructure) environments. This addresses the need for both hybrid cloud and multicloud capabilities. This offering (Pure Storage Evergreen Storage Service [ES2]) delivers the most seamless hybrid cloud environment, with a common cloud experience across all locations, available in the industry today. ES2 frees customers to make data locality decisions without many of the on- and off-premises limitations of the past, ultimately providing more

flexibility to create the most efficient and cost-effective balance between cloud and noncloud environments to meet business requirements.

IN THIS WHITE PAPER

Many CIOs have given their teams a strategic objective around the use of cloud technologies with the intent of optimally balancing their workload mix across both on- and off-premises locations. This white paper introduces and discusses what a truly unified hybrid cloud vision means in today's modern enterprises, exploring the benefits, challenges, and requirements associated with achieving it. It then provides a brief overview of what all-flash array (AFA) vendor Pure Storage offers in terms of unified hybrid cloud. After perusing this document, readers will be in a good position to structure their IT organization's own hybrid cloud environment most efficiently given the organization's objectives and workloads.

SITUATION OVERVIEW

Today, most IT organizations are undergoing what IDC defines as a "digital transformation." DX is the profound transformation of business and organizational models to fully leverage evolving digital technologies and their impact across society in a strategic manner. As organizations move to this more data-centric business model, IT must step up to meet the increasing demand for performance, scalability, agility, and manageability within the IT infrastructure. As part of their DX, many organizations are also undergoing IT infrastructure modernization efforts, leveraging newer technologies like flash, software-defined storage, and cloud to help them and their customers meet evolving market requirements. Whether an IT organization operates as a cost or a profit center, deploying an efficient storage infrastructure is top of mind, and during infrastructure modernization efforts, CIOs look to optimize and streamline operations even as they build to meet new requirements.

Public cloud has become an important option for most enterprises. Although it is not appropriate for all workloads, the option to use cloud reduces the need to maintain on-premises IT infrastructure; provides easy worldwide access to shared resources across the internet; enables simple, nondisruptive scalability and technology refresh to accommodate business growth; outsources the management of related infrastructure; and allows many IT assets to be moved off balance sheet. Storage as a service provides options to leverage the public cloud for storage, while software as a service allows IT organizations to outsource the day-to-day management of key supporting services, like email and collaboration platforms, to third-party cloud providers (e.g., Microsoft's Office 365, Oracle Cloud). Cloud can also provide quick access to services available from the cloud provider in new and emerging areas, such as big data and analytics, artificial intelligence (AI), and machine learning (ML), that might prove difficult to quickly deploy in on-premises infrastructure.

Despite the attractiveness of the public cloud, however, it is not appropriate for all applications, and there are clear reasons why enterprises keep certain workloads in-house. Performance, availability, security, regulatory/compliance, and IT governance concerns can require that workloads be hosted in on-premises, "owned" infrastructure; according to *Trends in Enterprise Storage Availability Management* (IDC #US44649819, January 2019), there is a strong propensity among enterprises to maintain workloads that they deem mission critical in-house. Many organizations are, however, already either running hybrid cloud environments – with workloads split between on- and off-premises and public cloud locations – or moving in that direction. In the United States, 41% of IT organizations already have a hybrid cloud environment and 38% plan to implement one in the next 12 months. Forward-looking implementation plans are even higher in other developed countries, with the United

Kingdom at 40%, India at 44%, Brazil at 45%, Germany at 46%, China at 57%, and South Korea at 58%. Hybrid cloud is a mainstream deployment model already, and it is how IT infrastructure will generally be built going forward.

Those workloads that are maintained in on-premises, "owned" infrastructure generally require lower latency than would be available across the internet and higher availability than public cloud providers are willing to guarantee (which is usually capped at "four-nines"), require access to certain storage management functionality (e.g., snapshots, quality of service, replication, stretch clusters) not available in the cloud, must meet certain data locality requirements from regulatory agencies that preclude leveraging public cloud-based storage, or have access patterns that are not cost effective given public cloud egress charges. But other aspects of the cloud – easy global access over the internet, simple storage provisioning and scalability, the ability to move IT assets off balance sheet, and the self-service orientation – remain attractive, and many IT organizations are looking to achieve a "best of both worlds" solution by standing up their own private clouds in on-premises infrastructure. While private cloud infrastructure is not as popular as public cloud, its usage is growing steadily. Many storage vendors also offered "storage utility pricing" models for on-premises infrastructure that up until recently allowed a true operational expense (opex) model option for on-premises infrastructure.

Even as IT organizations look to deploy private clouds, certain aspects of the true "public cloud" experience have been difficult to achieve. Technology refresh in the public cloud is nondisruptive, and public cloud providers tend to refresh their offerings more frequently than the typical enterprise for its own on-premises infrastructure. Many enterprise-class storage arrays offer limited technology refresh opportunities without a disruptive forklift upgrade (a key factor driving longer upgrade cycles). Recent changes promulgated by the IASB that began to take effect in December 2018 changed storage leasing definitions, and most of the "storage utility pricing" models in use by vendors are no longer viewed as operational expenses. This means those assets must go back on the balance sheet.

Toward a Unified, True Enterprise-Class Hybrid Cloud Environment

The first storage workloads enterprises tended to move to the public cloud were secondary ones like backup and disaster recovery. Storage-as-a-service offerings from public cloud providers were a good fit for these workloads – they provided virtually unlimited scalability at a low cost per terabyte, offered sufficient availability guarantees, and enabled remote site options that did not require enterprises to stand up their own facilities. This data did not need to be accessed very often at all and was very inexpensive to store in the public cloud. But public cloud storage generally did not offer the types of enterprise-class storage management features available in mature, proven external storage arrays from established providers – such features include multiple RAID options; storage efficiency features like compression, deduplication, thin provisioning, write minimization, and pattern recognition; space-efficient but high-performance and scalable snapshots; quality of service; encryption; and multiple replication options including stretch clusters. Many primary storage workloads required one or more of these features. Enterprises could configure an on-premises storage platform to achieve "five-nines" or greater availability but could not obtain an availability guarantee from a major public cloud provider that exceeded "four-nines." Instrumentation against the data was viewed as limited, particularly among end users who were familiar with the cloud-based predictive analytics platforms available from some enterprise storage vendors that were driving significant value.

Given these realities, setting up and managing a hybrid cloud environment can be quite complex. A disparity in the storage management features available, separate management skills and administrative interfaces between on-premises and public cloud, and the lack of a consistent pricing model for storage

in on-premises and public cloud infrastructure all contribute to this complexity. The promulgation of IASB 2019 precluded the use of many vendor "storage utility pricing" programs as a way to get on-premises IT infrastructure off the balance sheet. All of these challenges also make it more difficult to optimally align data locality and workload needs to meet the broad set of performance, scalability, agility, availability, manageability, and cost objectives with which modern IT organizations must deal.

The industry has been evolving to address some of these challenges. Several enterprise storage vendors have recently released software-only versions of their proven, feature-rich, enterprise-class storage operating systems (OSs) that can be configured to support "five-nines" availability in on-premises infrastructure configurations. With the ability to run the same storage operating system in either on-premises or cloud-based infrastructure (public and/or private), customers enjoy not only a comprehensive and common set of data services but also the same management semantics and API access regardless of data locality (i.e., cloud or noncloud).

While the availability of portable, software-only, true enterprise-class storage operating systems is a good step in the right direction, there are other key capabilities needed to create a truly seamless hybrid cloud environment. What is lacking from most vendors is a common cloud experience that is the same, regardless of location. This refers to aspects such as the nondisruptive nature and frequency of technology refresh, fast and easy provisioning, simple and transparent scalability, and a self-service orientation. And to date, no vendor has introduced a common consumption model that allows a customer to select a "pay per use" subscription approach that applies equally regardless of location.

Most customers are offered outright purchase and a storage utility pricing option (which may or may not be IASB 2019 compliant with respect to "opex" expenditures) for on-premises equipment, while public cloud providers offer separate "pay per use" consumption options. What has been lacking so far is a pricing model that is consistent across both on-premises and public cloud-based infrastructure and would allow workload movement between cloud and noncloud locations without any double-billing or licensing impacts. Such an approach would not only represent a significant simplification but also remove the licensing model as a consideration when determining the best location to place a workload (a determination that can change as conditions evolve over time).

Pure Storage and Evergreen Storage Service

Pure Storage is a $1.3 billion vendor of enterprise-class storage platforms based on solid state storage technology. With a portfolio that addresses block-, file-, and object-based storage requirements, Pure Storage has quickly risen to industry prominence since its first shipments in 2011 by driving key changes in customer expectations about enterprise storage:

- Pure Storage's FlashArray product line leveraged inline data reduction to make all-flash arrays much more affordable for both mission-critical and general-purpose workloads way back in 2012, addressing an initial concern about a higher cost per gigabyte than conventional spinning disk. Based on its lead, inline data reduction has now become standard on AFAs targeted for mixed workload consolidation, and in 2018, these systems (from all vendors) drove almost 80% of all primary external storage revenue.

- Pure Storage was also early to market with a cloud-based predictive analytics platform (Pure1) that transcended the traditional remote monitoring approach, leveraging big data and analytics, AI/ML, and the cloud to provide significant additional value to customers. Cloud-based predictive analytics collected and retained significantly more data than the traditional remote monitoring systems and enabled secure, AI/ML-driven analysis of data across the entire installed base. The more proactive management enabled by this approach improved

performance, availability, capacity utilization, and efficiency of operations; made capacity planning more accurate; provided installed base statistics like data reduction ratios and uptime statistics by workload type; drove rapid best practice dissemination; and supported more automated operations for higher administrative productivity. Today, most enterprise storage vendors have realized the value such a platform can provide to their customers and are now offering their own versions (although functionality and maturity of these platforms vary considerably across vendors).

▪ Pure Storage introduced "Evergreen Storage" offerings that not only enabled nondisruptive, multigenerational technology refresh but also introduced a number of guarantees that either improved the predictability of enterprise storage costs over time or lowered them. These guarantees included an effective capacity guarantee (called the Right Size guarantee), all-inclusive array software bundling (which includes even future new array software), fixed maintenance pricing for the life of the array, free next-generation controller upgrades every three years (with an option for earlier controller upgrades at substantial discounts), guaranteed up-front trade-in credits when moving to denser or higher-performance solid state storage devices in an array, a money-back guarantee if customers were not satisfied with the array, and the Pure1 cloud-based predictive analytics platform. In 2018, Pure Storage extended the Evergreen Storage offerings to include the Evergreen Storage Service (ES2), an IASB 2019-compliant subscription pricing model for on-premises infrastructure that offers an always available, pay-per-use service for block/file/object-based storage that meets enterprise performance, availability, and data integrity requirements with a true cloudlike experience.

The name "evergreen" comes from the FlashArray's ability to allow nondisruptive, multigenerational technology upgrades at any time (although the upgrades are only free every three years), providing a much more cloudlike experience for Pure Storage on-premises storage infrastructure. Evergreen Storage helped Pure Storage consistently drive one of the highest Net Promoter Score (NPS) ratings (86.6) in the external storage market for its customers over time and prompted its competitors to eventually introduce similar programs, of which, however, none has equaled the full value of what Pure Storage offers in particular because of the nondisruptive, in-box multigenerational technology refresh capability of the FlashArray. (NPS is a standardized metric that measures customer satisfaction/experience and is broadly used across 220 different industries.)

▪ In 2016, Pure Storage delivered the first enterprise-class, highly flash-optimized AFA specifically built for unstructured (file/object) workloads called the FlashBlade. Next-generation applications for mobile computing, social media, and big data and analytics were increasingly penetrating enterprises, and many of these had a real-time orientation whose performance requirements could not be adequately met with existing SCSI-based storage platforms. FlashBlade leverages custom PCIe technology that drives NVMe-class performance — well above the performance SCSI-based arrays are capable of — and features a scale-out design. This system not only was targeted at technical computing workloads running in commercial environments but was also cost effective enough to be sold as a dedicated backup and disaster recovery solution to many customers, and its revenue has grown faster than even that of Pure Storage's initial FlashArray product (which at the time was the fastest-growing storage array in the history of the industry). We are just now starting to see other vendors introduce highly optimized AFA designs for secondary workloads, another example of Pure Storage's industry leadership.

▪ Pure Storage also led the industry in introducing AI-ready infrastructure (AIRI), a converged infrastructure offering that featured NVIDIA GPUs, scale-out FlashBlade storage, and networking technology from Arista — all pre-integrated and available under a single SKU and with a single point of support contact. This system was targeted specifically for AI/ML and deep learning workloads, and its pre-integrated nature enables data scientists to jump-start their AI/ML

initiatives in hours instead of weeks or months. In the wake of this announcement in March 2018, a number of other AFA vendors have provided similar configurations or reference architectures to help their customers get AI/ML initiatives started faster. These offerings have found fertile ground – 80% of IT organizations will be using AI/ML technology by 2020.

In November 2018, Pure Storage announced Cloud Block Store. Cloud Block Store is a native, public cloud-based block storage offering that meets enterprise-class requirements. Cloud Block Store is a block storage instance running Pure's Purity storage operating system on industry-standard hardware in the cloud, providing all the performance, availability, and security capabilities of enterprise-class on-premises infrastructure. With the Purity storage OS potentially spanning traditional on-premises infrastructure as well as private and public cloud, customers enjoy a common feature set and management paradigm across all locations with a seamless hybrid cloud experience. Today, Cloud Block Store runs on the Amazon public cloud, but Pure Storage has plans to expand that to other public clouds in the future.

Making the Unified Hybrid Cloud Experience a Reality: The New ES2

Pure Storage initially announced Unified Hybrid Cloud in November 2018 and made an additional announcement in April 2019. The company delivered on the missing functionality necessary to provide a truly unified cloud experience across both cloud (private and/or public) and noncloud environments. This solution features unified, enterprise-class storage technology that spans all locations; offers the public cloud experience in terms of provisioning, management, expansion, and multigenerational technology refresh; and includes a single unified subscription model that applies equally to all locations (which is new with this announcement):

- **Unified, enterprise-class storage technology.** Pure's Purity storage operating system features a full complement of enterprise-class data services, including RAID, thin provisioning, inline compression and deduplication, space-efficient snapshots and clones, encryption, quality of service, and multiple replication options and topologies including stretch clusters. Since 2016, Pure Storage has tracked and empirically proven its ability to deliver at least "five-nines" availability in production use across its entire installed base. Purity can be run in on-premises infrastructure in both traditional and private cloud deployments and can be run on industry-standard servers in public cloud infrastructure (where it is referred to as Cloud Block Store), offering the same enterprise-class features across all locations. In 2018, Pure Storage introduced additional data mobility capabilities, based in part on intellectual property obtained with the StorReduce acquisition, that enable extremely efficient and rapid migration of storage workloads between on-premises and public cloud locations.

- **Unified cloud experience.** Because Purity is running in all locations, the same management features and workflows apply everywhere. With its support for multiple access methods (including FC, iSCSI, and cloud APIs like S3), hybrid cloud infrastructure based on Pure Storage provides easy worldwide access to secure, shared resources across APIs that can be consistent between on-premises and cloud deployments. Provisioning is fast and easy, driven by policy-based workflows that ensure IT governance requirements are met, regardless of deployment location. The common subscription model offers the "pay per use" pricing, for which the cloud is known, across all locations and allows workload movement between locations without requiring any changes to licensing – all while conforming to IASB 2019 "opex" definitions. Finally, Pure supports nondisruptive expansion to higher-performance models (through controller upgrades) and transparent firmware and software upgrades and uniquely (in the industry) supports multigenerational technology refresh (e.g., upgrade of a

SCSI-based array to an NVMe-based array) without impacting application services — just like public cloud infrastructure.

- **New unified subscription model.** Pure Storage offers a single, pay-per-use subscription model that applies equally to on- or off-premises infrastructure. The subscription model is fully IASB 2019 compliant to ensure that all infrastructure stays off the balance sheet. A customer details its initial requirements, and then Pure Storage provides the customer with a rightsize storage solution at a single cost per gigabyte that applies regardless of where a customer locates or moves a workload. This is the only subscription model in the industry that applies equally and freely enables data mobility across traditional infrastructure, private cloud, and public cloud environments. As customers increase capacity under management, the cost does increase, but moving data between locations requires no changes in licensing.

CHALLENGES/OPPORTUNITIES

Given that the IASB 2019 changes have just recently started to have an impact, many customers do not realize that the storage utility pricing models offered by many vendors no longer allow assets to be kept off the balance sheet. For those customers that want to leverage this aspect of the "cloud" for their on-premises infrastructure, vendors like Pure Storage will be challenged to educate the market about the impact of the IASB 2019 changes before the true value of programs like ES2 becomes clear to customers.

One of the real advantages of Pure Storage's Unified Hybrid Cloud is the common subscription model combined with the efficiency and ease of use of data mobility. While hybrid cloud environments are common in the enterprise, moving workloads between cloud and noncloud environments is done sparingly because of the difficulty of doing so. Given the complexity and time associated with workload migration and the licensing changes it would drive in the past, getting the full benefit of programs like ES2 will require a change in mindset for many customers. As is often the case when breaking new ground in the IT industry, it demands clear and effective marketing to ensure that prospective users understand exactly how the innovation drives value for them. As with its other industry innovations, Pure Storage needs to ensure that it gets the message out effectively. Given that it can achieve that, however, this new program provides yet another opportunity for Pure Storage to drive value for its customers as they continue their hybrid cloud journey.

CONCLUSION

As cloud storage services have evolved, customers are taking advantage of them to rebalance workloads between on- and off-premises locations by creating hybrid cloud environments. While the public cloud offers significant advantages for some workloads, there have been performance, availability, security, regulatory/compliance, and IT governance considerations that have driven enterprises to maintain mission-critical primary workloads in on-premises infrastructure. Implementing a hybrid cloud has required IT organizations to navigate certain challenges, however, like the lack of enterprise-class functionality in the cloud and the absence of a common subscription model across cloud and noncloud locations. For those customers looking to move on-premises IT assets off the balance sheet, the IASB 2019 changes have introduced additional hurdles. For customers that understand these challenges, the value of a program that offers a unified enterprise-class technology, a unified cloud experience, and a unified subscription model from a proven enterprise storage vendor should be readily apparent. If customers are looking for a truly unified cloud experience across multiple on- and off-premises locations that delivers enterprise-class storage features and availability with an IASB 2019-compliant subscription model, then they need to look at Pure Storage's Unified Hybrid Cloud offerings.

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