

# NEC QxFS Storage Platform

## Simplified Storage Management and Reliable Performance

### Eliminate Silos

Replace legacy storage architectures and their siloed approach with a truly unified storage solution and enable better collaboration, ease of management, and efficient use of hardware.

### Linear Scale-Out

From a handful of nodes to thousands and to petabytes of storage: scale performance and capacity linearly.

### Simplicity at Scale

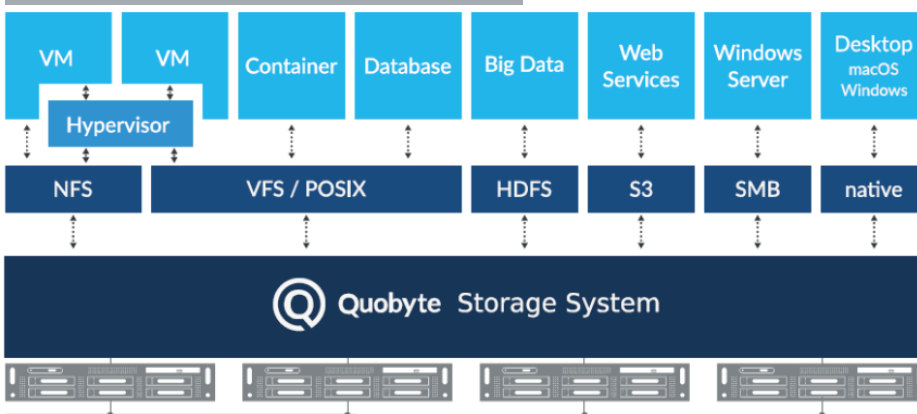
Easily install and administer the NEC QxFS storage system and benefit from real-time analytics and a self-healing software storage system. Get the insights you need through integrated monitoring and a graphical management interface (web console, CLI, and API).

### The Challenge

HPC continues to be the most demanding environment for storage today. HPC setups - in both commercial HPC and scientific research - have to support a diversity of user workloads across domains. Each workload can have vastly different performance profiles, a variety of requirements on storage protocols and their interfaces, and massive scalability needs. Add to this fault tolerance, manageability, and affordability at scale and you have one very demanding environment. Getting results quickly and reliably from this mix of workloads and requirements is critical and can differentiate you from the competition. To stay ahead of the crowd, you need a data storage system that delivers excellent performance, non-stop data availability, full fault tolerance, and is easy to manage and maintain.

### The Solution

Your storage has to meet your performance and capacity demands without sacrificing efficiency and maintainability. The NEC QxFS Storage Platform is based on Quobyte's Data Center File System and combines a high-performance true scale-out parallel file system with powerful and reliable NEC server and storage hardware.



The software provides native data redundancy and safety features and pools storage devices into a single, unified storage system that's easy to maintain. With its file system core, the NEC QxFS Storage Platform implements strong data semantics that can subsume all kinds of unstructured data, including block storage (for virtual machines and databases) and object storage. As all the data are stored as files, it is transparently accessible across various protocols and interfaces. Data can be copied in via NFS or SMB then a map-reduce operation can work on

the same file. The results can then be accessed via Quobyte's S3-compatible object interface or natively with Windows, MacOS, or Linux clients. Similarly, all data stored on the NEC QxFS Storage Platform can be subject to file-based backup systems. With the Quobyte Data Center File System, a storage infrastructure can be set up that enables transparent data placement throughout data lifecycle from scratch to archive using a single management pane. Quobyte's detailed accounting, analytics, and monitoring tools provide valuable insights into the usage and dynamics of an installation. Analytics include graphs for top consumers, throughput, IOPS, file stats and creates. Built-in monitoring, alerting, and automation along with an interface to external monitoring systems makes NEC QxFS Storage Platform a complete system out-of-the-box.

## NEC QxFS Storage Platform Building Block Concepts

The NEC QxFS Storage Platform is a true software defined storage solution that applies the principles of abstraction, pooling, and automation to local storage in standard x86 servers, creating a high-performance, highly available shared storage service without the need for conventional storage arrays or filers. Although software is the key aspect for the NEC QxFS Storage Platform the choice of hardware is crucial for any software-defined storage solution. Based on NEC's long-lasting expertise with high performance storage systems and parallel filesystems, NEC created a modular building block system to match any given workload or workflow. Starting point are the NEC HPC1212Rh-2 servers offering 12 disk bays per server, which can be used with either spinning drives or flash devices. This platform is ideal for building a NEC QxFS Storage Platform scale-out cluster with a broad range of network connectivity options. For scale-up, NEC offers an unmatched JBOD portfolio from 12 drives in a 2U chassis up to the latest high-density JBOD offering up to 102 disks in just 4U.

For capacity centric installations, NEC offers various storage server solutions with up to 100 disks in a 4U enclosure based on a dual Intel Xeon® SP architecture. All hardware components have been thoroughly tested before they have been released for the use with the Quobyte Datacenter Filesystem. Starting with four servers, NEC QxFS Storage Platform can be extended drive by drive and server by server with NEC storage hardware. As a shared-nothing architecture, its IOPS and throughput scales linearly with every added resource.

## Workflow Automation

Policy-defined placement of files and file-level location changes provide endless possibilities for a granular scale-out cluster setup based on workflows. Data can be moved between device types based on a file-level tiering policy or exclusively designated to a set of devices of specific NEC QxFS Storage Platforms. Changing a placement policy can be done with a single click of a mouse button; data will then be moved transparently in the background. Policies can be based on

attributes such as file size, file age, last modification date, and more. They drive automated tiering, deliver performance isolation, and enforce physical device-level security. Placement policies also define data protection, striping, and block size. Since these storage functions are abstracted from the hardware and defined by policies, they can be changed in a matter of seconds, even on the fly.

## Fault Tolerance at Scale

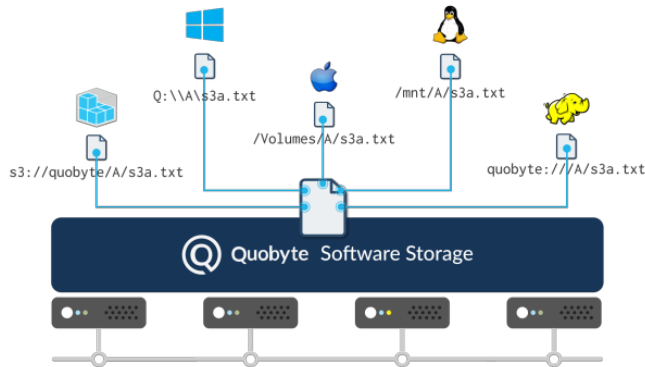
Fault tolerance is the basis for scalable operations in a datacenter and requires redundancy that spans servers, racks, and even entire clusters. When hardware failures or operator errors occur, the NEC QxFS Storage Platform - through the software - automatically and transparently routes around the failure. Data is protected by several methods, including a patent-pending quorum algorithm and sophisticated consensus algorithm, in order to guarantee strong data consistency and to avoid data corruption in split-brain scenarios. In addition, the NEC QxFS Storage Platform protects data by using cutting-edge technologies such as end-to-end checksums, smart replication, and erasure coding.

## Service Concept

With the value of data steadily increasing in both academic and commercial environments, support and service are growing equally important. NEC's strategy is to provide support and service as an integral part of its solutions packages, allowing the customer to concentrate on core business issues. To meet internal service level objectives, NEC offers a wide range of service-level agreements with up to 24x7x4 service for hard- and software.

## NEC as a provider of Storage Systems

The building blocks of the NEC QxFS Storage Platform are architected, integrated, tested and optimized to work flawlessly together, thus cutting complexity and eliminating risks. Consulting, benchmarking, implementation, and support during all stages of a project, from first design to 3rd-level support, are covered by NEC experts. NEC has successfully implemented and supports NEC QxFS Storage Platforms up to the petabyte scale and beyond.



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