

BLEND

resources into a pool of storage
for better SAN economics.

HP StorageWorks P4000 G2 SAN Solutions

Enabling a flexible, easy, and
cost-effective storage strategy

Brochure



Data is growing exponentially every day, technology is evolving, and budgets are shrinking—all of which place a huge strain on IT departments trying to determine the most effective storage strategy. They must accommodate change and capacity growth, protect data, and meet the availability needs of the business while striving to reduce storage management costs. Additionally, IT organizations are faced with implementing virtualization solutions, replacing aging storage assets, implementing affordable disaster recovery solutions, creating easily scaling storage infrastructures, providing access to information for a diverse range of users and applications, and re-allocating or provisioning storage quickly as business needs change.

All of these storage-related concerns are amplified in a virtual server environment. Flexibility is a key element of virtual environments, requiring the storage system to be adaptable as well as easy to manage. Legacy SAN arrays are often difficult to change or “re-provision” once they are set up—with provisioning often cited as the primary storage management pain point. This inflexibility threatens to erase the hard-won benefits of a virtual server infrastructure.

What is needed is a storage environment that is easy to learn, is intuitive to manage and change, scales up to meet business demands without creating IT bottlenecks or application downtime, and offers application data high availability—all without costing an arm and a leg. The good news is that these requirements can be met with the P4000 G2 SAN.

Solution overview

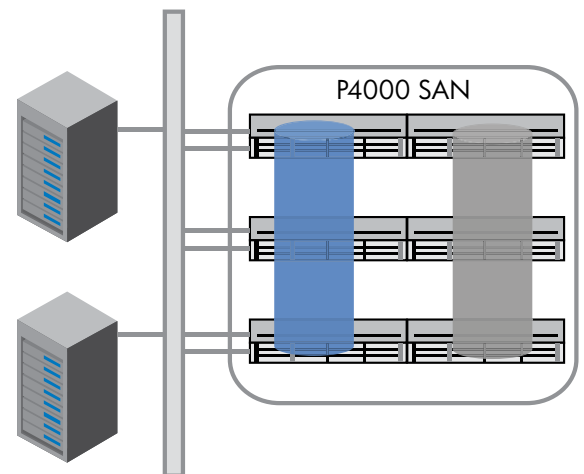
An HP P4000 SAN has a different architecture from traditional SANs. Traditional SANs are composed of two separate hardware units—a controller for performance and disk shelves for capacity. HP P4000 SAN Solutions represent a virtualized pool of storage. The scale out storage architecture allows to create a scalable SAN storage cluster by aggregating the critical components of all P4000 SAN nodes into a single pool of resources (Figure 1). In a P4000 SAN the capacity, performance, memory and I/O or all P4000 nodes are aggregated and available to all volumes created on the P4000 SAN.

If you are interested in Virtual infrastructures (around VMware, Microsoft, and Citrix), High Availability and Fault Tolerance mandates, or Disaster Recovery—you will find the P4000 SAN matching your requirements. Based on its architecture P4000 SANs provide some interesting advantages over traditional storage.

- **Cost and simplicity:** Buy only what you need today and grow your storage non-disruptively in the future. Most storage architectures require you to plan for growth and over-purchase today. With the P4000 SANs, you can start with a small SAN and scale to hundreds of terabytes (as many businesses have done), all managed from an intuitive user interface.
- **Scalable performance:** Because the resources of all P4000 nodes in a P4000 SAN are aggregated, capacity and performance of the entire SAN increases each time a P4000 storage node is added; this avoids expensive and complicated controller upgrades. Adding P4000 nodes into a SAN is done online, without disruption—which avoids downtime and complex coordination with server, application, and network teams.
- **Availability:** P4000 SANs can sustain multiple system failures and still keep data online and accessible. Most storage architectures use dual controllers for high availability, but they don't protect against dual disk failures, power failures, air conditioning failures, or any type of “outside of the box” failure. P4000 SANs provide levels of data availability beyond what dual controllers and hardware RAID can provide.

Figure 1

P4000 SAN Storage Clustering allows you to create pools of storage composed of P4000 SAN nodes. The cluster accepts and responds to iSCSI requests as a single, clustered SAN.



All storage management features are included with every HP P4000 SAN: Storage Clustering, Network RAID, Thin Provisioning, Application Integrated Snapshots, Remote Copy, and SmartClone. And all P4000 SANs come standard with 3 years support included (Next Business Day).

Storage clustering—scale your storage with ease

P4000 SAN Storage Clustering allows you to create pools of storage composed of P4000 SAN nodes. Storage clustering provides online scalability, both within a volume and across the entire SAN. All available physical capacity is aggregated and available to the volumes created on the SAN.

For increased business protection, customers can deploy P4000 SAN nodes anywhere on the IP network. Within a facility, P4000 nodes can be spread out between the server room and a network closet. A single P4000 cluster can also be spread across physical sites or data centers to remove the risk of data loss from a site or data center failure.

Customers can use P4000 SAN Storage Clustering to implement different tiers of storage in their SAN. For instance, a SAS-based SAN can be implemented for optimal performance while a midline SAS based SAN is implemented for higher density and storage capacity, and SANs are managed from a single interface.

Scalable performance

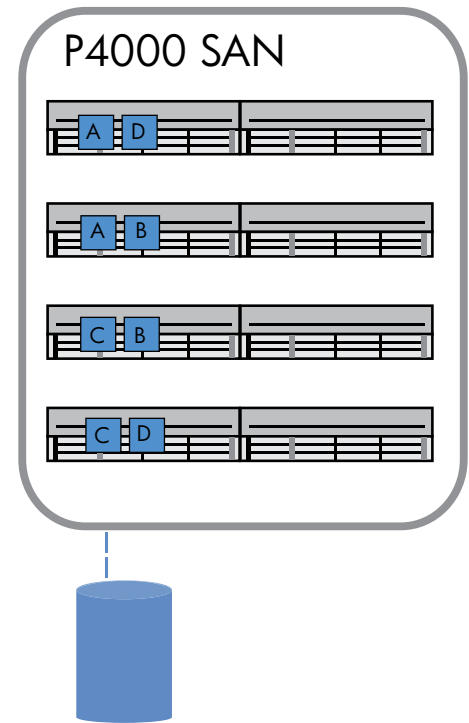
In order to scale capacity and/or performance, simply add P4000 nodes into the P4000 SAN cluster. HP P4000 SANs automatically redistribute the data for better data availability and performance. All the capacity, processing power, memory, and bandwidth included in each node are aggregated across the entire SAN, increasing the performance as the SAN grows. To make the process even easier, P4000 SANs let you expand volumes and add storage nodes online, without taking the volumes offline or causing application downtime.

Network RAID—delivering unprecedented availability

P4000 SANs use Network RAID, which stripes and protects multiple copies of data across a cluster of storage nodes, removing any single point of failure in the SAN. Applications have continuous data availability in the event of a disk, controller, storage node, power, network, or site failure.

Figure 2

P4000 Network RAID stripes and protects up to four copies of each data block across a P4000 SAN (2 copies are shown here). A logical volume's block replication with Network RAID 10 is illustrated. And certainly, each P4000 node offers disk RAID 5, 6, and 10.



SAN administrators can manage redundancy on a per-volume basis to improve storage utilization and match the data protection of the volume to the application data on that volume. Customers choose Network RAID 1, 5, 6, 10, 10+1, or 10+2 to protect data across storage nodes, allocating additional storage space only for data that warrants additional protection. For increased protection, Network RAID can also be integrated into environments where application servers are clustered, enabling true, seamless, geo-cluster solutions that provide both application and storage clustering across geographies.

Built-in self-healing technology allows Network RAID to proactively repair bad blocks on the SAN before applications encounter them. In addition, Network RAID automatically fine-tunes the data layout of a volume over time, providing high performance no matter how old or full the volume becomes.

Better than traditional SANs

Traditional SANs make you define RAID groups ahead of time by allocating the disks to a particular RAID group. Changing a volume's RAID level means taking its RAID group down for restriping or moving the volume to a different RAID group—either way, all the applications that depend on it suffer downtime during the move. Also, to support different RAID levels for different types of data, you must purchase and allocate physical disks for each, causing underutilization, creating storage islands, and forcing application downtime for copying. With P4000 SANs, Network RAID is an attribute of each logical volume, and you can change it on the fly—allowing you to closely match your storage characteristics to business requirements.

Better for business

The bottom line is that Network RAID and synchronous replication help you better utilize your storage. Rather than having to maintain a different storage system for each storage policy, you can support multiple policies in a single HP P4000 SAN. Because all of your storage is pooled, you reduce fragmentation and the wasted space that multiple, isolated storage systems bring. With the HP P4000 grow-on-demand architecture, you can expand each P4000 SAN dynamically as required. When you add P4000

nodes to the cluster, Network RAID re-stripes data and re-balances its workload internally, with no application downtime.

Thin Provisioning—provision actual storage only as you need it

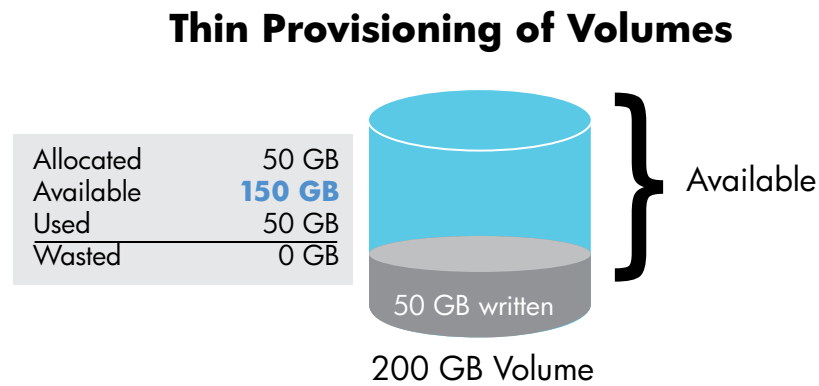
Most SANs place the provisioning burden on SAN administrators, asking them to predict how much space will be needed for volumes, snapshots, and remote copies, and what the expected growth rates will be. That is because most storage provisioning models call for pre-allocation of storage space on the SAN. Worse yet, if you over-allocate storage, it is nearly impossible to reclaim that unused space.

P4000 SANs do not require pre-allocation of storage space. The P4000 Thin Provisioning manages all the storage allocations underneath a given volume, and it allocates space only as data is actually written to that volume. Thin Provisioning lets you purchase only the storage needed today and then add more storage to the clusters as application data grows; this raises the overall utilization and efficiency of the SAN and ultimately increases the return on investment (ROI) associated with the SAN.



Figure 3

HP P4000 Thin Provisioning lets you create larger volumes than you need today, and let them fill as your application data grows.



Give your volumes room to grow

The P4000 Thin Provisioning functionality lets you size your volumes with room to grow. You can create a volume with the size you expect it to be in the future, create a file system in it, and allow your application data to grow to fill the volume over time. P4000 SANs incorporate advanced monitoring and alerting mechanisms that make over-provisioning safe for day-to-day use. Thin Provisioning is an attribute of each volume, so you can switch back and forth online between thin and full provisioning as you wish—it's as easy as a click of the mouse. This enables greater flexibility, efficiency, and lower cost.

Application Integrated Snapshots— instant, point-in-time backups

Snapshots create thinly provisioned, instant point-in-time copies of data on a per-volume basis. Administrators access snapshots to recover individual files from the volume, or rollback an entire volume. Built-in application integration provides automated quiescing for Microsoft VSS applications. You can create snapshots manually ad hoc, on a scheduled or scripted basis, or via the Microsoft® VSS framework, and can then access these point-in-time snapshots to recover individual files or folders from the volume—or roll back an entire volume. Unlike most SANs that require a snapshot reserve, P4000 SANs create snapshots that are always thin-provisioned for efficiency—consuming storage space on the SAN only for the data written to the snapshot, and removing the need for any upfront space reservation or guesswork

that could lead to snapshot and backup job failures. P4000 SAN Application Integrated Snapshots open up a range of new possibilities for the IT organization:

- Virtually any backup software can access the snapshots, including products that update backup times in the volume itself.
- Snapshots can be mounted read/write, and you can change the snapshot without affecting the live volume.
- Application integrated snapshots for windows VSS applications built into SAN for automated application quiescing.
- Use P4000 SAN/iQ Software snapshots as backups: retrieve a previous version of a file, or recover an entire volume instantly.

Remote copy—recover your data with minimal disruption

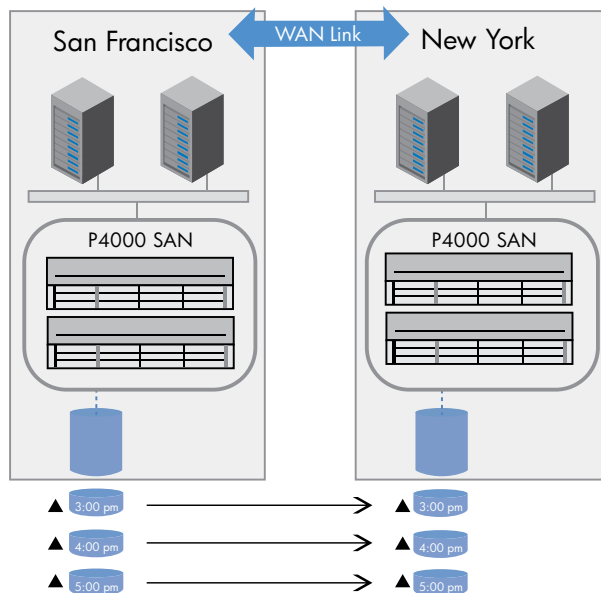
The P4000 remote copy functionality lets you replicate thin-provisioned snapshots between primary and remote locations. Because the remote copies are thin-provisioned, no space reservation at the remote location is required. Remote copy is used for centralized backup and disaster recovery and can be set up on a per-volume basis. Placing your remote copies on a recurring schedule lets you achieve point-in-time asynchronous replication of the data between locations, sites, or data centers.

A failover/failback wizard is also included with remote copy for step-by-step, easy-to-execute disaster recovery procedures when needed most.

Figure 4

HP P4000 SAN remote copy functionality uses space-efficient snapshots to create consistent, point-in-time remote copies for backup and disaster recovery.

- P4000 SAN creates a snapshot of the volume.
- The snapshot is copied to the remote cluster either physically or via the network. Watermarks prevent confusion.
- Asynchronous replication schedules send only the changed blocks to the remote site. Different retention policies enable you to save recent copies or a history of copies for recovery.
- Remote volumes can be promoted for disaster recovery or simple backup.



Asynchronous replication

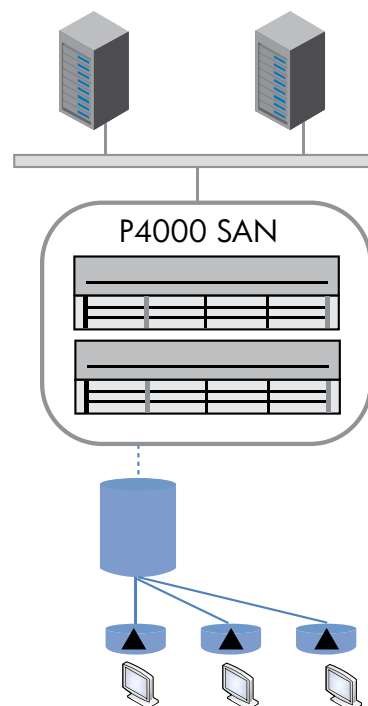
Asynchronous replication is implemented as a series of scheduled remote copies. P4000 SANs understand the relationship of any given snapshot to the sync point. Thus, to accomplish asynchronous replication P4000 SANs only copy the blocks that have changed since the last copy. Asynchronous replication is integrated with the P4000 SAN's snapshot mechanism, so you don't have to worry about write-ordering should a failure occur while a remote copy is in progress. Each remote copy is exactly the same as its source snapshot.

Intelligent bandwidth management

You probably don't have infinite bandwidth between your sites, and P4000 remote copy functionality helps you to intelligently manage and share your network resources so that you can support asynchronous replication while maintaining quality-of-service levels for the rest of your network traffic. The PrimeSync feature lets you physically move your initial volume copy to your remote location, which saves you from transferring potentially terabytes of data over the network. P4000 SANs also monitor and adapt to changing network conditions for bandwidth and latency, throttling the data transfer accordingly.

Figure 5

P4000 SAN with SmartClone Technology makes space-efficient volume copies instantly for use by virtual machines and physical servers.



HP SmartClone Technology—instant, space-efficient volume clones

P4000 SmartClone™ Technology instantly replicates data volumes and data sets without requiring additional storage space. Each volume clone is a virtual copy that enables you to save time and space in a variety of environments and applications, including server and desktop provisioning, boot-from-SAN provisioning, and rapid copying of production data into test and development environments.

P4000 SmartClone Technology essentially breaks down the cost and technology barriers to using virtualization. For example, copies of existing virtual machines can be used to scale existing applications by adding identical server instances, to create virtual desktop systems based on “golden master” images, and to create test and development environments based on existing production systems. Making new virtual server instances is easy, but most traditional SANs then require the time- and space-consuming process of copying existing logical volumes for use by the new virtual machines. Reference architectures for client virtualization based on P4500 and P4800 speak to the strength these storage platforms provide. P4000 SmartClone Technology changes that, letting you make as many volume copies as you need—all in an instant, and with minimal use of storage. This is possible because:

- Volume clones are based on an original source volume so they are space-efficient and instantaneous
- Clones can be accessed from physical servers, virtual servers, and virtual desktops
- P4000 SmartClone Technology is de-duplication technology for server and desktop images—so there is only one copy of operating system files on the SAN, which helps raise storage utilization and increases the return on storage investments
- Cloned volumes are thin-provisioned, allocating only the storage you actually use, when you use it, increasing your storage ROI

Everyday SAN operations are simple and worry-free

The entire HP SAN is managed from the P4000 centralized management console (CMC). An administrator simply connects via the IP network to the P4000 nodes. Multiple data centers and storage sites can be managed from a “single pane of glass”—no matter where the nodes are physically located. The CMC also includes an integrated performance

management system, providing you with detailed, real-time metrics and the ability to export statistics. All of the P4000 features are managed from the CMC.

A single point of management

The CMC lets you configure, manage, and monitor your P4000 SAN easily, making everyday operations simple and worry-free. Part of what makes managing P4000 SANs simple is their superior architecture, which lets you scale storage, change a volume’s Network RAID level, or migrate volumes between storage tiers without taking applications offline. The CMC simplifies access to all SAN features on all P4000 SANs, whether local or remote.

Now everyday administration is efficient and easy. When you need to change attributes of a volume, such as its Network RAID level, its location, or whether it is thin or fully provisioned, the CMC puts these management tasks just a click of the mouse away. When you need to do something more complex, such as failing back to an original volume after a failover to a remote site, wizards and tools take the guesswork out of operations where time and accuracy are critical.

Monitoring SAN performance is easy and intuitive

Quickly assess the performance of your SAN with the P4000 performance management system, which is also included with every P4000 SAN. The performance management system is designed from the ground up to make it easy for you to obtain the performance metrics you need, when you need them. One click of the mouse, and the system’s performance monitor is up and running in the CMC. You select from a short list of relevant statistics and counters to obtain performance metrics that are rolled up to the level of abstraction that you choose.

The P4000 performance monitor gives you specific performance information on each application server/virtual machine, logical volume, snapshot, storage cluster, and storage node. The performance monitor’s graphical user interface is simple and elegant—not cluttered with counters and statistics that are irrelevant or difficult to understand. And each statistic includes a detailed explanation of what it means for SAN performance, integrated directly into the management interface. There is no wading through irrelevant statistics in search of the ones you need.

Why HP P4000 SANs?

P4000 SANs provide the foundation for a proven storage solution, helping IT departments cope with today's influx of data in a way that's simple, flexible, and cost-effective. With P4000 SAN virtualization capabilities built into P4000 node, you get a comprehensive enterprise-class storage feature set—including Storage Clustering, Network RAID, Thin Provisioning, Application Integrated Snapshots, Remote Copy, and SmartClone—and simplified management capabilities.

Start confronting storage-related issues head-on with great ease, lower costs, and the flexibility that also allows you to take advantage of your virtual server environment's inherent benefits. P4000 SANs help you create and maintain a truly effective storage strategy—one that accommodates change and grows seamlessly as the business demands.

HP Education Services for HP SANs

A well-trained IT staff helps make your P4000 SAN Solutions even simpler to use and brings still more agility—and greater value—to your business. Educated customers experience improved solution reliability, fewer end-user support requests, speedier support issue resolution, and faster project implementation.

To help you get the most from your HP SAN Solutions, HP offers two levels of P4000 SAN training:

- Basic Training imparts the knowledge you need to understand, manage, and configure your HP SAN.
- Advanced Training outlines best practices for HP SAN, based on field experience and applied industry knowledge.

Visit www.hp.com/learn/storage for more information.

HP Financial Services

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Global citizenship at HP

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www.hp.com/hpinfo/globalcitizenship,

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HP Services

Put the strategic and technical know-how of HP Services experts to work for you: When you buy HP SAN Solutions, it's a good time to think about other levels of service and support you may need. You can trust the service professionals at HP to collaborate with you to make technology the difference in your business.

Recommended services

- **HP Support Plus 24 Service**—for around-the-clock, reactive onsite hardware support and over-the-phone software support
- **HP Installation and Startup for HP SAN Solutions**—fast, reliable startup for enhanced server virtualization and business continuance with SAN solutions

Related services

- **HP Proactive 24 Service**—integrated proactive and reactive services for businesses looking to achieve better performance, higher availability, and greater stability
- **HP Proactive Select Service**—to improve IT performance and manageability for businesses looking for services flexible enough to cover the IT product lifecycle and adapt to changing needs

When technology works, business works. For more information, contact your HP sales representative or HP-authorized Channel Partner or, visit www.hp.com/hps

To understand how HP StorageWorks P4000 G2 SAN Solutions can help reduce the cost of storing and managing ever-expanding data, while increasing data protection and availability, please visit www.hp.com/go/P4000

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