White Paper

Pure Storage's Evergreen//Forever Subscription Ushers in New FlashBlade//S as a Premier Platform

Sponsored by: Pure Storage

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IDC OPINION

Since its introduction in 2015, Pure Storage's Evergreen Storage has helped deliver a stellar customer experience and been a much-valued differentiator for the vendor by its customers. Among other things, Evergreen set the stage for nondisruptive multi-generational technology upgrades with investment preservation that is still the gold standard for the enterprise storage industry today.

There are two platforms in the vendor's all-flash enterprise storage portfolio: FlashArray and FlashBlade. FlashArray uses a scale-up design, whereas FlashBlade uses a scale-out design. Because of the architectural differences between these two platforms, there were some differences in the value proposition Evergreen offered for each. With the FlashBlade//S introduction in June 2022, changes to the FlashBlade architecture bring the full-blown value proposition of the Evergreen//Forever subscription (which has been available in different formats on FlashArray since 2015) to that platform as well.

Compared with the prior FlashBlade, FlashBlade//S improves performance, storage density, and overall capacity by 2.5x and improves the power, capacity, and overall total cost of ownership (TCO) efficiency by introducing denser, less expensive quad-level cell (QLC) NAND flash media. While there are many advancements with the FlashBlade//S, the move to disaggregate storage processor and storage capacity resources while retaining the same highly scalable "blade" architecture made the difference on the Evergreen//Forever subscription value proposition. FlashBlade//S customers will be able to nondisruptively upgrade storage processor and/or storage capacity resources independently, giving them the ability to either scale them within a technology generation or upgrade them to newer generations. The FlashBlade//S offers more configuration options than the prior platform and enables more efficient resource allocation, a factor that can save significant budget as configurations scale.

This document takes a closer look at the changes that brought all the advantages of the Evergreen//Forever subscription (formerly called Evergreen Gold) to Pure Storage's FlashBlade fast file and object storage platform.

SITUATION OVERVIEW

In early 2015, all-flash array (AFA) vendor Pure Storage introduced its Evergreen Storage program, an event that has forever changed the nature of the enterprise storage life cycle for the better. Prior to Evergreen, enterprise storage customers had reluctantly resigned themselves to dealing with a life-

cycle experience that locked them into older technologies; required disruptive, time-consuming, and potentially risky forklift upgrades to access next-generation technologies; and imposed considerable expense (rebuying storage capacity, relicensing software, etc.). Pure Storage's program combined product architecture innovations with Evergreen Storage features to support nondisruptive multi-generation technology upgrades that preserved existing investments and provided a number of other unheard-of (at the time) guarantees around customer satisfaction, all-inclusive software bundling, fixed maintenance costs, flash media endurance, and technology upgrades. All of those features, as well as 24 x 7 worldwide support, were included as part of the subscription fee.

In 2017, Pure Storage enhanced the Evergreen program by including two different subscription levels (Evergreen Gold and Evergreen Silver). For the FlashArray, the hardware subscription features were included in the Evergreen Gold subscription. In 2022, Pure Storage renamed the Evergreen Gold subscription Evergreen//Forever. For an in-depth analysis of this subscription and what makes it unique and the value it provides, see *Architectural Design Decisions Directly Support a Better Customer Experience for Pure Storage FlashArray Users* (IDC #US46800220, September 2020) and *Evergreen Storage Continues to Drive Industry-Leading Customer Experience as a Differentiator for Pure Storage* (IDC #US48785022, January 2022).

Pure Storage customers recognize the significant ease of use and economic value associated with the Evergreen subscription, and it is clear that it contributes strongly to the vendor's extremely high Net Promoter Score[1] (NPS), which has hovered in the mid-80s for the past seven years. The subscription program applies broadly to all of the vendor's enterprise storage offerings of both the FlashArray and FlashBlade type, but there were differences in how the program applied to the two product lines because of architectural differences between the two. Because of its design, FlashArray enjoyed the maximum benefits of Evergreen//Forever, but there were some differences in how *Ever Agile* (free controller upgrades every three years), *Ever Modern* (optional technology upgrades available at any time), and *Capacity Consolidation* applied to FlashBlade. With the introduction of FlashBlade//S in June 2022, all aspects of the Evergreen//Forever subscription apply equally to both product lines, a change that increases the value this program offers for FlashBlade customers.

While this document does not describe the Evergreen//Forever subscription in exhaustive detail (that is done by the IDC documents referenced previously), it does specifically discuss how the full program benefits apply given the FlashBlade//S' new disaggregated architecture and the value they provide for FlashBlade customers.

The Disaggregated Architecture of FlashBlade//S

FlashBlade is a scale-out unified fast file and object storage platform that offers both file- and object-based access methods (NFS, SMB, S3). It is based entirely on solid state media and uses a somewhat unique cacheless architecture to deliver very high levels of data concurrency at scale (a design that allows it to deliver predictably consistent high performance at scale with densely consolidated workloads). Each FlashBlade//S chassis can house up to 10 "blades," each of which include both storage processors and storage capacity. FlashBlade processors are based on the latest generation of Intel Xeon Scalable Processor technology, while DFMs are the proprietary storage devices Pure

[1] The Net Promoter Score (NPS) is a standardized measure of customer satisfaction that is broadly used across 220+ industries to provide an independent rating, based on customer response, of the quality of experience a vendor delivers to its customers. For further information about NPS, see *Net Promoter Score Becoming an Important Metric for Enterprise Storage Managers to Understand* (IDC #US43896818, June 2018).

Storage uses instead of off-the-shelf solid state disks (SSDs). A single FlashBlade//S system can cluster up to 10 chassis together to create a system that can house up to 20PB of data.

The new FlashBlade includes a number of significant enhancements that are discussed in detail in *Pure Storage's Next-Generation FlashBlade//S Delivers a Huge Leap Forward for Unstructured Data Storage* (IDC #US49102422, forthcoming). The key change that enables FlashBlade's full access to all the advantages of the Evergreen//Forever subscription is the disaggregation of storage processor and capacity resources on the redesigned blades. On the original FlashBlade blades, storage processor and capacity resources could not be independently replaced, so moving to newer technology for either resource required replacement of the entire integrated blade (including both storage processing and capacity). On the new FlashBlade blades, storage processor and capacity resources can be independently replaced and/or upgraded, and that can be done nondisruptively.

The Evergreen//Forever subscription includes a number of features shown in Figure 1.

FIGURE 1

Evergreen//Forever Subscription Features

Source: IDC, 2022

FlashBlade//S and Ever Modern, Capacity Consolidation, and Ever Agile

Ever Modern is a feature of Evergreen//Forever that provides included upgrades to the latest-generation blades (including the latest storage processors) every three years (upon renewal of the Evergreen//Forever subscription). *Ever Agile* is the option for customers to upgrade to higher-model blades with more powerful processors at any time during the subscription with full trade-in credit for the existing blades that defray the cost of the upgrade. In both Ever Modern and Ever Agile upgrades, the storage devices (DFMs) do not have to be upgraded and can be moved nondisruptively to the new upgraded blade. *Capacity Consolidation* is the option to upgrade to denser DFMs as those become available over the life of a FlashBlade system.

Note that the DFMs are the FlashBlade persistent storage devices. In FlashBlade//S, each DFM supports 24TB or 48TB of raw storage capacity based on QLC NAND flash media, and a blade can have one to four DFMs. In addition, two blade models are available – one lower performance and one higher performance. This means that there are different configuration options for each blade. Customers starting with a lower-performance blade with one DFM can upgrade that by either adding

another DFM to each blade and/or upgrading the blade itself to the high-performance option. The older FlashBlade could support up to 52TB of raw capacity on a single blade, while FlashBlade//S can support up to 192TB on a blade.

Blade Processor Upgrades (Ever Modern)

With FlashBlade's new disaggregated blade design, administrators can upgrade to the latest generation (Ever Modern) or higher model (Ever Agile) with more processing capability without having to migrate data or add and pay for more storage capacity. Applications continue to run during this process and (because data is distributed across many blades and/or chassis in a FlashBlade system using an erasure coding technique) all data continues to be available as well. To perform the blade upgrade, a blade will have to be entirely removed from the system and the existing DFMs removed from it. The new blade (which has the higher-performance or the next-generation processor) can be inserted into the chassis, and the existing DFMs are then inserted into the new blade. Data persisted in the DFMs is immediately available once the new blade is back in the system without any data migration requirements.

The Ever Modern–included blade upgrade allows for upgrading all blades on a system to the latest generation. With FlashArray, there are only two controllers to be upgraded per array, but on FlashBlade//S, there can be as many as 10 blades per chassis, each with its own storage processors. A single FlashBlade system can have up to 10 chassis. When the Ever Modern blade refresh rolls around on FlashBlade, most customers will likely want to upgrade all blades in an entire system (although they technically do not have to when moving to the latest-generation blades), and this can be done in a "rolling upgrade" manner one blade at a time. The system can operate with mixed generations of both compute and capacity resources.

Storage Capacity Upgrades (Capacity Consolidation)

If, on the other hand, a customer wants to add and/or upgrade DFMs, that can be done without even removing a blade from the system. In the design of FlashBlade//S, each of the four DFMs on each blade are hot-pluggable field-replaceable units (FRUs) that can be removed and replaced without pulling out a blade. Blades can be "upgraded" by adding additional DFMs up to the four possible per blade (capacity expansion). There are two DFM densities currently available for FlashBlade//S, and history shows that higher densities will likely become available in the future. When moving to denser DFMs, customers will be able to perform a nondisruptive capacity consolidation task by removing the older, lower-capacity DFMs and inserting the newer, higher-capacity ones. Again, because the data is erasure coded across blades and/or nodes, removing a DFM does not impact data availability and once a new DFM is inserted, the system will rebuild data as necessary to return to the original level of resiliency.

Technology Upgrades on Your Own Schedule (Ever Agile)

To take advantage of Ever Agile, customers will trade in the old blades and pay the difference in cost between that and the new blades with higher-model processors. Using this program, customers can choose to upgrade some or all of the blades in a system, depending upon their requirements. And they can also move from lower- to higher-capacity DFMs (referred to as Capacity Consolidation and discussed previously). Trade-in credits are based on the list price of the existing blades, and those credits stay consistent over the life of the blade so that customers aren't penalized for upgrading when they need to. This allows customers to move to next-generation technology on their schedule rather than having to undergo a disruptive, risky forklift upgrade like with many other enterprise storage systems. And regardless of how many times customers may decide to take advantage of Ever Agile

over their Evergreen//Forever subscription, they can still qualify for the included Ever Modern blade upgrades three years afterward.

Forever Component Replacement

Component hardware failures are a possibility in all systems. Building a resilient and highly available system is not only about architecture but also about how a system responds to failures, how it operates in "degraded" mode, how easy it is to replace failed (or failing) components, and how quickly it can be returned to fully protected "normal" operation. FlashBlade offers a number of features that allow administrators to implement a "defense in depth" strategy that ensures high availability. Erasure coding ensures that even multiple simultaneous failures do not impact data availability. Host multi-pathing ensures that network failures do not impact access to data. Snapshots and replication provide options for fast, granular recovery of individual files and/or objects or even in the case of full site failures, and immutable snapshots (SafeMode snapshots) offer recovery from data corruption and/or ransomware attacks. Redundant hot-pluggable FRUs ensure that hardware failures do not impact system capabilities and make the replacement of failed components fast and easy. FlashBlade has already proven itself able to deliver enterprise-grade availability in production use based on installed base metrics collected over years by Pure1, the vendor's artificial intelligence–driven, cloud-based AIOps platform.

For all systems covered by Evergreen//Forever, failed or failing components are replaced at no charge with the latest version of that component. This means that in some cases, customers may receive upgraded components, in terms of either processing power or storage density, relative to the failed component that is being replaced. It is notable that Evergreen//Forever customers receive these upgraded replacements while the vendor delivers guaranteed fixed subscription prices at the component level for as long as customers wish to renew their subscription. Given that the same FlashBlade system can be nondisruptively upgraded over multiple technology generations, the life cycle of the system can easily be 8–10 years while its performance and capacity profile stays updated. It is this ability to stay up to date with technology advancements without disruption that gives the "evergreen" storage subscription its name.

Forever Component Replacement also means that Pure Storage effectively offers a flash media endurance guarantee since any storage devices that "wear out" will be replaced at no charge. The vendor has introduced many innovations in how it manages raw flash capacity with a key one being that it manages flash media globally (rather than having it managed at the device level by individual SSD controllers that do not have a global understanding of I/O in the system overall, like many of its competitors do). Pure Storage makes a strong argument that its strategy for managing flash media directly and globally within a system (referred to as DirectFlash) allows it to deliver more consistent performance and better media reliability and endurance. The better media endurance it delivers also means that it needs less flash media overprovisioning at the storage device level, a factor that helps lower the cost per gigabyte at the system level.

The fact that Pure Storage builds its own storage devices also results in a faster time to market for new flash media technologies as they are introduced by the NAND flash suppliers. The vendor's competitors have to wait for storage device vendors to integrate new flash media into their own products and then go through their own separate validation process for those devices in their own systems before the newer media becomes available for use by their customers.

Upgrading Existing FlashBlades to FlashBlade//S

Pure Storage has proven that it knows how to structure storage platforms for major technology transitions. The original FlashArray 300 systems that shipped in 2012 could be nondisruptively upgraded to the FlashArray 400 systems that shipped in 2013, which could then be nondisruptively upgraded to the FlashArray//M systems that shipped in 2015, which could then be nondisruptively upgraded to the FlashArray//X systems, which became available starting in 2017. Along the way, the vendor moved its customers from SAS to NVMe storage devices and to different chassis — all nondisruptively. In fact, the vendor claims there are several customers that have made that exact journey over 10 years with FlashArray. Pure Storage has publicly stated that, while it will not be available at launch, existing FlashBlade customers will eventually be able to migrate nondisruptively to FlashBlade//S without requiring a forklift upgrade.

FlashArray and FlashBlade: Peers Under Evergreen//Forever

FlashBlade has always supported most other aspects of the Evergreen subscription: all-inclusive software subscription, access to new software enhancements, Pure1 management and Portworx Kubernetes tools, Love Your Storage (the 30-day money back guarantee), premium proactive and predictive support (24 x 7 with four-hour onsite response supplemented by Pure1), flat and fair maintenance (the fixed maintenance pricing at the component level guarantee over the life of the system) and, since 2018, the ability to trade in lower-capacity blades for higher-capacity ones under Capacity Consolidation. With the support for Ever Modern, Ever Agile, and Capacity Consolidation (now at the DFM level) enabled by FlashBlade//S, FlashArray and FlashBlade now offer customers the same exact customer experience and value proposition.

Above and beyond the benefits of Evergreen in the past for FlashBlade, full-blown Evergreen//Forever support for FlashBlade//S delivers additional key differentiators that administrators familiar only with the traditional enterprise storage life cycle may not know about:

- **Upgrade blades, storage processing, and capacity resources independently.** When blades and capacity resources have to be upgraded in lockstep, customers almost always end up paying for resources they don't need just to get ones they do. For small systems, inefficient resource allocation may not be a big concern, but as systems grow to the petabyte range and beyond, the purchasing of unwanted resources can add up to significant additional cost. This is one of the key reasons that hyperconverged infrastructure (HCI) tends to be limited to cluster sizes of less than 16 nodes and why the hyperscalers (who invented HCI) are deploying a lot more disaggregated infrastructure in their public cloud environments these days. FlashBlade//S' disaggregated architecture will allow customers to deploy and configure the exact resource mixes that best meet their individual requirements, leading to a very efficient use of budget resources.

  Being able to more accurately configure storage processor and capacity resources not only saves on purchase costs but also keeps energy consumption down. Environment, social, and governance (ESG) impacts are rising as an IT management concern, and disaggregation enables systems that use power more efficiently. It should be noted that the recent megadeal between Pure Storage and Meta (the parent company of social media giant Facebook) was driven primarily by the much better ESG performance of Pure Storage systems — a factor that Meta expects will save it millions of dollars over the life of the AI Research SuperCluster, which will be based on storage infrastructure from Pure Storage. Meta commented specifically that it was Pure Storage's cost and power efficiency that differentiated it from the competition and drove the decision. Pure Storage recently released its first report on ESG with specific

information on how its technology helps organizations lower their own carbon emissions. The vendor has this information available on its website.

- **Life-cycle extension.** The ability to nondisruptively upgrade a disaggregated system such as FlashBlade across technology generations can extend the useful life of the platform to 10 years and beyond. The most expensive part of that traditional life cycle is rebuying all the storage hardware, relicensing all the software, migrating all the data to a new system, and learning how to efficiently manage the new system. Extending the life cycle of a single system while ensuring that the system can always accommodate the latest in storage technology saves a significant amount of money.

FlashBlade's new disaggregated architecture delivers more configuration flexibility, enabling a range of configurations that can better meet varying budget requirements for highly scalable unstructured data storage environments. As mentioned previously, there are different blade configurations that can be deployed from a mix of two performance levels and one to four DFMs.

Finally, the new FlashBlade//S uses a new chassis with redesigned airflow that allows it to accommodate much hotter components over time. This is part of the overall strategy to enable an "evergreen" storage system that can accommodate faster processors and denser storage capacities — both of which will require the enhanced cooling capabilities of the new system — to help extend the life cycle of FlashBlade to a decade and beyond.

FlashBlade//S and Pure Storage's Other Subscription Offerings

While the focus of this document has been on a traditional FlashBlade//S purchase combined with an *Evergreen//Forever* subscription from Pure Storage, the vendor offers its customers other ways to consume its storage. For customers that want a managed operational expenditure-based approach for on-premises storage infrastructure, Pure Storage offers a cloud consumption model option called *Evergreen//One* (until recently this was referred to as Pure-as-a-Service). Under this model, customers choose the workload, capacity, and performance they need, and the vendor then delivers the required platforms (which can be based on FlashArray or FlashBlade) either on premises or at a colocation facility to meet the requirements. Service-level agreements (SLAs) ensure that these customers' requirements are met, and Pure Storage's personnel manage the storage, including expansions and upgrades. The vendor claims that with its disaggregated architecture, FlashBlade//S will allow it to deliver more workload choices via Evergreen//One, including capacity-optimized unified fast file and object workloads.

In addition, Pure Storage recently launched an entirely new subscription — *Evergreen//Flex* — which combines storage ownership with a flexible subscription based on actual consumption and can apply to either FlashArray or FlashBlade. With Evergreen//Flex, customers purchase, own, and manage their storage but utilize a pay-as-you-go subscription based on storage capacity used. The Evergreen//Flex subscription is useful where maintaining ownership of storage infrastructure is either preferred or required for regulatory compliance, but where the flexible consumption and operational expense benefits of an Evergreen//One subscription are desired.

CHALLENGES AND OPPORTUNITIES

As unstructured data storage workloads grow, enterprises will be looking to more densely consolidate many of them onto fewer storage platforms for ease of use and economic reasons. Big data analytics workloads that have multiple stages have in the past required administrators to move large data sets between storage systems when different storage performance and access methods were required for

different stages in the analytics workflow. An ability to support multiple data stages on a single system dispenses with the time and effort needed to migrate data around but does require support for multiple access methods. FlashBlade supports NFS, SMB, and S3, but there are other access methods that may also be important depending on what workloads administrators are looking to consolidate. Customers considering dense workload consolidation (which FlashBlade is well suited for with its ability to support high degrees of data concurrency) should ensure that FlashBlade offers the required access methods.

With file- and object-based storage enjoying increased growth rates driven by the deployment of next-generation application workloads due to digital transformation, it is a good time to extend the performance, scalability, and flexibility of the FlashBlade. FlashBlade//S' new capabilities will help enterprises easily and more cost-effectively maintain rapidly growing data pools while at the same time analyzing those data sets to produce better business insights. More and more companies are going through an information technology (IT) infrastructure refresh driven by digital transformation, and FlashBlade//S is well positioned to meet evolving unstructured data management challenges in the enterprise.

CONCLUSION

Since its initial availability in 2017, FlashBlade has been a very successful platform for unstructured data storage. Based on evolving data management requirements in the enterprise, however, Pure Storage did identify three areas where it felt it could improve the FlashBlade design: scalability, reliability, and simplicity. FlashBlade//S, with its new disaggregated blade design, higher performance and increased storage density, more efficient use of solid state resources, improved hardware serviceability, and easier, more granular technology refresh capabilities, offers a compelling platform for unstructured data storage in the enterprise. While the disaggregated blade design, with its ability to enable independent scaling and upgrade of storage processor and storage capacity resources, is the most visible aspect of the new system, there are a number of other improvements that make FlashBlade//S an industry leader in terms of TCO and power efficiency — features that should be of interest to enterprises looking to manage their IT infrastructure more efficiently while at the same time accommodating data growth rates of 30-40% per year.

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