PAC Storage PS Gen2 Series Technical Overview

This whitepaper provides an overview of the PS Gen2 Series' key features, hardware components, data services, and use cases to help you better understand the system.

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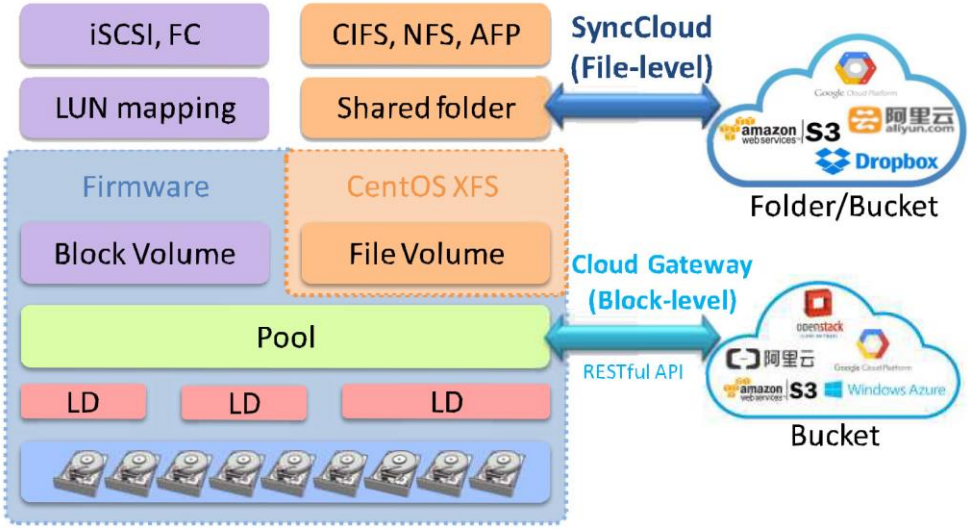
PS Gen2 Series Features

Cloud-Integrated Unified Storage

The PS Gen2 Series unified storage is based on the block-level RAID technology with XFS file system and PAC Storage's self-developed cloud engine. From a user's perspective, block-based unified storage provides better performance and response time for block-based applications, such as database, exchange and virtualization. XFS file system allows users to easily scale their file shares to handle today's tremendous growth in unstructured data. Compared to other file systems, its main advantage is the support for large-capacity file sharing and smooth data flow, enabling user convenience.

In addition to block and file level, the PS Gen2 Series also supports PAC Storage's proprietary cloud gateway engine and enables integration with third party cloud services with its complete features, including Cloud Cache, Cloud Backup, and Cloud Tiering. With Cloud Cache, all data is stored on cloud and users can choose to store all data or just the most accessed data on local storage. With Cloud Tiering, inactive data is moved to cloud for long term archive while the most accessed data will remain on local storage. For disaster recovery, Snapshot backup to cloud feature is capable of periodically taking snapshot images according to schedule and uploading to cloud so users can select the latest images on the cloud for data recovery. These cloud features are offered to allow users to leverage cloud storage capacity and make use of off-site backup and disaster recovery.

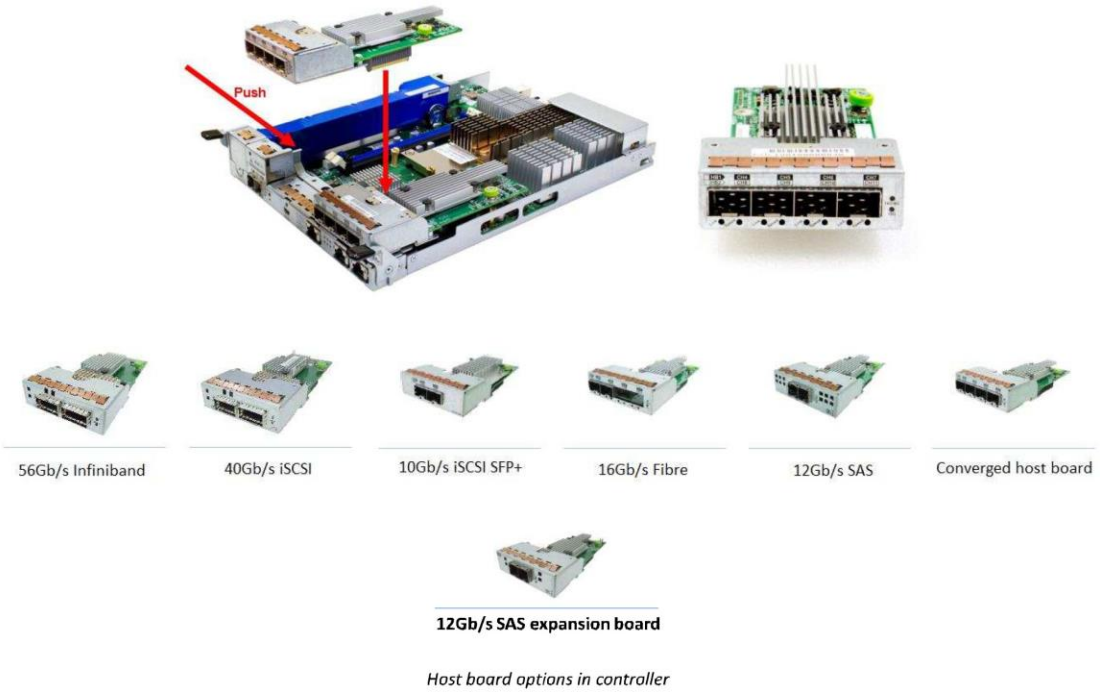


Complete Product Line

PAC Storage is devoted to the planning of the PS Gen2 Series line to meet a wide of range of user requirements. With the current PS 2000, 3000, and 4000 on the product roadmap of the PS Gen2 Series, additional host board interface ports, better I0PS/throughput performance, and higher scalability to satisfy customer demands for performance and storage capacity. PAC Storage also introduced the all flash array series with extremely outstanding performance and minimal response time for your mission-critical applications. With its proprietary software dedicated to all flash array, the PS Gen2 All-Flash Series extends the SSD lifecycle and significantly improves performance. By optimizing the overall system resource allocation, the PS Gen2 All-Flash outperforms the PS Gen2 Series by accelerating lOPS from 400K to 740K with the same configuration.

The single controller (storage processor) PS Gen2 All-Flash Series offers cost-optimized storage solutions with outstanding performance and versatility.

For the PS storage and JBOD configuration, multiple form factors, including 2U12, 3U16, 2U24, and 4U24, are available and the converged host board supports multiple interface ports, including FC 16G x 2, FC 8G x 4, iSCSI 10G x 4, and FCoE 10G x 4. In particular, the PS Gen2 4000, compared to other models, additionally provides 8 embedded on-board converged ports per controller so users will enjoy more flexibility on the interface configuration and double on-board I/O bandwidth performance. In general, with the converged host board, IT administrators who would like to upgrade the data host port connectivity from 10Gb/s iSCSi to 16Gb/s FC Channel can do so by substituting SFP+ or SFP transceivers and taking easy steps to switch the connection mode without changing the host board or controller. The converged host board offers flexibility for connections with different fiber-optic standards. It provides enterprises a whole new, convenient and versatile way to set up fiber-optic data storage systems that accommodate future data storage plans and enable cost savings for system upgrades.



Host board options in controller

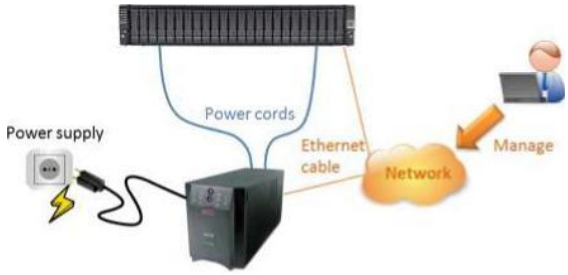
Reliable Supercapacitor Backup with Flash Module

The traditional backup battery is replaced by an innovative Cache Backup Module methodology (CBM) which consists of a supercapacitor and a Flash Backup Module (FBM). Cached data is quickly distributed to a flash backup module for permanent storage with the support of the supercapacitor in the event of a power outage. The main advantage of a supercapacitor is its ultra-fast charging time. The supercapacitor is charged within a few minutes and available to distribute power to the controller so cached data can be saved immediately and permanently in the flash backup module (FBM). In addition, the supercapacitor has a long-life expectancy and therefore is highly reliable and requires minimum maintenance effort.

Supercapacitor Backup with Flash Module

UPS Support

A UPS (Uninterruptible Power Supply) is an electrical apparatus to protect electronic devices from unexpected power failures and shut down the devices in a safe manner. PAC Storage's PS Gen2 and PS Gen2 All-Flash Series systems sends SNMP get-requests to synchronize the status of the UPS and shows it on the PAC Management Software GUI. When a power outage or other unexpected power failures occur, the system will turn into "safe mode" to prevent data loss and will also send a notification to the administrator.

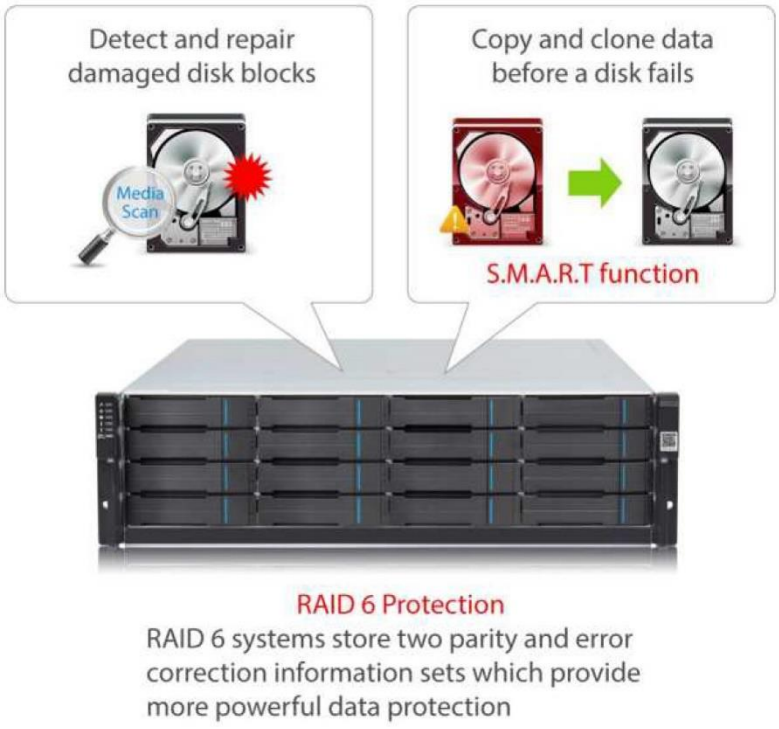


Built-in Intelligent Drive Recovery (IDR) Mechanism

IDR offers superior RAID protection and recovery compared to generic RAID, increasing data integrity and system efficiency while keeping your data secure against error and loss.

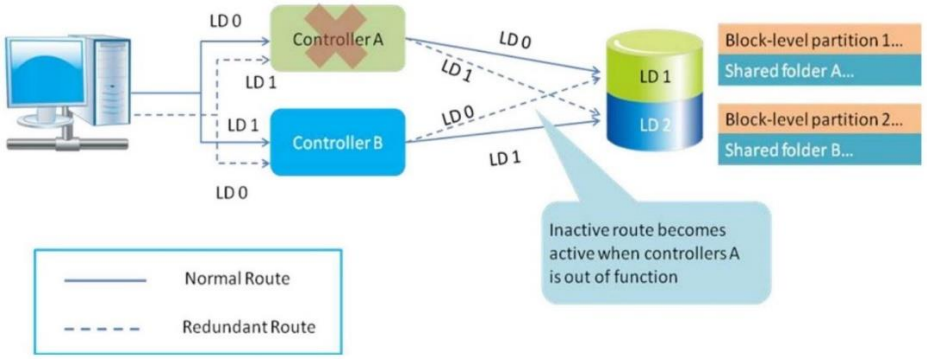
Working best in RAID 6, IDR uses spare drives to recreate data. Intelligent clone and replace prevents data loss by automatically recovering affected media. IDR clones faulty drives and is capable of specifically recovering bad sectors or blocks as needed. It automatically relocates potentially problematic data to readable sectors and blocks in the background without user intervention, providing a vital tool for preempting drive failure and preventing data issues.

Together with HDD S.M.A.R.T (self-monitoring, analysis, and reporting technology), IDR offers smart media scan, which catches errors before they become a problem. Smart media scan takes into account I/O demand, suspending and resuming to avoid performance degradation. Media scan can also be scheduled manually or set to automatic mode.



Supporting Native Block-level and SMB 3.0 Continuous Failover

A simple parity error may sometimes cause a storage system to completely hang up, and system downtime is not allowed for today's mission-critical environment. Having two controllers working together will guarantee that at least one controller will survive catastrophes and keep the system working. PS Gen2 Series Unified Storage supports both block-level failover and file-level (SMB3.0 continuous failover) in redundancy of dual controller design to ensure continuous service availability. During normal operation, each controller serves its own I/O requests from the host. If one controller fails, the other existing controller will temporarily take over for the failed controller until it is replaced. The failover and failback processes are totally continuous to the host and require only physical disconnection and reconnection efforts. Controllers are hot-replaceable and replacing a failed unit takes only a few minutes.

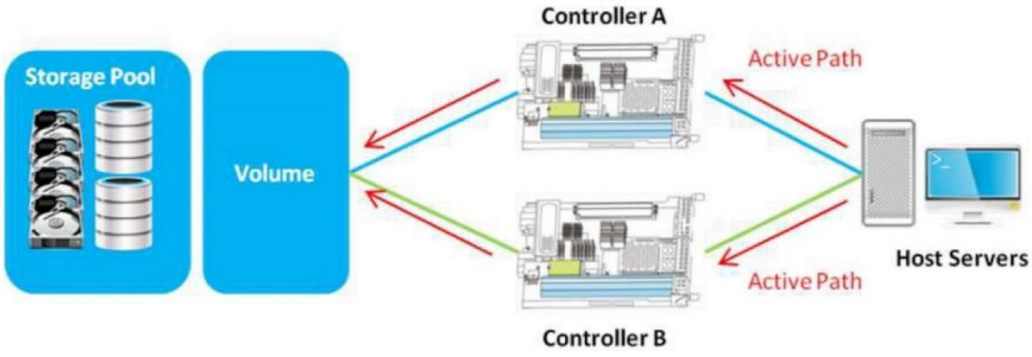


Controller Failover

Supporting Symmetric Active-Active Controller

In a storage system, storage controllers play as an important role in system overall performance. With powerful built-in CPU and flash memories, they are capable of quickly processing the data from host servers and disks. A storage controller manages the data flow between the host server and the storage LUN by assigning dual paths in case one of the paths fails. "Active" indicates that the controller is actively available at all times while "passive" means the controller remains idle until it is asked to take over a load. Generally, midrange storage systems use asymmetric controller architecture, which is also referred to as asymmetric logical unit access (ALUA). To optimize the efficiency and performance, the mechanism requires the administrator not only to deploy an active path and a passive path, but also to evenly divide and assign the storage pool to different controllers.

The PS Gen2 Series family introduces symmetric active-active controller architecture which does not require controller assignments. The state-of-the-art mechanism ensures performance enhancement and throughput load-balance with multiple accesses from/to one consistent LUN space for users. Thus, IT veterans can enjoy a stable and higher ROI storage system deployment.



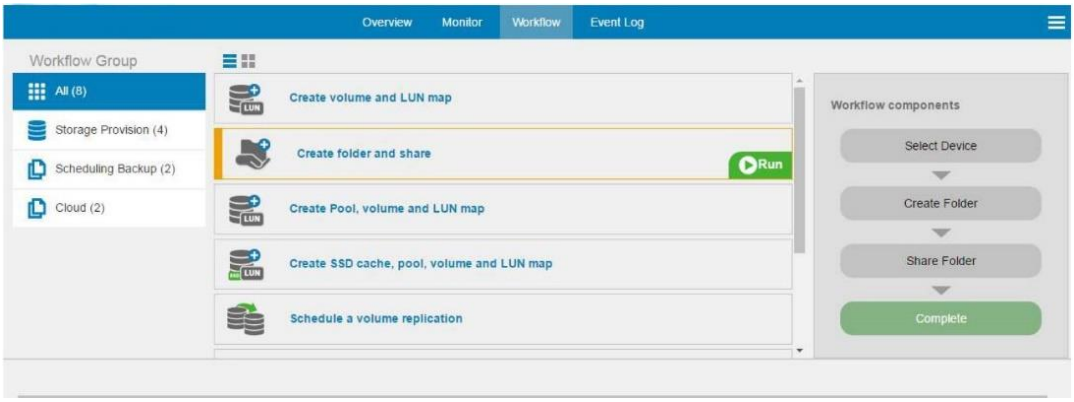
PAC Management Software
An Easy-to-use Interface for Management

The PAC Management Software, the PS Gen2 Series' management interface, simplifies data management by providing a single control center for centralized system management and resource monitoring. IT administrators are able to easily analyze and optimize system resources to improve ROL One of the innovative features of the PAC Management Software is its workflow automation GUI that integrates storage controls such as storage provision, scheduling backup as snapshot, and cloud into one easy and simple step-by-step procedure by grouping similar functions and settings into one streamlined page. This makes it much faster and easier to configure new systems while avoiding all the hassles of complicated navigations. Another advantage is Storage Resource Management (SRM) which allows IT personnel to analyze performance and capacity usage status to optimize system resources with quota management. Complete event notifications for system monitoring ensure users are fully informed of various events.

At the login for the first time to the PAC Management Software, you will see an initial Setup Wizard which will guide you through basic storage configurations.

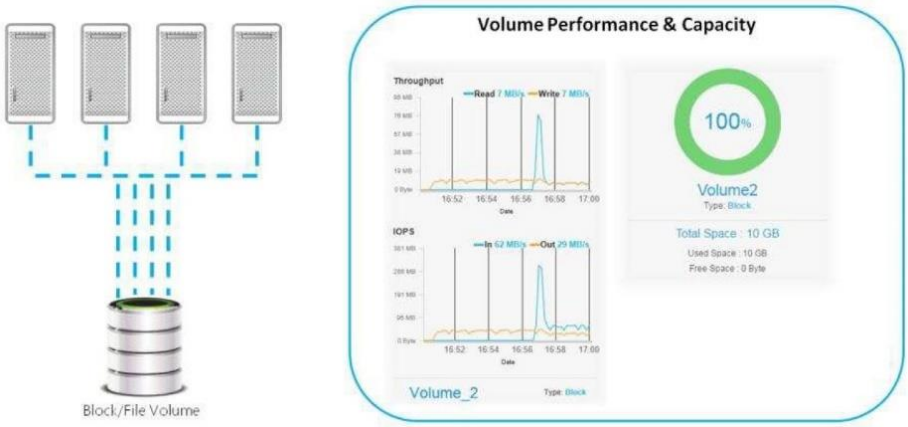
Initial Setup Wizard Page

Workflow can integrate storage controls into one easy and simple step-by-step procedure by grouping similar functions and settings into one streamlined page.



Workflow

For conveniences of storage status monitoring, the PAC Management Software provides analysis data of performance and capacity usage so users can easily locate the problem when any unplanned situations happen.



Performance Monitoring

As for storage consumption analysis, the Storage Resource Management (SRM) function helps to collect the history records from disk array systems and displays them in trend charts. Users can easily plan storage usage ahead, make decisions, and even locate abnormal situations.

Choose the Display Time Interval of the SRM Diagram

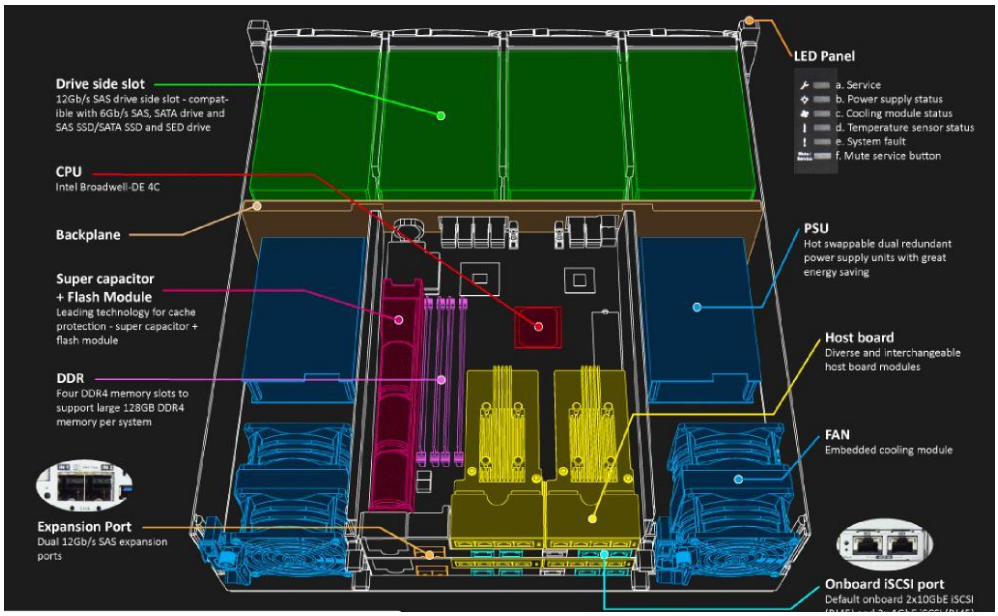
Hardware Overview

The PS Gen2 Series platform runs the gamut from flash to hybrid systems, rackmount to desktop models, including the all-flash array, entry-level PS 1000, mid-range PS Gen2 All-Flash 2000, 3000 and 4000. The models share certain similarity in the form factor. All enclosures for hybrid storage are designed to utilize 2.5" or 3.5" hard drives (only 2.5" for all-flash array) and drive capacity can be expanded by installing expansion host boards or attaching expansion hard drive enclosures (JBODs), and feature high-availability hardware design with redundant and hot-swappable hardware components, such as dual controllers, power supplies and cooling fans, to eliminate single-point-of-failure. The main differences among the series are the computing power, memory capabilities and connectivity, designed to meet different operation requirements.

PS Gen2 3024 Front View

PS Gen2 3016 Front View

Hardware Components



Top View of PS Gen2 3000 Hardware Component

Hardware Highlighted Features

Large Memory Size

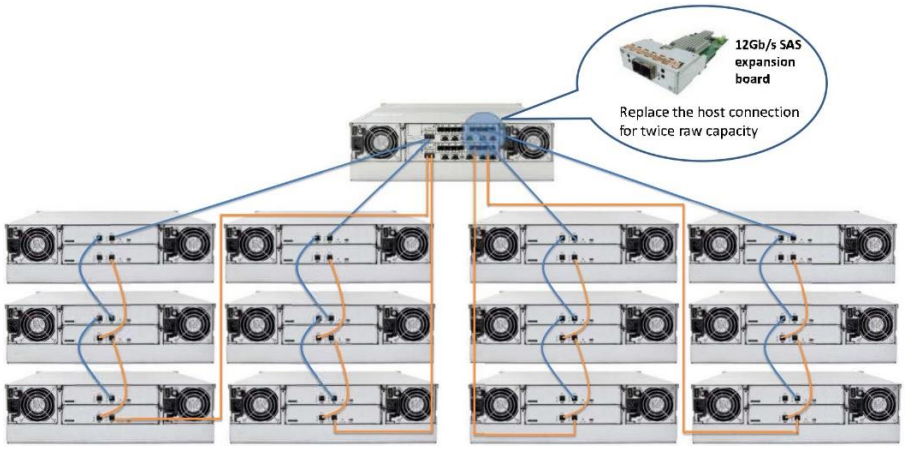
The PS Gen2 Series supports up to 256 GB per system (128 GB per controller). Due to its large memory size, more data can be stored in temporary memory as read and write cache, enabling faster processing. In other words, compared to small capacity systems, it is expected to have better performance and quicker response time in application use cases. In addition, adopting larger memory size provides the system great ability to process multi-tasks. For example, operations can run more smoothly with larger memory capacity when block- and file-level services are enabled simultaneously.

**Available in PS Gen2 3000 and 4000 Models*

Hardware Scalability

PS Gen2 Series supports high scalability and upgradability based on highly scalable hardware design. Various form factor options of JBOD expansion units are available that help users quickly and efficiently expand capacity without downtime. With 12Gb/s SAS connectivity to compatible JBOD enclosures and drives, storage capacity can be expanded as easy as cascading up to 900* drives with a RAW capacity as large as 9,000 TB*, and customers can save as much data as they want with no worries about capacity limit.

**Available in PS Gen2 2024 and 3024 with 10TB Nearline SAS Drives*

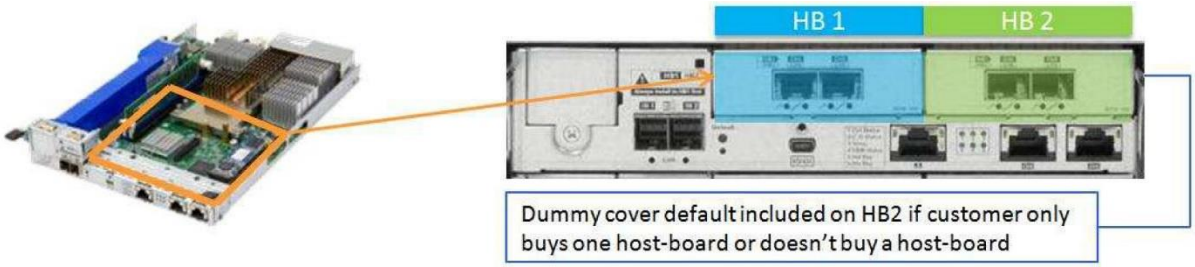


Redundant Cross Loop and Protection Against Single Point of Failure

Dual Host Board and Embedded On-Board Converged Host Board Design

The PS Gen2 Series features an optional dual host board design which vastly augments storage network speed and flexibility. The PS 4000 additionally offers 8 embedded on-board converged interfaces per controller in order to meet modern data center requirements on easy management, flexibility and convergence. Beyond wider bandwidth, it enables hybrid combinations of Fibre Channel (up to 16Gb/s), SAS (up to 12Gb/s), and iSCSI (up to 10Gb/s) for diverse connectivity. With its unique dual host board design and 12Gb/s SAS interfaces to internal SAS or SATA disk drives, these systems achieve a massive throughput to meet even highly demanding applications such as media editing.

**Dual Host Board Available for PS Gen2 2000 and 3000 Models*



PS Gen2 2000 and 3000 Dual Host board Design for One Controller

PS Gen2 4000 Dual Host Board and Embedded On-Board Converged Host Board Design

Cable-less Modular Design

The PS Gen2 Series' completely cable-less and modular design eliminates problems associated with cable connections to offer a higher level of serviceability and hot-swappability. This design is for easy deployment and maintenance.

Cable-less Design

Data Service Overview

Rapidly growing data leads to burgeoning storage needs. As an ideal storage solution for business-critical applications, the PS Gen2 Series not only provides necessary capacity and performance to accommodate data and process transactions. It also offers comprehensive data services to provide cloud integration features and ensure storage operation efficiency, enhanced data protection, and serviceability.

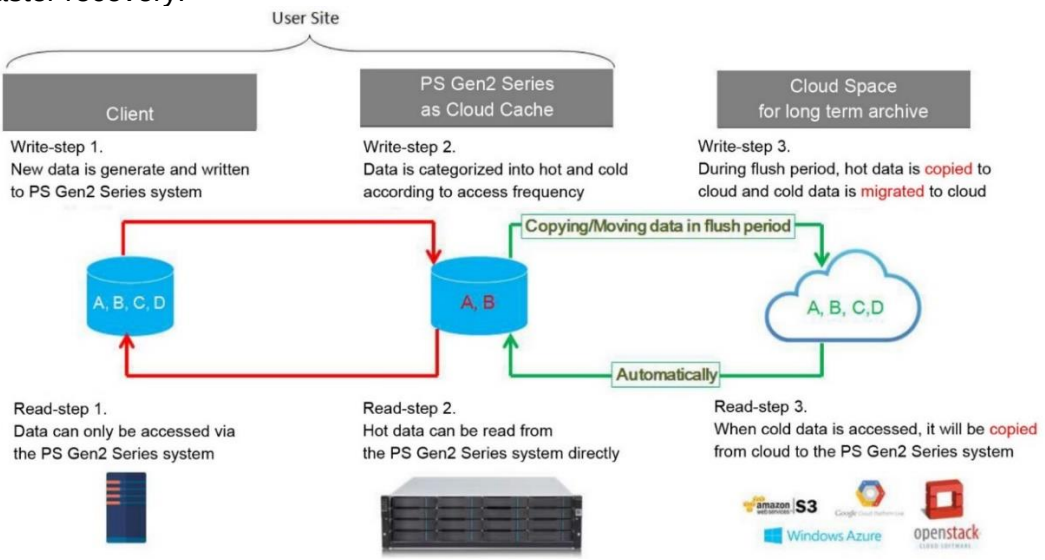
Cloud Integration

The PS Gen2 Series integrates three cloud features that extend local storage with cloud capacity or make use of off-site backup and disaster recovery. These features include Cloud Cache and Cloud Tier. Currently the PS Gen2 Series supports integration with the following cloud service providers:

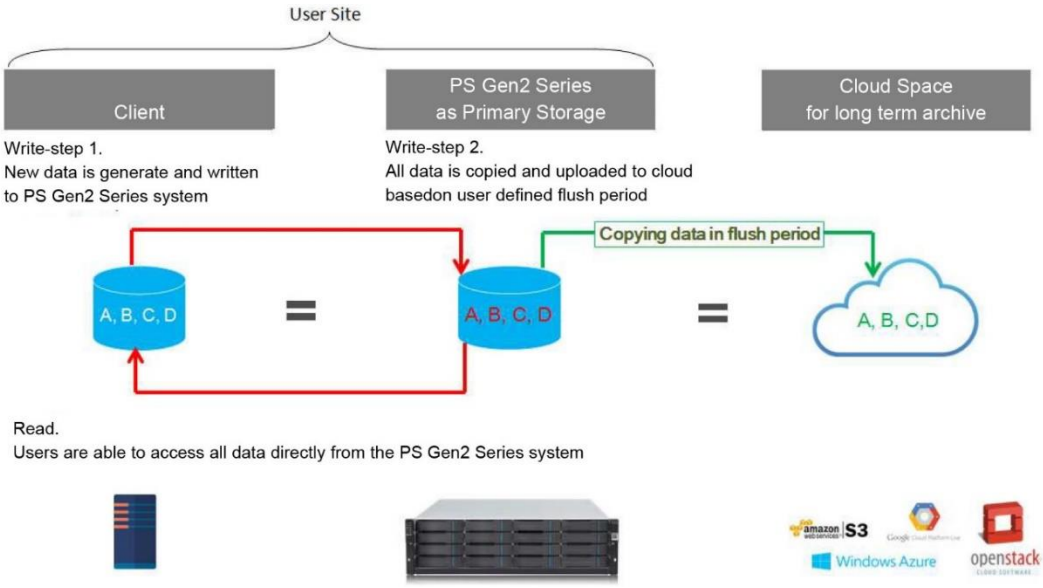
- Amazon S3
- Google Cloud Platform
- Microsoft Azure
- Alibaba AliCloud
- OpenStack Swift

Cloud Cache

Enable the Cloud Cache to establish a connection between a storage pool and a cloud bucket. Data will automatically be deduplicated, compressed (optional), and encrypted when migrated to the cloud. Cloud Cache is available in two options—fully cache or non-fully cache. If Fully Cache is active, the PS Gen2 Series system will keep all data locally and flush all data to the cloud based on a scheduled snapshot. On the other hand, if Fully Cache is inactive (non-fully cache), the PS Gen2 Series system will keep only frequently-accessed data locally and flush all data to the cloud based on a scheduled snapshot. Regardless of whether Fully Cache is active or inactive, all data will be stored in the cloud and is recoverable based on the last flush period of the snapshot. Based on the operation mechanism of Cloud Cache and Cloud Fully Cache, Cloud Cache is suitable for email archiving or less-frequently-accessed database archiving and Cloud Fully Cache is suitable for less-frequently-accessed database or production data backup and disaster recovery.



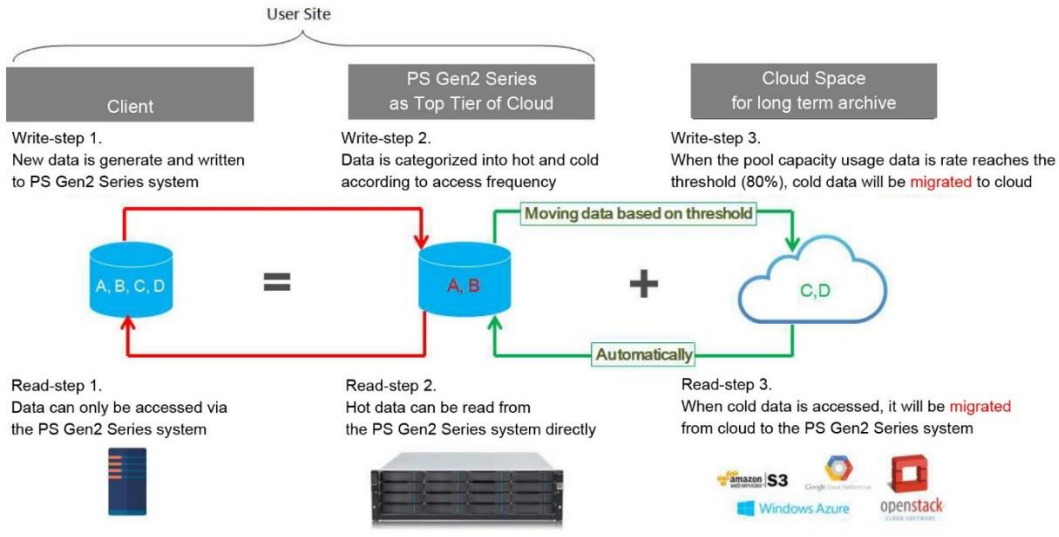
Cloud Cache



Cloud Fully Cache

Cloud Tier

With Cloud Tier, PS Gen2 Series users can establish a connection between a pool and a cloud bucket to integrate cloud storage into a storage tier, keeping the frequently accessed data locally to ensure a high read/write speed while moving the less accessed data to the cloud. Less accessed data stored locally will be moved to the cloud according to its data access frequency record if the used storage pool capacity exceeds 80% (Threshold > 80%). Therefore, data will exist only either locally or in the cloud. Therefore, we strongly suggest that you take snapshot images with the Cloud Tier feature to ensure data integrity. If users need to retrieve less accessed data which is stored in the cloud, it will take time to access the data as it will be first decompressed (optional), unduplicated, and decrypted into its original format. In addition, data migration speed from cloud to the PS Gen2 Series system is based on Internet bandwidth. Due to its mechanism, Cloud Tier is suitable for users who wish to leverage online scalability due to a steady capacity demand and can deal with slower cloud data access.

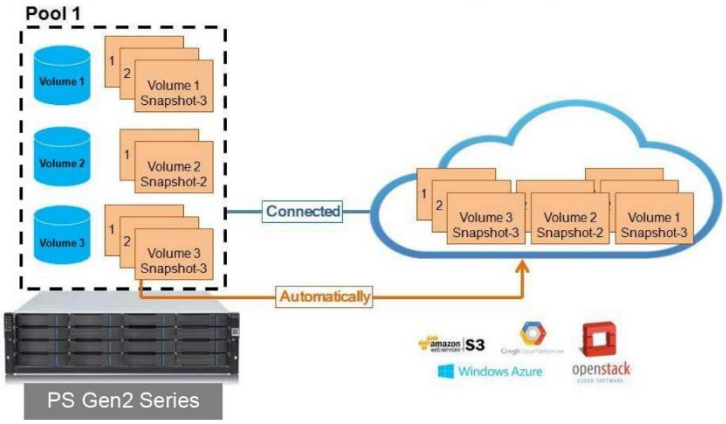


Cloud Tier

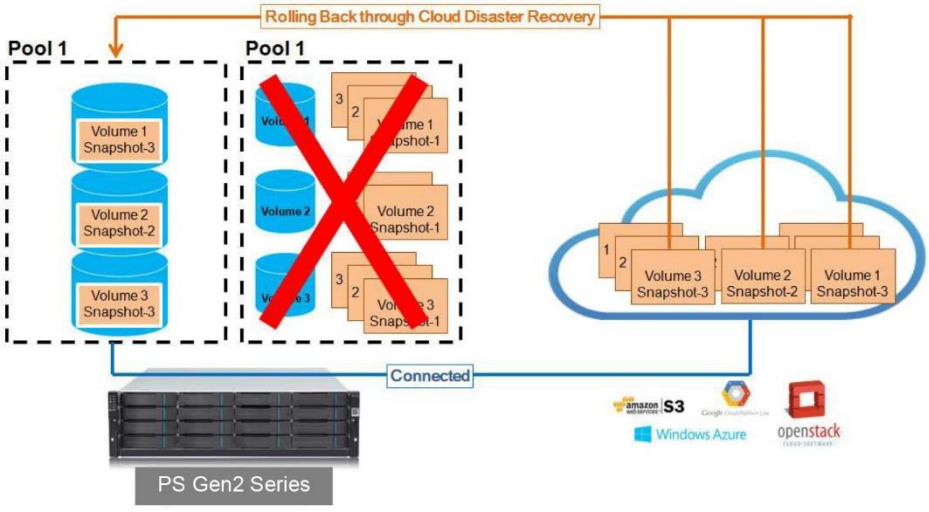
Disaster Recovery

The usage-based model of cloud computing is well suited for disaster recovery (DR), and it offers a viable alternative to on-premises solutions. Snapshot back up to cloud combines DR operations with three cloud-integrated features enhances data protection and business continuity, resulting in additional cost savings and flexible deployment. It allows users to upload snapshot images onto the cloud storage. When pools are deleted by unexpected incidents, the snapshots on the cloud can be used to recover the data and serve as the last line of defense against data loss.

1. When a pool is connected with a cloud service provider, snapshots taken within the pool can be selectively uploaded to the cloud when scheduling or creating snapshots.



2. When a pool is deleted due to unexpected incidents, users can use the snapshot images on the cloud to recover the original data.

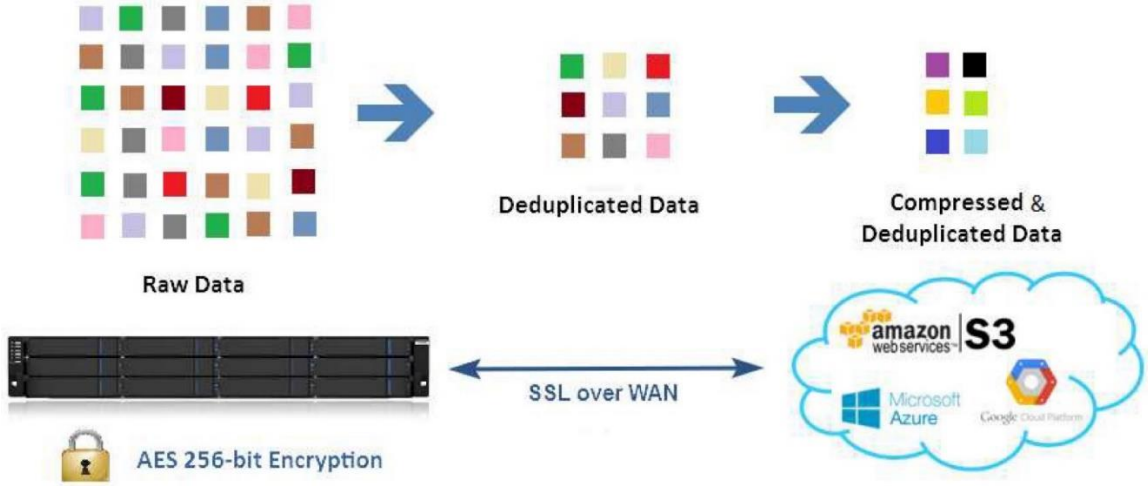


Data Reduction Technology: Deduplication & Compression

The PS Gen2 Series' cloud gateway engine can automatically de-duplicate and compress data (optional) before moving it out of on-premise storage, which significantly reduces footprint to cloud and lowers the cost charged by cloud service providers. In addition, the PS Gen2 Series encrypts data with AES 256-bit algorithm for in-flight and at-rest data to ensure data security.

Data deduplication is a method of consolidating redundant copies of data. In the deduplication process, unique chunks of data are identified and stored during a process of analysis. As the analysis continues, other chunks are compared to the stored copy and whenever a match occurs, the redundant chunk is replaced with a small reference that points to the stored chunk.

The PS Gen2 Series uses GZIP, a format standard where the underlying compression algorithm is called Deflate, to operate compression and de-compression process in order to optimize bandwidth usage before delivering data over the Web. Compression helps speed up data transmission time and minimize cloud storage costs, and there are many types of data that can benefit from compression, such as archives for virtual machines file and static copies of databases.



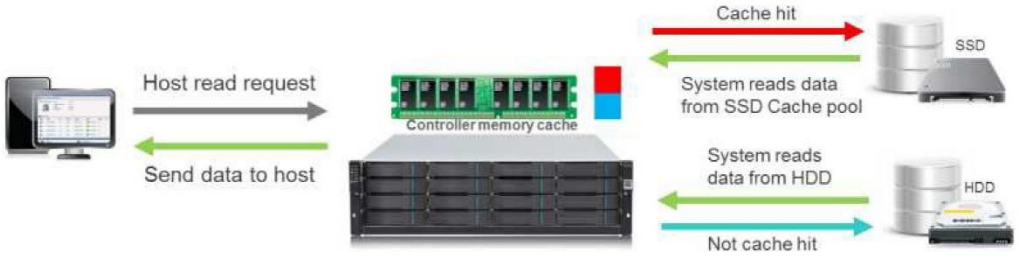
Data Reduction Technology

Operation Efficiency

SSD Cache

Cache is a component that transparently stores data so that future requests for the data can be served more efficiently. It is fundamental to storage, especially for read-intensive applications. Because the capacity of controller memory cache is limited, SSD Cache* allows fast SSD to be used to extend the cache pool capacity of storage systems and stores frequently accessed data. While the capacity of SSD Cache has increased, the cache hit rate has also improved. With more hot data stored in the SSD Cache, future request for those data can be served more efficiently and the read performance dramatically improves.

**SSD Cache feature is not available for all flash models*



SSD Cache

Automated Storage Tiering

Block-based automated tiering automatically migrates data between low and high performance drives. A maximum of four tiers can be deployed, with the highest tier (tier 0) featuring the highest performance level. The most frequently accessed data will be stored on the fastest storage tier. Users can greatly optimize storage performance and increase ROI when enabling this function.

**Automated Storage Tiering feature is not available for all flash models*

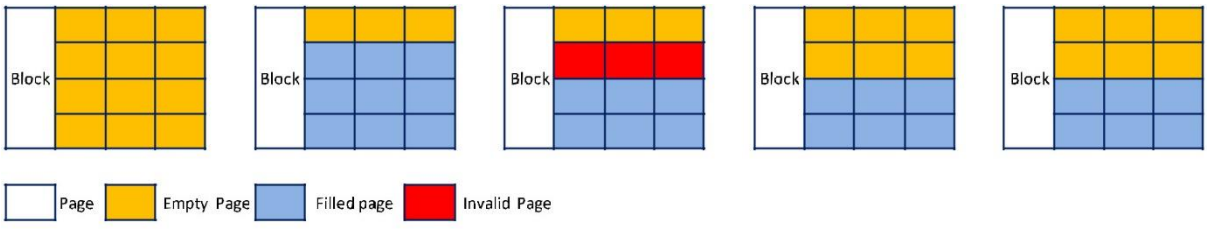
Automated Storage Tiering

Trim (Unmap)

Traditionally, data blocks within hard disk drives (HDDs) can be overwritten. However, due to physical structure and limitations, this mechanism cannot be applied to solid state drives (SSDs). Data blocks in flash memory has to be erased to blank space before it can be overwritten, which is called SSD garbage collection. In the SSD, data is typically stored as a minimum unit in a page and 128 pages is stored as a block. However, data can be accessed through a page, but can only be erased by a block. Therefore, the performance of SSD is fast when reading data or writing data into a blank page and is reduced when overwriting data, which contains complicate procedures.

Without the trim feature, SSDs will not know which data in the page has been deleted and is marked as "invalid" until the host sends a write request on the same page. In this mechanism, due to frequent reads and writes, SSD performance is not optimized and its life cycle is shortened. If trim is enabled, the system will send a signal to inform SSD that data within the page has been erased within an appropriate time (off-peak hours) and that new data can now be written directly when the old data is deleted. The SSD copies the entire data block into the cache and writes the valid page back to the corresponding page to clear invalid pages. Therefore, the new coming data can now be written to the pages at full speed.

**Trim feature is only available for all flash models*



1. SSD pages contain no data.
2. The host writes data to SSD pages.
3. The host deletes some data. The pages are marked as "invalid" by the host but data remains on SSD.
4. If the system support UNMAP, system will find a suitable time to inform SSD that pages contain invalid data and do not write to another new block when doing garbage collection.
5. Data is written back to SSD. The invalid data has been erased and the pages are ready to be written.

Thin Provisioning

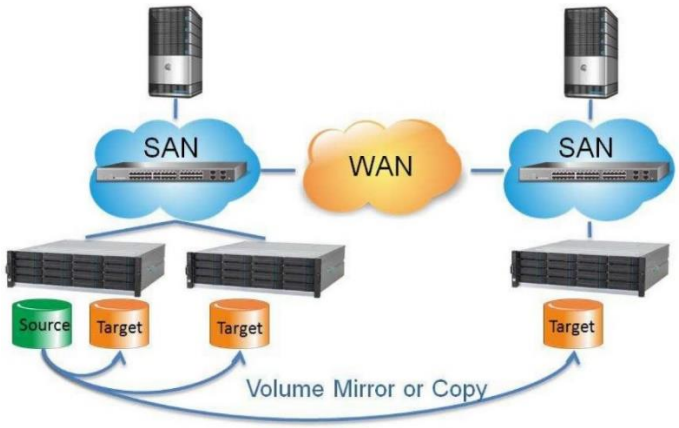
Thin provisioning allows you to allocate a large amount of virtual capacity for a pool regardless of the physical capacity actually available. Actual space is used only when data writes occur. By automatically allocating system capacity to applications as needed, thin provisioning technology can significantly increase storage utilization. Thin provisioning also greatly simplifies capacity planning and management tasks.

Data Protection

Block Replication

PAC Storage's Block Replication (Block-level Remote Replication) capability allows users to create full data copies across storage systems, including in synchronous or asynchronous mode. If source data fails due to system malfunctions or disasters, users can leverage disk-based remote copy to restart services in a few minutes. If the source needs to resume its role, it can be quickly synced with the remote copy while adjusting only for differentials.

To further ensure the integrity of remote data, remote replication allows users to protect remote copies with snapshot technology. Granular snapshot images can help restore corrupt remote copies in seconds when the resumption of business services is a top priority.



Block-level Remote Replication

Snapshot

Snapshot functions provide instantaneous point-in-time copies of data that look and behave like complete backups without consuming equivalent disk space. The snapshot images are ideal for various applications including backup, testing or development, information analysis and data mining.

In the instant of snapshot creation, a point-in-time data image is taken without disrupting online applications. Based on the image, data changes will be copied to the snapshot volume when new writes occur. With copy-on-write design, the PS Gen2 Series system's snapshot protects production data from accidental modifications, deletions and corruptions with minimal capacity requirements and performance overhead. By accessing a snapshot copy as the desired recovery point, users can immediately restore system availability from data disruption.

File Replication (Rsync)

File Replication via the Rsync protocol allows users to create an identical backup copy of a PS Gen2 Series system (source) in a target device located at a physically distant place. When system failure occurs, the target can swiftly restore the data and network services to the previous state.

Data Security

Self-Encrypting Drives (SED)

SEDs have an encryption controller (ASIC) and an encryption key both embedded on the hard drive itself. SED encryption is automatic and transparent without performance degradation. A unique encryption key is generated randomly at the factory for each SED. The encryption is essentially fail-safe, meaning drives are extremely secure when installed in an array or when removed so even if the physical drive is stolen or misplaced, the data thereon remains protected against intrusion.

Folder Encryption

The PS Gen2 Series system supports comprehensive data protection mechanisms to provide the highest level of data integrity and availability. When folder encryption is enabled, the encrypted folder is password-protected with 256bit AES encryption to prevent data leakage if drives are stolen or the management server is hacked. Users can still freely access files in the folder when the folder is unlocked.

IP Autoblock

The IP Autoblock feature is a defense mechanism to prevent PS Gen2 Series devices from being accessed by unauthorized users or malicious attacks such as DDOS. Administrators can set policies to deny/allow connections from IP addresses within a certain range/region or to block access from certain IP addresses when the log-in attempts have failed for a specified number of times.

WORM

The PS Gen2 Series system supports the creation of WORM (Write Once Read Many) volumes wherein the files are read-only to ensure data integrity. Two modes are available—Compliance WORM and Enterprise WORM. Files in a Compliance WORM volume cannot be modified, renamed or deleted by the user or the administrator. For files in an Enterprise WORM, the administrator can delete them but cannot modify or rename them and users cannot modify, rename or delete them. Due to the WORM characteristics, cloud cache, cloud tier and synchronization with cloud storage are not available for WORM volumes. Snapshots of WORM volumes are read-only and cannot be rolled back.

Serviceability

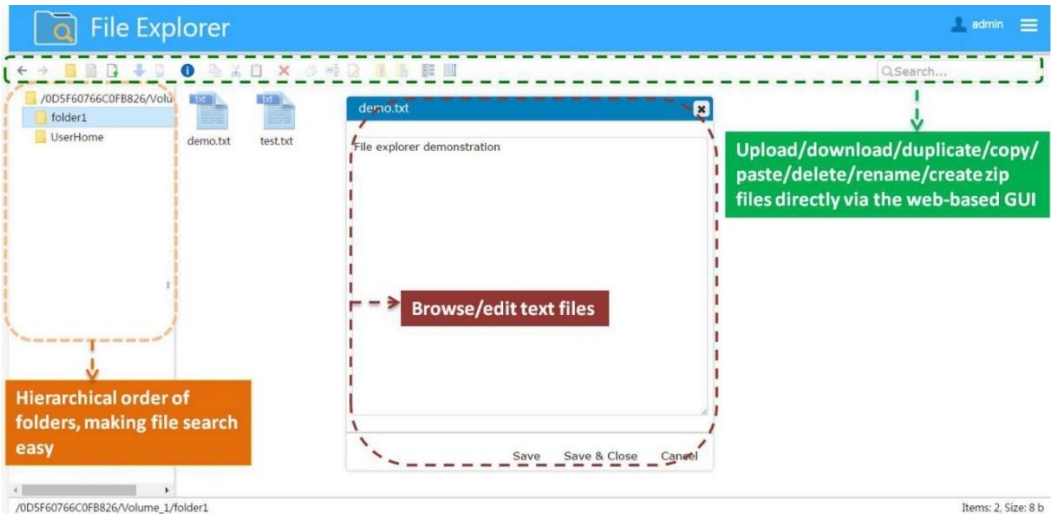
Service Manager

Service Manager, a built-in service on the PAC Management Software, provides a proactive approach to technical support for the PS Gen2 Series systems. When a hardware failure occurs on a PS Gen2 Series system, the system can automatically notify the PAC Storage Service Center, which will automatically create a service ticket and return merchandise authorization (RMA) and a technical support engineer will contact the user and send a field-replaceable unit (FRU). In the case of troubleshooting or requesting additional features, the user can create a service request form on the PAC Management Software and the system will automatically collect and send system configuration information to the PAC Storage Service Center. After the PAC Storage Service Center receives the service request, it will issue a service ticket and launch subsequent procedures, thus greatly simplifying and accelerating the process of requesting technical support.

Add-on Applications

File Explorer

File Explorer is a file management application built in with the PS Gen2 Series to enhance its usability. With File Explorer, it is more convenient for the administrator to search, browse or share files in the PAC Gen2 Series file system.



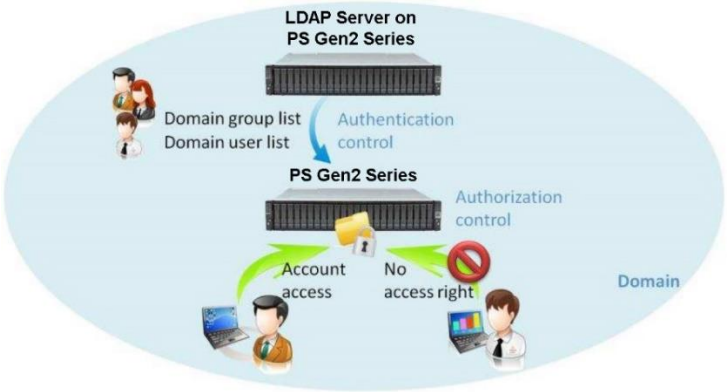
File Explorer

Proxy Server

The proxy server acts an intermediary for requests from a client to other servers, providing caching and access control for HTTP-based services. When a user connects to the proxy server on the PS Gen2 Series system, the access control rules will be applied to the user, denying requests for accessing restricted websites. When an HTTP request is made, the proxy server caches contents in the reserved storage space and the cached contents will be delivered if the same request is made again. With the proxy server application, the administrator can build a working environment with enhanced network security and productivity.

LDAP Server

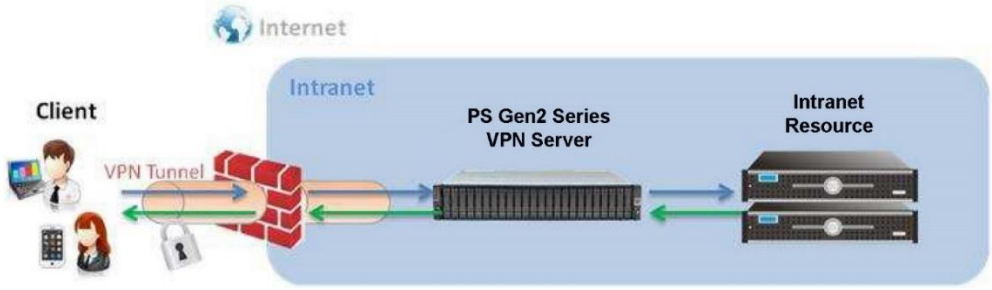
The Lightweight Directory Access Protocol (LDAP) is a standard protocol for accessing and maintaining distributed directory services over network. The LDAP Server function is embedded in the PS Gen2 Series system. Multiple PS Gen2 Series systems can be joined to the LDAP server provided by one of the PS Gen2 Series systems. The administrator can easily manage user accounts by connecting the LDAP server and the PS Gen2 Series NAS without a second system.



LDAP Server

VPN Server

Virtual Private Network (VPN) provides secure connections to access network services or resources across a public network such as Internet. With PS VPN Server service, you can remotely and securely access resources within the local area network of your PS Gen2 Series system or surf the Internet through L2TP/IPSec VPN tunnel. The VPN Server application can be connected with a built-in VPN client in various operating systems.



VPN Server

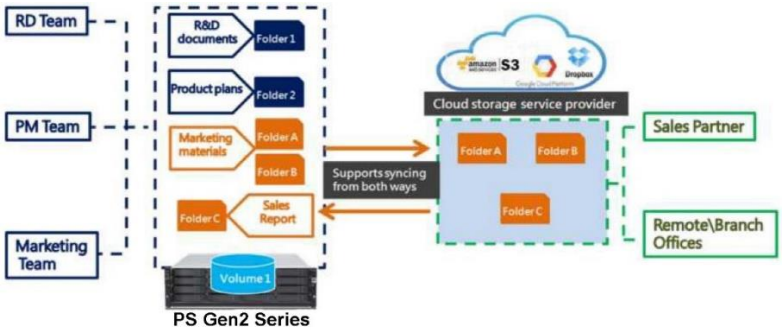
Syslog Server

Syslog is a standard for message logging in computing, consisting of the identity of the event log generator, event text messages, and a severity label. Generally, IT administrators use syslog for system management and security surveillance as well as debugging messages. Since Syslog data may be significantly large and need to be stored safely, the Syslog Server application within the PS Gen2 Series system allows storage devices to receive syslog sent from a variety of clients (e.g. NAS, Router, UPS, etc.). Syslog can be transmitted via TCP transfer protocol, which allows users to manage system notifications with security.

Syslog Server

SyncCloud

The SyncCloud feature allows data in a PS Gen2 Series storage system to be synchronized with data on cloud storage provided by public cloud services such as Aliyun, Dropbox, Google Cloud, and Amazon S3. Sending files to the public cloud offloads insensitive data sharing from the headquarters file server. Therefore, file servers can be set at a higher security level, denying direct access from outside the company network. With SyncCloud, files can be shared to partners/ROBOs and fetched from the public cloud using their familiar web interface.



SyncCloud

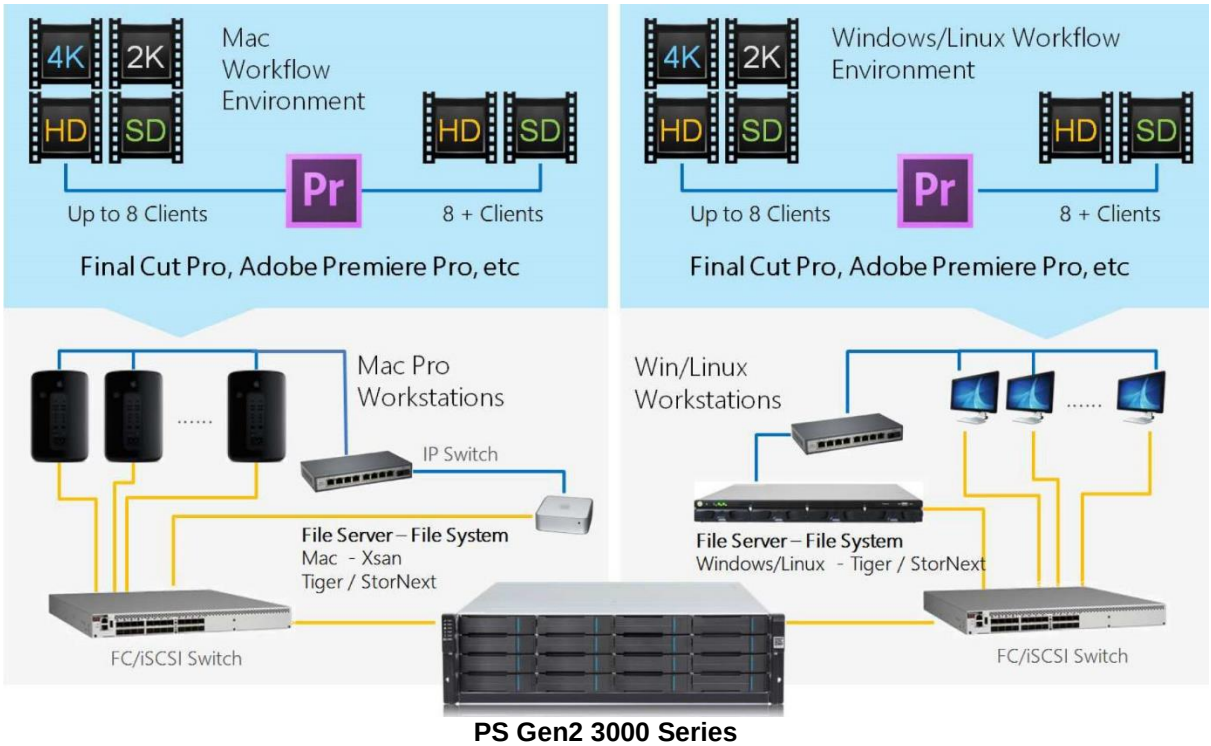
PS Gen2 Series Use Case

With best-in-class scalability, performance and availability, the PS Gen2 Series Unified Storage system optimizes support for critical applications, cloud-ready infrastructure and data center consolidations, all through a single platform.

General Application	PS Gen2 Series Benefits
Media & Entertainment	- Compatible with popular and industry-standard 3rd party software (Xsan, StorNext, MetaSAN, Diva, SGL and more) - Supports multiple host platforms (Windows, Mac OS) and host interconnections (8Gb/s and 16Gb/s FC, 1Gb/s and 10Gb/s iSCSI) within media and entertainment environments - Consolidates SAN and NAS in a single system to provide powerful storage features and simplify deployment and management
Mail Solution	- Provides considerably more mailboxes per drive than competitors - Consolidates SAN and NAS in a single system to provide powerful storage features and simplify deployment and management - Supports cloud integration solutions, enabling users to extend data to cloud automatically for long term archive - Multiple host interface choices: 8B/16G FC, 1G/10G iSCSI, 6G/12G SAS - Expansion scalability: up to 900 drives - High availability and reliability hardware protects mission critical email services and contents
Database **(SQL, Oracle, My SQL)**	- Supports popular database applications - Supports All-Flash Storage solutions / Hybrid Storage solutions with wear level function to monitor remaining SSD life - Consolidates SAN and NAS in a single system to provide powerful storage features and simplify deployment and management
Virtual Desktop Infrastructure **(VDI)**	- All-Flash and Hybrid solutions for high performance computing and solving boot storms - Simple to deploy and manage: Intuitive PAC Management Software interfaces and workflow automation GUI enable repeatable management tasks to be automated - VMware, Citrix, and Windows Hyper-V ready - Consolidates SAN and NAS in a single system to provide powerful storage features - High availability and reliability hardware protects mission critical data
Data Center Virtualization	- Seamless integration with virtualization environment, VMware, Citrix, and Hyper-V ready - Comprehensive All-Flash Storage / Hybrid Storage solution - Consolidates SAN and NAS in a single system to provide powerful storage features - Non-disruptive operations based on redundancy components
NAS Application	**PS Gen2 Series Benefits**
File Server (CIFS / NFS)	- File server (CIFS/NFS/FTP): high and stable bandwidth
Cloud Gateway	**PS Gen2 Series Benefits**
Disk to Cloud (D2C)	- Supports cloud integration solution, enabling users to extend data to cloud automatically for long term archive - Provides deduplication and compression to reduce bandwidth usage and increase storage efficiency

Media & Entertainment

In the media asset industry, companies can be categorized into video production, TV stations and network streams. Video production services include most advertising productions, film post-processing and animation productions. TV stations contain local or nationwide TV stations. Network streams are a new media category usually used in network television.



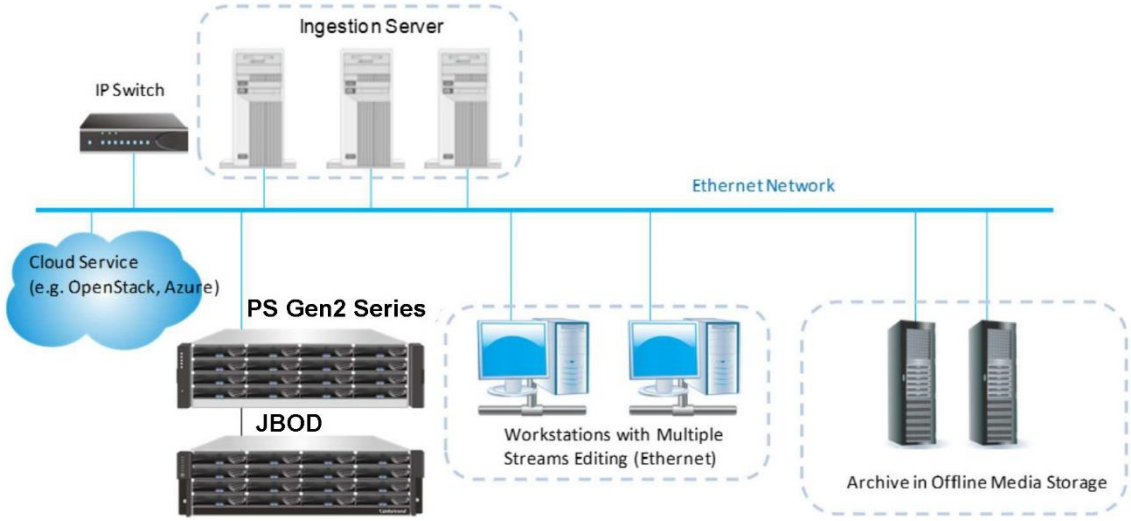
PS Gen2 3000 Series

Reference Architecture

Major M&E applications of the PS Gen2 Series can be divided into the following two categories. Users can configure the system according to their requirements.

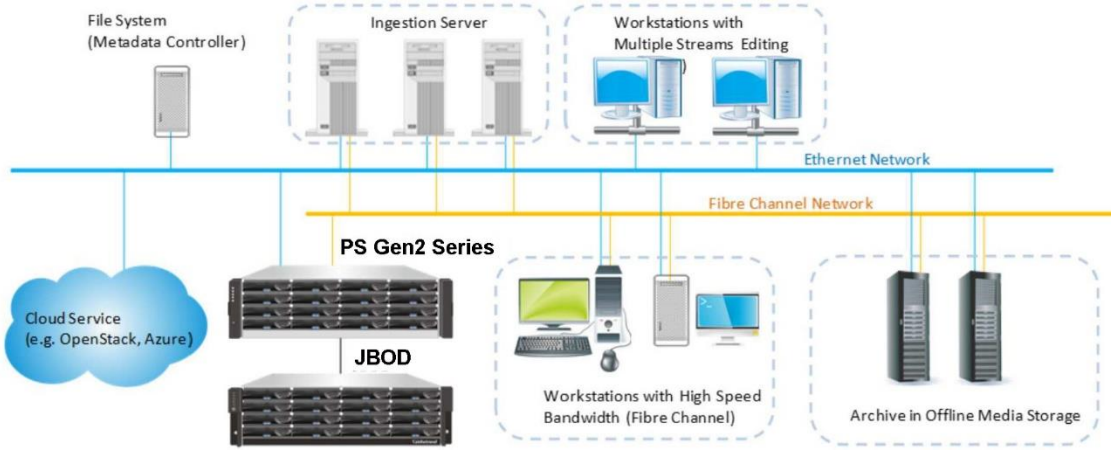
NAS Network Architecture Solution

The NAS network architecture solution meets the needs of mass multiple streams broadcasting and editing. Unified storage with full-IP network provides convenience and compatibility to most network structures.



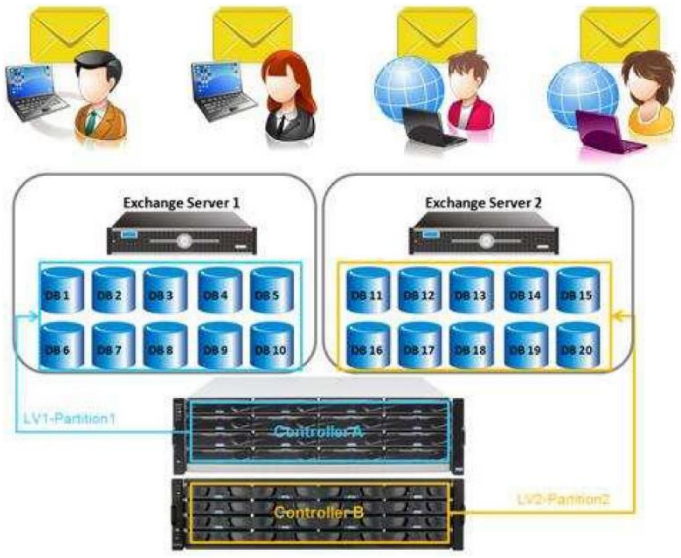
Unified Architecture Solution

This solution offers those media groups with some high-resolution video retouching and multiple small stream editing. Hybrid architecture provides high flexibility to fit users' environments.



Mail Solution

Mail server is a disk-intensive application. The PS Gen2 Series supports high expansion scalability and can be scaled up to 444 drives, flexibly compatible with different types of drives. Configuration of the system should take mailbox capacity and future growth, performance requirements, number of databases and database size into consideration. Since a larger database size and a higher number of databases may impact performance, it is recommended to follow mail server guidelines when configuring the system.



Database

Data can be of various levels of importance at the time when they are created and their value may change with time. Capacity demand will also grow with. Furthermore, users' access patterns on the data are different and they may also expect different read/write performances. The PS Gen2 Series supports storage tiering and SSD cache, with which frequently accessed data and log files are moved to SSD storage to take advantage of SSD's low latency and infrequently accessed data (cold data) is migrated to 15K SAS, 10K SAS, or NL-SAS to make use of the large low-cost capacity.

Virtual Desktop Infrastructure

Most businesses employ a mix of professional talents, such as sales, marketing, finance, call center workers, etc. In a traditional IT infrastructure, computer resource management is always a nightmare for IT staff as they try to meet the variety of requirements of the different types of workforce in a business environment. The PS Gen2 Series unified storage integrates SAN and NAS features in one enclosure, providing easy folder sharing and better protection for user data and profile for all VDI users, making VDI deployment simple.

VDI Solution

Easy Folder Sharing for All VDI Users

The PS Gen2 Series can help not only build a VDI infrastructure but also provide features of file sharing. Shared folders are the basic directories, transferring data to VDI users over TCP/IP using the CIFS for Windows, NFS for Linux/ UNIX, or AFP for Apple OS X, where users can securely and easily share documents with other colleagues in the same company. In addition, based on each type of employee's requirement, IT staff can set up folder permissions for them.

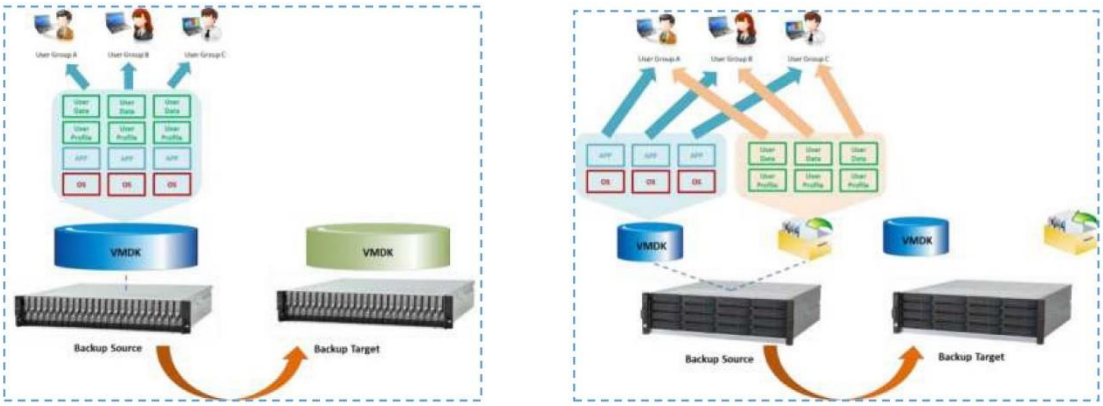
Easy to set up folder permission for different user groups

Optimizing VDI Data Management

The PS Gen2 Series unified storage along with well-organized planning will greatly simplify VDI data management.

Typically a virtual desktop consists of OS, applications, user data (created from daily work including document, spreadsheets, and so on). OS and applications files are frequently accessed by all users, and they do not grow rapidly in capacity. On the other hand, user data are not accessed frequently but the capacity grows over a period of time. Therefore, it is better to manage them separately.

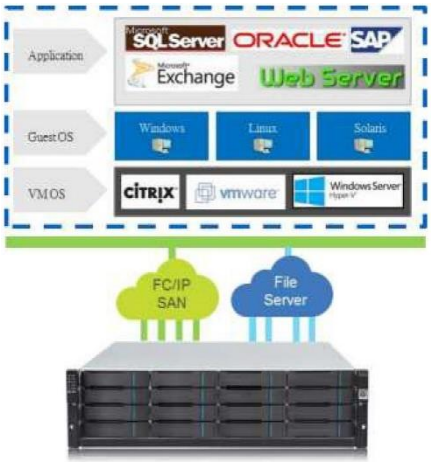
Traditional SAN Storage has to back up all VMDK files and this is time-consuming and costly. However, the PS Gen2 Series provides efficient management solutions. Along with a reasonable backup plan and 3rd party tools, the PS Gen2 Series can help only back up valuable user data and profiles and save backup time.



Traditional SAN Storage vs. PS Gen2 Series Unified Storage

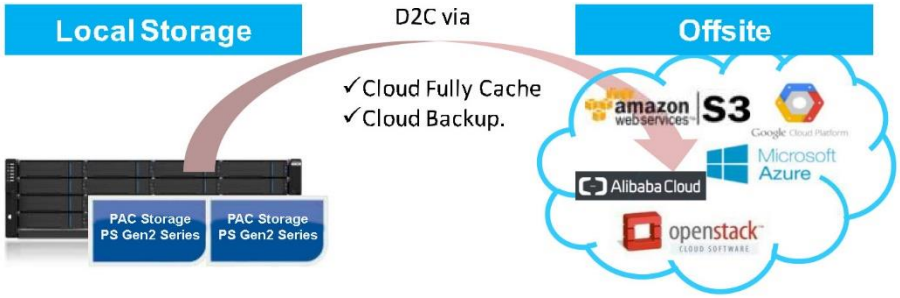
Data Center Virtualization

The PS Gen2 Series has been designed to seamlessly integrate with a virtualization environment, offering user-friendly GUI for efficient operations and delivering all flash and hybrid storage solutions to sustain heavier workload demands and loads. In addition, the PS Gen2 Series consolidates SAN and NAS in a single system so users can easily share folders among virtual machine users and set folder permissions based on requirements.



D2C Backup

Data backup to cloud storage is the trend of the future. With the Fully Cache and Snapshot back up to cloud features, the EonStor GS/GSe enables Disk to Cloud (D2C) backup with the remote replication function of GS/GSe. In the case of a disaster, data on the cloud can be restored from a local site to thereby ensure organizations' application programs can continue to provide services without interruption. To guarantee data security both in-flight and at-rest, the EonStor GS/GSe will encrypt the data using the AES 256-bit algorithm before transmitting the data to cloud. Also to reduce bandwidth usage and increase storage efficiency, the EonStor GS/GSe provides data deduplication and compression.



D2C Backup Solution