



## DATA SHEET

# Pure Storage Purity

The software powering next-generation shared accelerated storage.

**Purity Optimize**

- Provide always-on bandwidth and IOPs limits QoS
- Accelerate application performance with storage-class memory.
- No hassle of configurations or tuning

**Purity Protect**

- Multi-site active-active stretch cluster
- Effortless business continuity and disaster recovery
- Proven 99.9999% availability

**Purity Reduce**

- 5:1 data Reduction, 10:1 total efficiency with thin provisioning
- Inline and global data reduction
- Zero performance impact

**Purity Secure**

- Always-on encryption
- Highest security standards with FIPS 140-2
- End-to-end encryption with data reduction

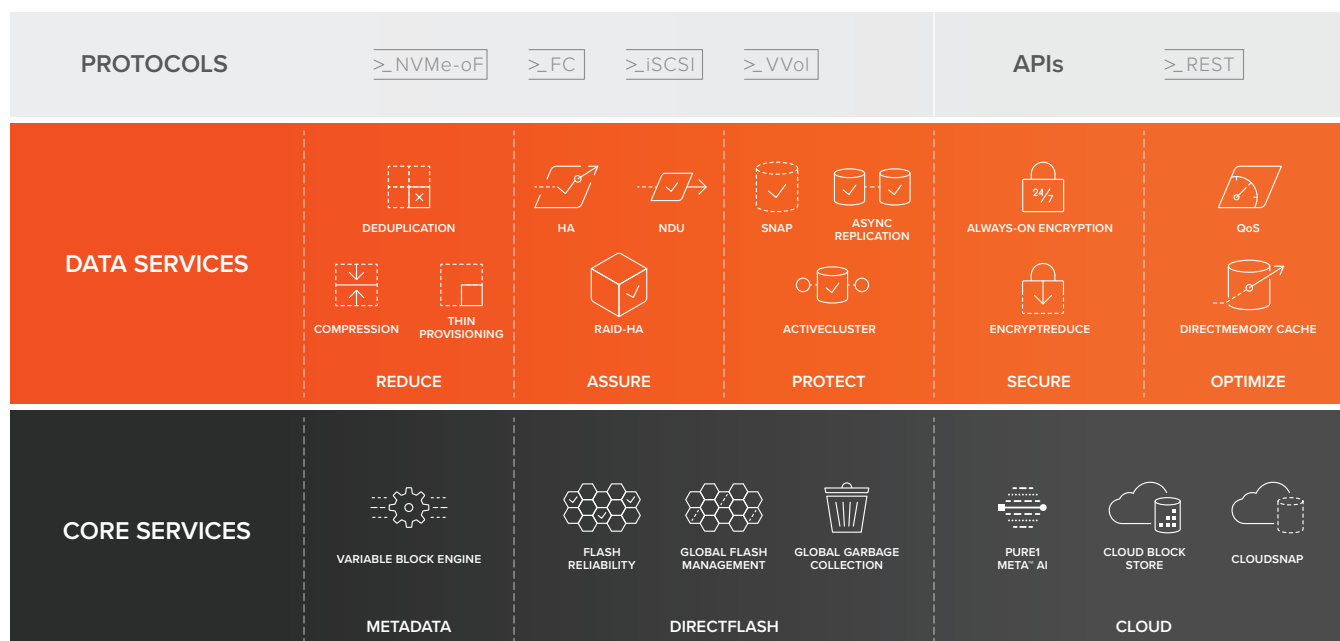
The Pure Storage® Purity operating environment is the software-defined engine of Pure Storage FlashArray™. Purity is the driver that enables Pure FlashArray products, powering [FlashArray//X](#) to deliver comprehensive data services for all your traditional and modern data-center applications and FlashArray//C to solve tier 2 application storage needs.

Purity's core technologies provide the speed, agility, and intelligence needed to simplify everything in your production environment. Its features set the pace for next-generation shared accelerated storage, from enterprise data services for all workloads to proven FlashArray 99.9999% availability and 10:1 total efficiency. And with the Pure Evergreen™ ownership model, your [Pure as-a-Service](#) includes new array features and improvements to [Purity](#) via non-disruptive upgrades.

Purity implements communication protocols and delivers rich data services across all Pure FlashArray systems. Features including [ActiveCluster™](#) for business continuity and disaster recovery, QoS, vVols, NVMe-oF, Snap to NFS, CloudSnap, DirectMemory Cache, and EncryptReduce are all examples of valuable new features provided with non-disruptive Purity upgrades. All Purity storage services, APIs, and advanced data services are built-in and included with every array. These technologies are driving the next-generation performance and industry-leading resiliency of Pure solutions.

**Metadata**

Purity leverages a variable block metadata engine across all layers of every array. This engine powers built-in, always-on compression; thin provisioning; encryption; and rapid data locking, as well as high-availability and non-disruptive upgrades. The [metadata engine](#) provides faster mixed workload performance while ensuring that data services have no performance impact.



Purity//FA Features\*

## DirectFlash™

Purity implements global flash management at the system level, including allocation, I/O optimization, garbage collection, and error correction. This drives 100% NVMe-connected raw flash within [DirectFlash Modules](#) and eliminates the performance-density limitations and unpredictable latency of large SSDs. Whether providing latency-optimized performance with FlashArray//X, or capacity-optimization in FlashArray//C, DirectFlash exploits the full potential of flash. It provides predictable, consistent, microsecond latency alongside higher throughput and reliability, better efficiency, and ultra-high density.

DirectFlash Fabric recently expanded the capabilities, enabling direct-attached storage (DAS) performance with enterprise-class reliability and data services. FlashArray//X is the first enterprise storage array to deliver [NVMe-oF RDMA](#) over Converged Ethernet (RoCE), providing massive optimization between the storage controllers and host over fast networking. DirectFlash Fabric brings both performance and efficiency gains: 50% latency reduction compared to iSCSI, 20% latency reduction compared to fiber channel, 4X capacity efficiency, and up to 25% host CPU offload.



## Purity Reduce

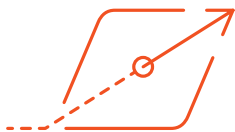
Purity delivers the industry's most granular, comprehensive data reduction—and the industry's best total efficiency, averaging 10:1—with savings that are typically twice as good as the competition. Unlike other vendors' products, our data reduction and thin provisioning are built-in, always-on, and require no tuning. It's simple and predictable, even predictive. As a result, you'll buy less storage now, and less in the future.

The following capabilities are what put Purity as the industry leader in data reduction:

- **Always-on:** The Purity Operating Environment is designed to support high-performance, always-on data reduction. All our performance benchmarks are taken with data reduction on.
- **Global:** Purity Reduce dedupe is inline and global unlike data-reduction solutions that operate within a volume or a pool, thereby partitioning the data and dramatically reducing dedupe savings.
- **Five reduction technologies:** Purity has the data reduction necessary for nearly any application, already built-in, including pattern removal, deduplication, compression, deep reduction, and copy reduction.
- **Variable addressing:** With variable addressing, Purity finds duplicates that fixed-block implementations miss. Purity Reduce scans for duplicates at 512-byte granularity and auto-aligns with application data layouts without tuning at any layer. In addition, variable (byte-granular) compression avoids diluting your savings with waste propagated by fixed-bucket granular compression implementations.
- **Compression algorithms:** Purity employs multiple compression algorithms for optimal data reduction for different kinds of data.
- **Designed for mixed workloads:** Purity Reduce delivers optimal data-reduction savings for mixed workloads without requiring trade-offs and/or tuning. That's unmatched simplicity for the real world of your data.

### 100% Thin Provisioning

Thin provisioning dynamically allocates capacity on demand for all volumes and workloads, optimizing utilization of the array. While many vendors use thin provisioning to boost data-reduction savings, thin provisioning is an over-provisioning strategy vs. a data-reduction technology. The Purity Reduce Ticker works differently, calculating only the average data reduction savings from deduplication and compression, which is separate from Pure's total efficiency where [thin-provisioning](#) is included. Granularity is at the 512-byte level just like all Purity services, meaning that Purity thin provisioning delivers even more efficiency than the competition.



## Purity Optimize

Purity Optimize with Quality of Service (QoS) and DirectMemory Cache features, effortlessly delivers consistent application service level agreements and improved database, analytics and reporting performance. Always-on QoS provides IOP and bandwidth limits to ensure applications get the resources they need and you can consolidate radically diverse applications without fear of I/O contention. DirectMemory Cache software automatically stores hot data read from flash media in the array to onboard DirectMemory Modules with Intel Optane storage-class memory. Once the modules are non-disruptively added to a new or existing FlashArray//X70R2 or //X90R2, DirectMemory Cache begins working, without the hassle of configurations or tuning. You can expect the array to start providing latency improvements, along with additional throughput, for FlashArray workloads.



## Purity Protect

Purity Protect combines Purity ActiveCluster with space-saving snapshots, replication, and protection policies into an end-to-end [data protection and recovery solution](#) that protects data against loss locally and globally (to heterogeneous NFS targets). All [Purity Protect](#) services are fully integrated in FlashArray and leverage native data-reduction capabilities.

## Purity ActiveCluster

Simplify business continuity with [Purity ActiveCluster](#), Pure's ultra-simple solution for running applications active-active between two data centers. The innovative design of ActiveCluster, including the cloud-based Pure1® Cloud Mediator, enables all data-center applications to use metro-area clustering. ActiveCluster also delivers asynchronous replication to a third site globally. Purity 5.2 async replication is active-active, meaning that a target array makes intelligent and resilient use of async replication links from both source arrays. ActiveCluster does not require re-baselining after the loss and recovery of a replication link. Best of all, ActiveCluster takes just minutes to set up, requires no third site, and is included with the [Evergreen subscription](#).

### Asynchronous and Snapshot Replication

Asynchronous and snapshot replications are the powerful combination behind ActiveCluster. With this approach, you can achieve low recovery point objective with regular delta updates and enable RTO zero via instant recovery from point-in-time snapshots. Benefits include:

- Data-reduction optimization, meaning always thin, deduped, and compressed. With it, you can eliminate lost performance, ballooning data, and added complexity.
- Instant recovery enables RTO zero with no data copying required so you can get back online faster.
- Multisite replication with one:many, many:one, or many:many replication delivers flexibility that you can use for data sharing, centralized backup, or disaster recovery.

### Open, Self-Protecting Storage from Local to Data Recover to Cloud

Data backup is no longer simply about storing data. It's about flexible protection, fast restores, and—above all—making your valuable data available for other uses, such as test/dev and analytics. Legacy, complex disk-to-disk-to-tape backup architectures can no longer keep pace with the advanced and constant flow of data that businesses must protect—and exploit. Purity is a key element in [flash-to-flash-to-cloud](#). It's designed for the scale and use cases of a modern backup strategy, providing more flexible backup and recovery options, faster restores to meet aggressive recovery-time objectives (RTOs), and simpler, more efficient operations while taking advantage of cloud economics. Consolidate workloads on FlashArray and secure them with a robust flash-to-flash-to-cloud backup and recovery strategy.

### Flexible Backup and Recovery

Pure portable snapshots provide simple, built-in, local and cloud protection for Pure FlashArray. Together, Purity Snapshots, Snap-to-FlashBlade, Snap-to-NFS, and CloudSnap enable free movement of space-efficient copies either between FlashArrays, to FlashBlade, to third-party NFS storage, or to the cloud, respectively. Unlike other cloud backup solutions, [Pure portable snapshots](#) are cost-efficient, because they encapsulate metadata, which means they're incremental, space-efficient, and self-describing.



## Purity Assure

Purity for FlashArray delivers 99.9999% proven availability, inclusive of maintenance, failures, and generational upgrades. [Purity Assure](#) is resiliency that never quits. Your data is always available, always performing, and always protected – without performance loss.

### Zero-impact Maintenance

Purity for FlashArray delivers 100% performance through regular maintenance operations including adding flash capacity online; expanding performance, even across generations; replacing any failed component; or upgrading software.

Examples of this zero-impact capability include:

- **Stateless controller architecture:** Simply unplug a failed controller, cable up a new one, and the FlashArray is back to full-availability without performance loss.
- **Active-active high availability:** A clustered controller design allows for the complete failure of a controller or any controller component without impacting operations.
- **Mirrored NV-RAM:** Write I/Os persist to NV-RAM modules, ensuring protection of in-flight writes against power loss and device failure.
- **Hot-swappable components:** Flash modules, NV-RAM modules, and controllers are hot-swappable for continuous operation, even when recovering from a failure.



## Purity Secure

FlashArray meets the highest security standards with FIPS 140-2 validated always-on encryption, NIAP/Common Criteria Certification, and rapid data locking. It's well-equipped to assist with compliance on new data regulations such as GDPR. EncryptReduce, introduced in Purity 5.3, allows for full in-flight encryption of data from a host, over the network, to a Pure FlashArray. This ensures greater security and all the data reduction benefits FlashArray has always offered.

### Always-on Encryption

Purity continuously [encrypts all data](#) within FlashArray via FIPS 140-2 validated AES-256 encryption, meeting the U.S. government's highest security standard for data-at-rest encryption. Encryption is built-in, always-on, always in-line, and costs nothing: there's no impact on performance, administrative overhead, key management—and no additional fee.

## EncryptReduce

Purity EncryptReduce, in conjunction with our partner Thales eSecurity, allows for full in-flight data encryption from a host, over the network, to a Pure Storage FlashArray.

This achievement provides the following:

- Allows for in-flight encryption over the wire
- Allows FlashArray to perform its standard data reduction
- Provides physical security through Key Management Interoperability Protocol (KMIP)

## Tough External Security

FlashArray's accreditation by the Common Criteria Organization (CCO) demonstrates its stringent standards for [data system security](#). Rapid data locking (RDL) offers smart card-based instant locking of an array. Similarly, KMIP support enhances software-generated secrets used to regenerate an array's flash module access keys.

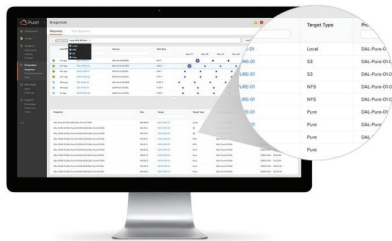
You can instantly disable an array and crypto-lock its data, greatly reducing risk of loss, capture, or compromise. Secure administration includes multiple account types, directory-based authentication, and secure management connectivity to enable secure administration.

Every organization that collects and/or processes the data of subjects in the European Union is subject to and must comply with the General Data Protection Regulation (GDPR). Penalties for non-compliance are significant, but a combination of data policies and technology considerations—such as encryption and data reduction—can help you achieve GDPR compliance cost-effectively.



## Cloud Block Store™

Pure Cloud Block Store for AWS is industrial-strength block storage delivered natively in the cloud. Powered by Purity software, Pure [Cloud Block Store](#) enables mission-critical applications to run in the cloud seamlessly, while also making public-cloud storage more powerful for web-scale applications. Cloud Block Store drives true hybrid operations with consistent data services, resiliency, and APIs, and bi-directional mobility and seamless management and orchestration. Gain the ultimate agility: faster application development and the ability to free applications from specific infrastructure.



Pure1 cloud-based management

## Complete Visibility with Pure1

Pure1 provides simple [cloud-based management](#) and effortless predictive support. With Pure1 Meta™, predictive intelligence helps to resolve potential issues and optimize your workloads, supporting our vision for self-driving storage.

Now, you can:

- Get information about the health of your entire stack, right up to each VM
- Predict and model capacity and performance needs over time
- Resolve issues before they become problems

## Additional Resources

- [FlashArray//X Data sheet](#)
- [FlashArray//C Data sheet](#)
- [Pure1 Data sheet](#)
- [ActiveCluster Data sheet](#)
- [DirectMemory Cache Data sheet](#)

\* Not all Purity features supported on all FlashArray models.

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