

A background image of a server room with blue lighting and a digital overlay of binary code (0s and 1s) and data streams.

# PAC Storage Scale-Out NAS Family User Guide

This document introduces the document resource of PS Scale-Out NAS.  
Also introduce the configuring procedure of PS Scale-Out NAS.

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## Preface

The purpose of this user guide is to provide users an efficient way to find all PS Scale-Out NAS product related software and hardware information, to guide users through system architecture to basic installation and configuration, and to introduce PAC Storage customer support service. PAC Storage dedicates its work to develop the best storage solutions to fulfill customers' expectations and their requirements. Therefore, PAC Storage further develops its products continuously and releases periodically information about hardware and software updates online. PAC Storage recommends users to check the official website for the latest news, the customer support system for latest firmware and software, or, in case of a product malfunction or a feature that is not working as intended to contact a PAC Storage technical support professional.

## Audience

This user guide is intended for PAC Storage customers and partners who want to quickly get an overview of the PAC Storage PS Scale-Out NAS system.

## What's in This Guide?

This guide contains the following topics:

“**Getting started**” provides information you need to know before using the PS Scale-Out NAS.

“**Using PS Scale-Out NAS**” provides basic configuration while using PS Scale-Out NAS.

“**Customer Service**” offers information and resource reference for customer supports.

## What You Should Know Before Reading?

This user's guide assumes that you are familiar with basic server, storage, and networking concept and configurations.

# Getting Started

## 1.1 Overview of PS Scale-Out NAS

PS Scale-Out NAS is a scale-out NAS system that provides high performance and capacity. By unifying multiple nodes to provide a single namespace system, user is allowed to access the system via standard protocol, effectively reducing data management hassles and cost.

PS Scale-Out NAS provides comprehensive data protection to protect against disk, node and even cluster failure, effectively protect user data and maintain system serviceability. With the scale-out and scale-up capabilities, PS Scale-Out NAS is able to individually scale performance and capacity without downtime.

Furthermore, PS Scale-Out NAS supports flexible storage deployment to meet different application requirements, whether it's throughput-intensive applications like High Performance Computing (HPC) and Media and Editing (M&E), or capacity-intensive workloads, such as data backup and archive.

PS Scale-Out NAS provides:

- High performance and capacity cluster system
- Fully distributed single file system
- High scalability and availability
- Comprehensive data protection
- Easy management and maintenance

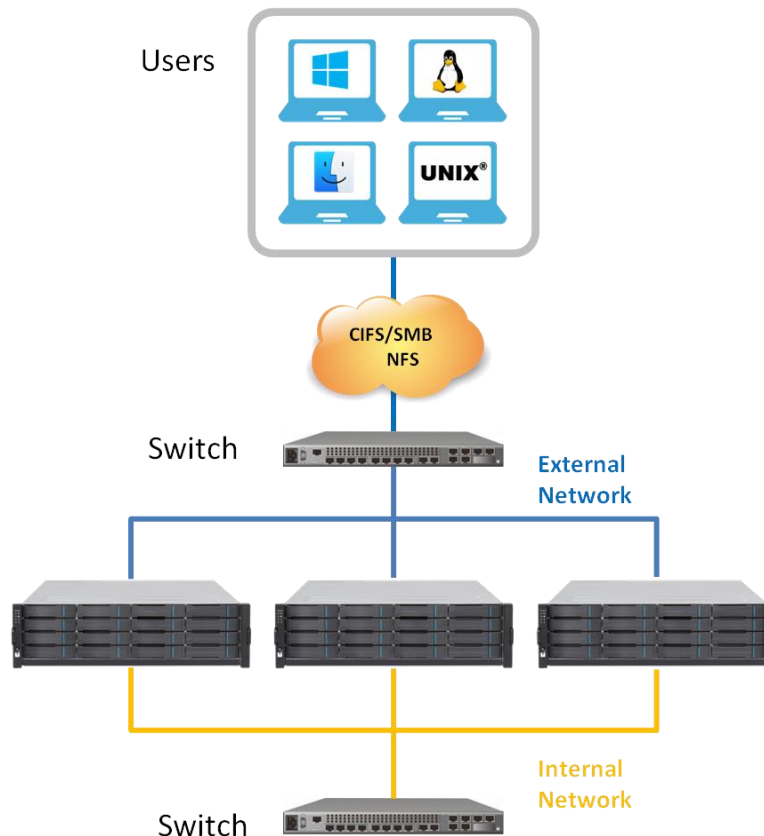
## 1.2 PS Scale-Out NAS Architecture

### 1.2.1 System Architecture

The basic unit of PS Scale-Out NAS storage is node, a node is a storage system with multiple drives providing storage space. Traditionally each storage system has its own namespace, and it's not allowed to share capacity or performance between storage systems, which may cause low storage efficiency and management difficulty. PS Scale-Out NAS unifies multiple storage nodes to provide a storage cluster system with single namespace, and user is allowed to use protocols like CIFS/SMB, NFS and FTP to access all nodes in the cluster system.

PS Scale-Out NAS is a symmetric cluster system; all nodes in the system provide services to the clients and continuously monitor each other for cluster status. Unlike asymmetric cluster system that needs metadata server, PS Scale-Out NAS does not require a dedicated metadata sever, and therefore is more scalable and reliable.

There are two networks for the system, one is for external, which is needed for the communication between user client and PS Scale-Out NAS cluster, and the other is for internal network, which is for the communication between PS Scale-Out NAS nodes. Figure 1-1 shows PS Scale-Out NAS system architecture.



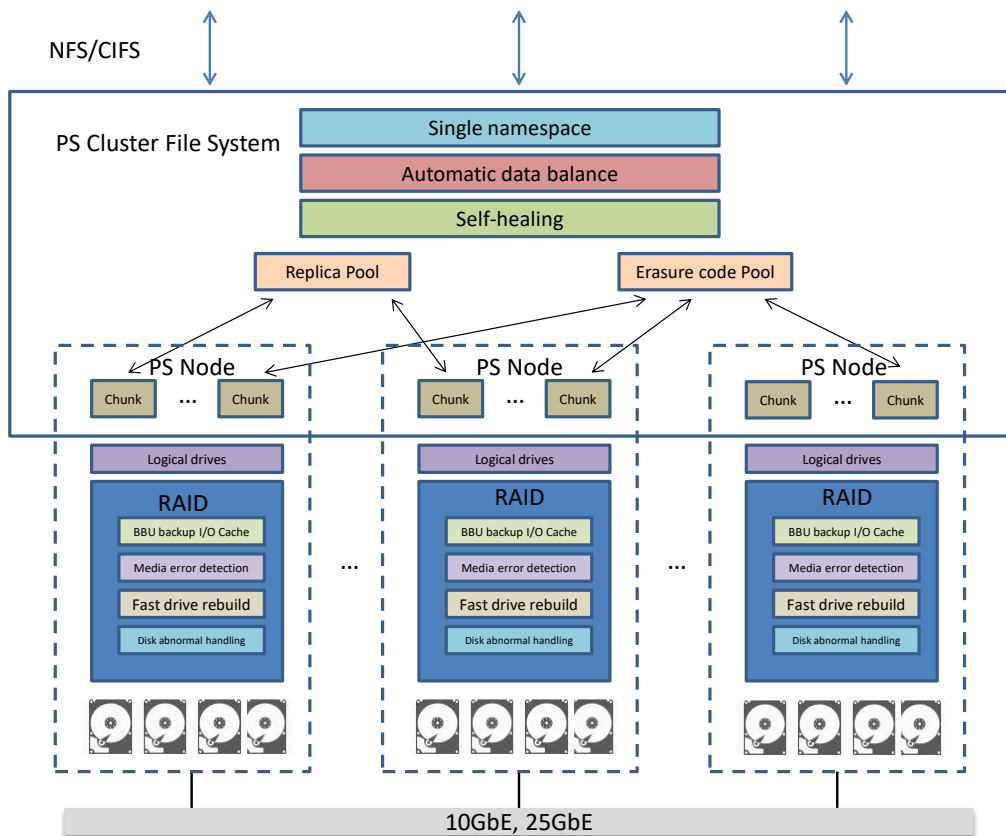
**Figure 1.1 PS Scale-Out NAS System Architecture**

### 1.2.2 Software Architecture

At the bottom of the PS Scale-Out NAS storage system is PAC Storage RAID, it groups multiple disks to form logical drives (LD), and provides RAID 5/6 disk protection. In addition to disk failure protection, PAC Storage RAID also provides better disk abnormal handling, continuously media error detection and correction, and fast drive rebuild – Unlike other scale-out NAS systems that do not provide RAID protection, there is no performance impact for PS Scale-Out NAS when rebuilding the drives. The BBU backup cache design protects cache data against power loss, and therefore further accelerates I/O performance.

On the top of logical drives, the system is divided to multiple basic storage units called chunks, user is allowed to aggregate chunks on different nodes to form storage pools to fulfill different application needs, for example, you can create a Replica x 2 disk pool for read-intensive application, and create an Erasure Code pool for backup data.

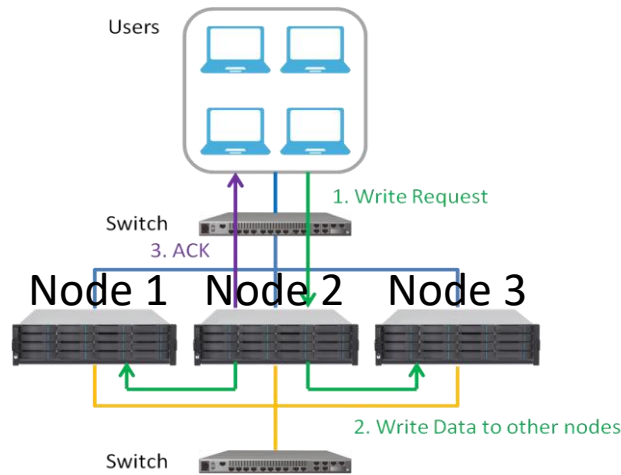
On top of disk pool is PS Scale-Out NAS cluster file system, which provides management to storage disk pools, automatic balance of data between nodes, self-healing of data when node fails, and most important, a single namespace for the system. Figure 1.2 is the software architecture of the PS Scale-Out NAS system.



**Figure 1.2 PS Scale-Out NAS Software Architecture**

### 1.2.3 File I/O

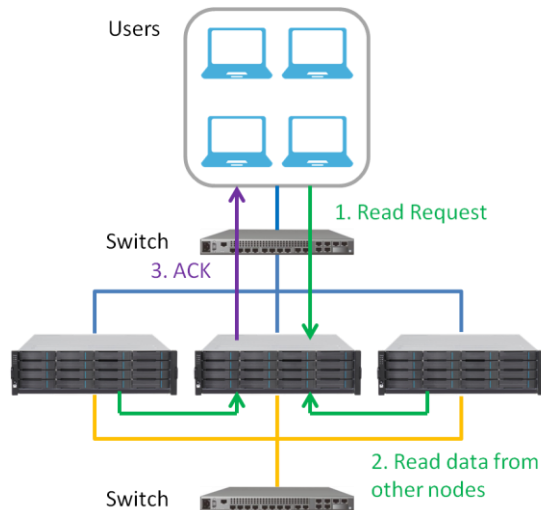
During a write operation, user client is allowed to connect to any node in the cluster to issue write command, when data is written to the node, the system first checks disk pool protection level, if it's Replica, multiple copies will be created, if it's Erasure Code, parity will be generated, and then, data or parity will be replicated to proper nodes to protect against node failure. In figure 1.3, user client writes data to node 2, node 2 then duplicates two copies to node 1 and node 3, after all nodes complete write data to the system, node 2 will respond to client successful data write.



**Figure 1.3 Write IO Process**

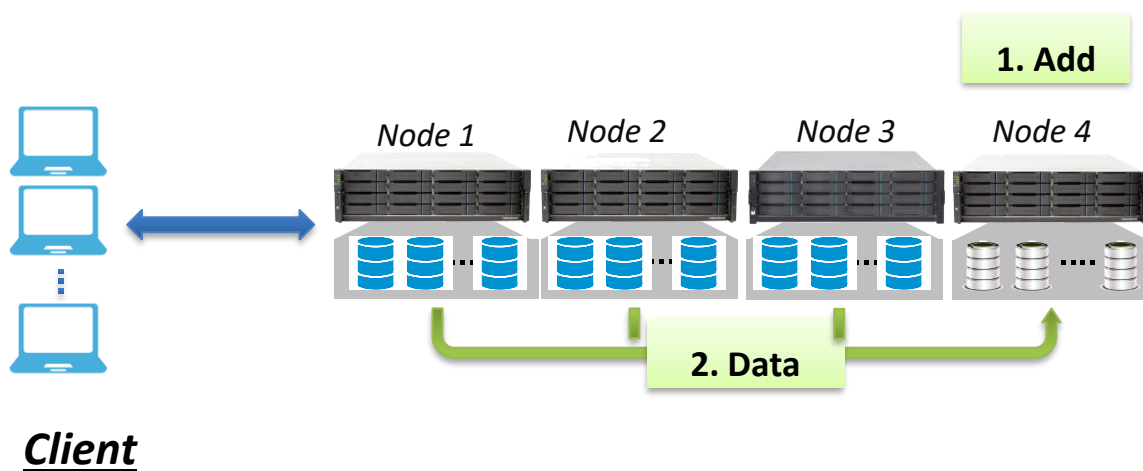
When client tries to read data from the cluster, client connects to any node in the cluster system to issue read request, if data is located in the node where client connected, data will immediately return to the client; if data or partial data is on other nodes, data will first be read from other nodes, assemble and then send back to the client. Figure 1.4 is an example of erasure code 2+1 data read operation, client sends read request to node 2, node 2 then read partial data from node 1 and 3, assemble data and send back to the client.

**Figure 1.4 Read IO Process**



### 1.2.4 Expansion

PS Scale-Out NAS allows user to add more nodes or JBOD for expansion. When more performance or capacity is needed, a new node can be added to the cluster, this node can then provide I/O to enhance cluster performance, and disks in this node can provide more storage capacity for the system. To maximize cluster performance, data in the cluster will be redistributed to newly added node to make sure data on all nodes are balanced, just like figure 1-5, data on node 1, 2 and 3 will be migrated to node 4 to a balanced state to provide better performance.



*Figure 1.5 Node expansion*

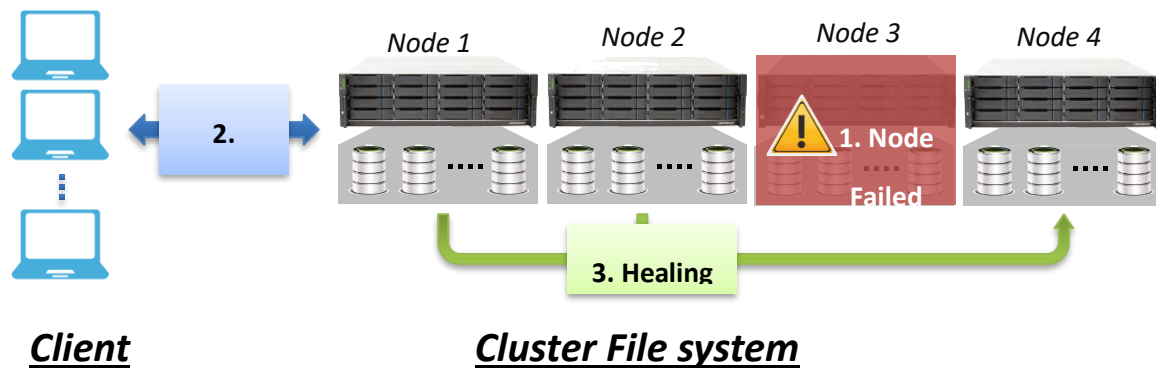
When only capacity expansion is needed, user can add JBOD to the node, disks capacity will then be added to the cluster. Same as node expansion, data in the cluster will be redistributed to a balanced state, and it's recommended to have all nodes to have same capacity.

### 1.2.5 Failure Protection

PS Scale-Out NAS uses RAID to protect disk in the node, data can still be retrieved when there is a disk failure, and when a failed disk is replaced, and data will be rebuild to the new disk. If a node fails, this node status will temporarily become unavailable and system status will become degraded, but data access will not be impacted, whether erasure code or replica protection is used, data stored at failed node can still be retrieved from other nodes. If the failed node does not come back after a period of time, the system will start self-healing process, it will rebuild data on the failed node from other nodes and store to working nodes; after self-healing process is completed, cluster status will become normal again. Note that if there is no space left to restorer failed node data, self-healing process will not be started.



Figure 1-6 shows self-healing data flow, when node 3 fails, node 1, 2 and 4 will rebuild node 3 data, and then write to nodes that have free capacity, service to the client will not be impacted.



*Figure 1.6 Self-healing*

### 1.2.6 Management

PS Scale-Out NAS provides a central management web interface to manage the cluster, user is able to use browser to connect to the cluster nodes to do the management, and no dedicated manager server installation is required. When PS Scale-Out NAS cluster is created, a management IP is assigned during cluster deployment, this management IP will then be assigned to the master node in the cluster. The role of the master node is to collect information and status from all other nodes, issue commands, and provides web management interface to the user. When the master node fails, the remaining nodes will elect a node to be the master node, and it will take management IP to continue provide management service to the users.

# Using PS Scale-Out NAS

## 2.1 Hardware Installation

Detailed information about the hardware installation, maintenance and upgrade can be found in the PS Scale-Out NAS Series **Quick Installation Guide** and **Hardware Manual**. The Quick Installation Guide, which is a provided in printed version included in the storage sub-system too, provides a guideline to assist you to quickly install and basically setup the PS Scale-Out NAS. The hardware manual introduces hardware components of the PS Scale-Out NAS and JBOD systems to be connected with, and describes in detail installation, maintenance and monitoring. If you want to scale-up your PS Scale-Out NAS, please refer to the **Expansion Guide** for detailed information and limitation.

## 2.2 Software Configuration

After hardware installation, you can start to deploy and create the cluster, after cluster is created, you can use PS Management Software to create disk pool and share folder for client access.

### 2.2.1 Deployment Wizard

PS Scale-Out NAS provides a deployment wizard for you to quickly deploy the cluster; it will guide you step by step to build the cluster.

### 2.2.2 PAC Management Software

After the PS Scale-Out NAS cluster is created, you can use the PAC Management Software which is a web-based user interface to manage the cluster. The dashboard provides general system information including cluster and capacity status, node, pool and shared folder information, and system events.

The first step to use the PS Scale-Out NAS is to create disk pool, you can create multiple disk pools with different protection level and size, you can also configure threshold alert for pool capacity usage monitor.

Once disk pool is created, you can start to create folders on disk pool. The PS Scale-Out NAS provides File Manager, it's a web based file management tool just like file explorer in Windows system, almost all folder and file operations can be done by using File Manager, including create folder, set permission, upload and download file.

PS Scale-Out NAS provides standard protocols for you to share folders for client access, just go to shared folders configuration page to create a new shared folder; you can then share it out by using CIFS/NFS/FTP protocols. Please note that a folder can be shared by using multiple protocols. For more information about system configuration and management, you can refer to the PS Scale-Out NAS Software Manual.

## 2.3 System Maintenance

PS Scale-Out NAS provides easy system maintenance, you can use the PAC Management Software console or check hardware status for maintenance. In the PAC Management Software console, you can manually start self-healing process when node fails, balance storage capacity when add node, and even replace a node with new node, you can also check system, node and drive status from both the PAC Management Software and hardware LED.

When there is component failure that needs to be replaced, the PS Scale-Out NAS **Hardware Manual** provides detailed information including node replacement, drive replacement, PSU/cooling module replacement and CBM replacement.

## **Website**

For more information on PAC Storage products and services, visit:

<https://www.pacstorage.com>

## **Customer Support**

Contact your system vendor or visit the following support site.

<http://www.pacstorage.com/pac-storage-product-support.html>