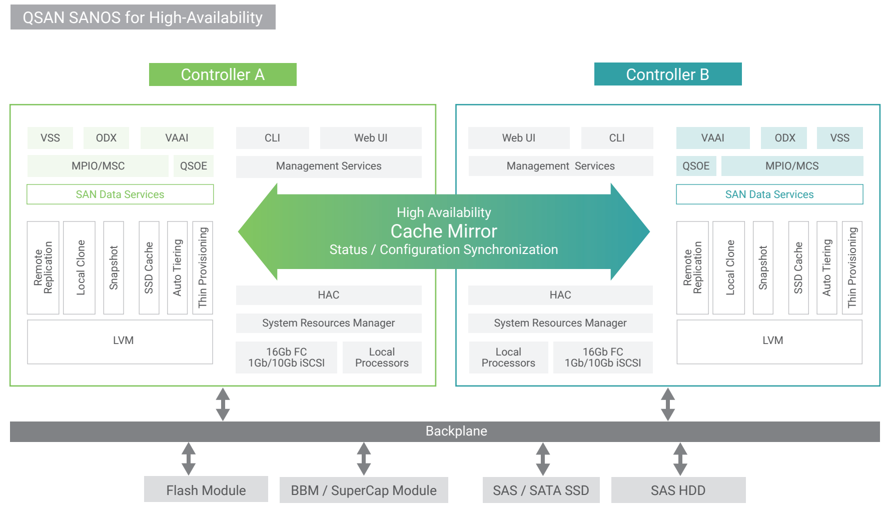
SANOS 4.0 SAN Operating System



SANOS System Architecture

SANOS 4.0 is QSAN's proprietary SAN storage operating system. SANOS 4.0 is equipped with a refreshingly simple to use web GUI and easily deployable into any infrastructure.

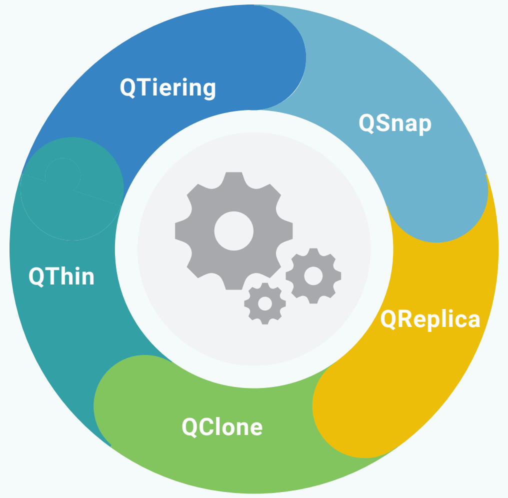
Based on the Linux kernel, SANOS delivers comprehensive storage functionality including advanced storage management, complete RAID level protection, fast RAID rebuild, storage pool migration, thin provisioning, SSD cache, auto-tiering, snapshot, data backup & disaster recovery, virtualization support, performance monitoring, and scale-up support and more.

Comprehensive Enterprise Storage Features

SANOS 4.0 brings you to a totally different experience of SAN operating system. SANOS 4.0 boots up your XCubeSAN with ultimate high performance by adopting ingenious SSD cache and auto tiering; smart and efficient storage space management by thin provisioning; and undefeatable data protection by snapshot, local volume clone, and remote replication.

Thin Provisioning (QThin)

QThin operates by allocating disk storage space in a flexible manner among multiple users, based on the minimum space required by each user at any given time. As the storage pool fills, you can add extra disk groups to expand the storage pool capacity without downtime.



SSD Cache (QCache)

QCache accelerates application performance by utilizing SSD drives as extended RAID controller cache for frequently-accessed hot data, while most of the cold data are stored in the hard drives. It can improve random read performance by up to 92 times and random write by up to 171 times. QCache 2.0 supports read cache and write cache which are up to four SSD cache pools per system. Each SSD cache pool can be used by one dedicated storage pool and its multiple volumes shared for effective usage of resources.

Auto Tiering (QTiering)

With QTiering technology, the XCubeSAN series can help you put the right data at the right place in the right time for optimal use of all storage tiers and allow you to reduce storage costs and management overhead while increasing performance and capacity. Intelligent algorithm behind QTiering manages the data relocation and monitors the data hotness ratio using half-life coefficient and advanced ranking mathematics.

Snapshot (QSanp)

QSnap is the easiest and most effective measurement to protect against ransomware attacks, virus attacks, accidental file deletion, accidental file modification, or unstable system hardware caused by bad I/O cable connection, unstable power supply, etc. Writable snapshot support and compatible with Windows VSS (Volume Shadow Copy Service) are features included to provide additional data availability.

Local Volume Clone (QClone)

QClone is used to make a duplicate copy of a volume in the same storage pool as well as in a separate storage pool within the same enclosure. Manual and scheduled tasks are available for management flexibility. In the event that the source volume fails, IT managers can quickly switch to the cloned volume and resume data services.

Remote Replication (QReplica)

QSAN remote replication is a block-level, asynchronous, differential remote volume backup function through LAN or WAN. QReplica 2.0 has many powerful capabilities including unlimited bandwidth, traffic shaping, and multiple connections per replication task. It's the most cost-effective and efficient way to perform remote data backup.

Software

Operating System

- 64bit embedded Linux

Storage Management

- RAID level 0 ,1 ,0+1 ,3 ,5 ,6 ,10 ,30 ,50, 60, and N-way mirror
- RAID EE level 5EE, 6EE, 50EE, and 60EE
- Flexible storage pool ownership
- Thin Provisioning (QThin) with space reclamation
- SSD Cache (QCache[4])
- Auto Tiering (QTiering[4])
- Global, local, and dedicated hot spares
- Write-through and write-back cache policy
- Online disk roaming
- Spreading RAID disk drives across enclosures
- Background I/O priority setting
- Instant RAID volume availability
- Fast RAID rebuild
- Online storage pool expansion
- Online volume extension
- Online volume migration[5]
- Auto volume rebuilding
- Instant volume restoration
- Online RAID level migration
- SED & ISE drive support
- Video editing mode for enhanced performance
- Disk drive health check and S.M.A.R.T. attributes
- Storage pool parity check and media scan for disk scrubbing
- SSD wear lifetime indicator
- Disk drive firmware batch update
- Volume QoS (Quality of Service)
- Advanced disk awareness

iSCSI Host Connectivity

- Proven QSOE 2.0 optimization engine
- CHAP & mutual CHAP authentication
- SCSI-3 PR (Persistent Reservation for I/O fencing) support
- iSNS support
- VLAN (Virtual LAN) support
- Jumbo frame (9,000 bytes) support
- Up to 256 iSCSI targets
- Up to 512 hosts per controller
- Up to 1,024 sessions per controller

Fibre Channel Host Connectivity

- Proven QSOE 2.0 optimization engine
- FCP-2 & FCP-3 support
- Auto detect link speed and topology
- Topology supports point-to-point[6] and loop
- Up to 256 hosts per controller

High Availability

- Dual-Active (Active/Active) SAN controllers
- Cache mirroring through NTB bus
- ALUA support
- Management port seamless failover
- Fault-tolerant and redundant modular components for SAN controller, PSU, FAN module, and dual port disk drive interface
- Dual-ported HDD tray connector
- Multipath I/O and load balancing support (MPIO, MC/S, Trunking, and LACP)
- Firmware update with zero system downtime

Security

- Secured Web (HTTPS), SSH (Secure Shell)
- iSCSI Force Field to protect from mutant network attack
- iSCSI CHAP & mutual CHAP authentication
- SED & ISE drive support

Storage Efficiency

- Thin Provisioning (QThin) with space reclamation
- Auto Tiering (QTiering[4]) with 3 levels of storage tiers

Networking

- DHCP, Static IP, NTP, Trunking, LACP, VLAN, Jumbo frame (up to 9,000 bytes)

Advanced Data Protection

- Snapshot (QSnap), block-level, differential backup
  - Writeable snapshot support
  - Manual or schedule tasks
  - Up to 64 snapshots per volume
  - Up to 64 volumes for snapshot
  - Up to 4,096 snapshots per system
- Remote Replication (QReplica)
- Asynchronous, block-level, differential backup based on snapshot technology
  - Traffic shaping for dynamic bandwidth controller
  - Manual or schedule tasks
  - Auto rollback to previous version if current replication fails
  - Up to 32 schedule tasks per controller
- Volume clone for local replication
- Configurable N-way mirroring
- Integration with Windows VSS (Volume Shadow Copy Service)
- Instant volume restoration
- Cache-to-Flash memory protection[4]
  - M.2 flash module
  - Power module: BBM (Battery Backup Module) or SCM (Super Capacitor Module)
- Support USB UPS and network UPS with SNMP management

Virtualization Certification

- Server Virtualization & Clustering
- Latest VMware vSphere certification
- VMware VAAI for iSCSI &, FC
- Windows Server 2016, 2012 R2 Hyper-V certification
- Microsoft ODX
- Latest Citrix XenServer certification

Easy Management

- USB LCM[4], serial console support, online firmware update
- Intuitive Web management UI, secured web (HTTPS), SSH (Secured Shell), LED indicators
- S.E.S. support, S.M.A.R.T. support, Wake-on-LAN, and Wake-on-SAS

Green & Energy Efficiency

- 80 PLUS Platinum power supply
- Wake-on-LAN to turn on or wake up the system only when necessary
- Auto disk spin-down

Host Operating Systems Support

- Windows Server 2008, 2008 R2, 2012, 2012 R2, 2016
- SLES 10, 11, 12
- RHEL 5, 6, 7
- CentOS 6, 7
- Solaris 10, 11
- FreeBSD 9, 10
- Mac OS X 10.11 or later

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[4] The function is optional and is not included in the default package.
[5] The feature is based on RAID level migration of disk groups on the fly in thick provisioning pools.
[6] 16Gb Fibre Channel only supports Point-to-Point topology.

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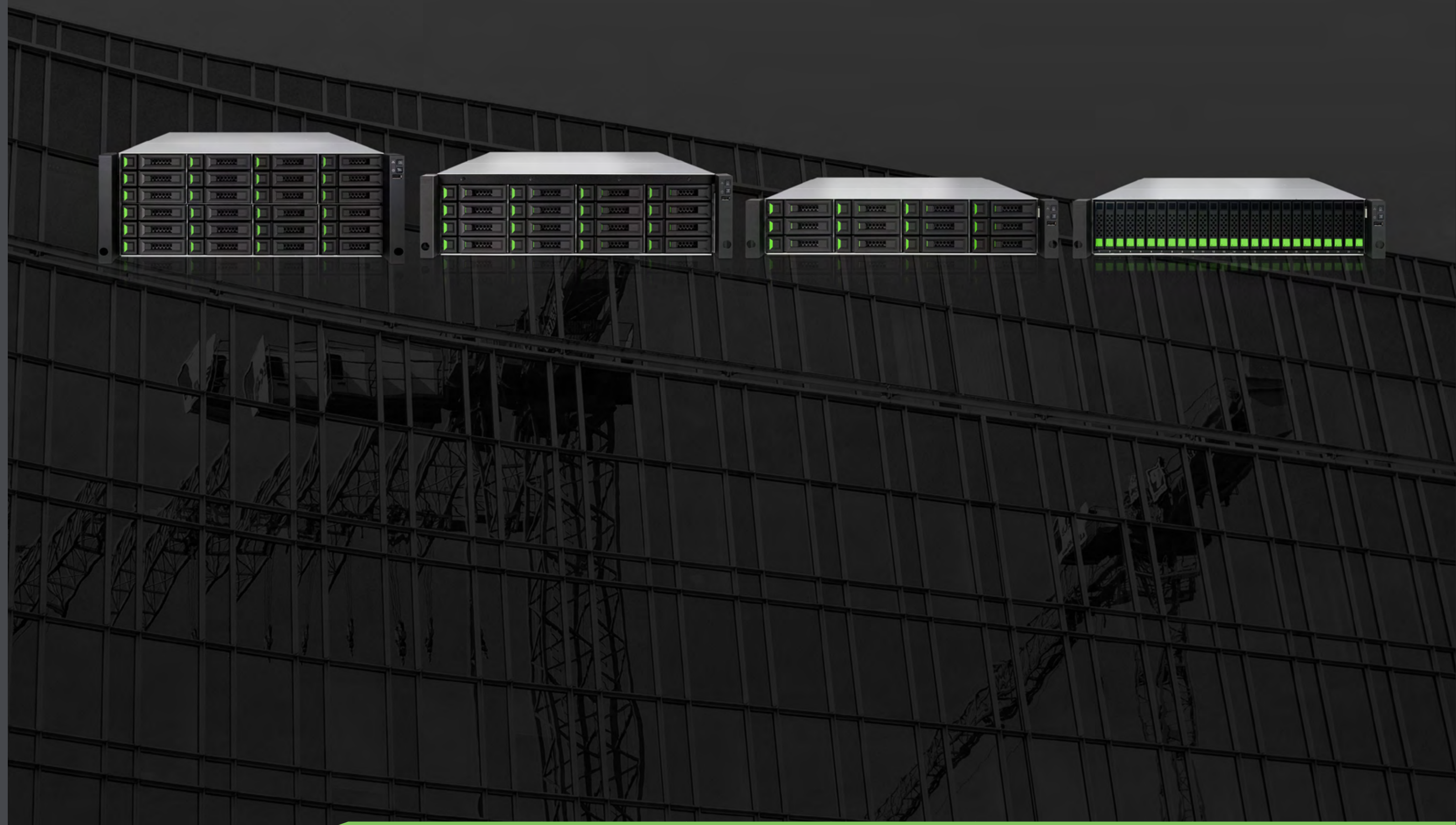
Data Storage, Security & Performance

XCubeSAN

Product Guide



Product Highlights

- High Performance SAN storage system with Dual-Active (Active/Active) controller
- High availability design with no single point of failure
- 5th generation Intel® processor, up to 128GB RAM per controller
- Latest 12Gb SAS 3.0 technology
- Built-in 10GbE iSCSI
- Scale up solution supports over 6.1PB of raw storage capacity
- QSAN SANOS (SAN Operating System) 4.0
- Advanced Storage Management
  - Thin Provisioning
  - SSD Cache (read and write cache)
  - Auto Tiering
  - Snapshot
- Flexible I/O host cards for iSCSI SAN or Fibre Channel SAN
- Local clone and remote replication for disaster recovery
- Virtualization support for VMware VAAI, Microsoft Hyper-V ODX, and Citrix
- Cache-to-Flash memory protection technology

QThin QCache QTiering QSnap QClone QReplica

XCubeSAN Hardware Specifications

Model Name	XS5224D (Dual)	XS5216D (Dual)	XS5212D (Dual) XS5212S (Single)	XS5226D (Dual) XS5226S (Single)	XS3224D (Dual) XS3224S (Single)	XS3216D (Dual) XS3216S (Single)	XS3212D (Dual) XS3212S (Single)	XS3226D (Dual) XS3226S (Single)	XS1224D (Dual) XS1224S (Single)	XS1216D (Dual) XS1216S (Single)	XS1212D (Dual) XS1212S (Single)	XS1226D (Dual) XS1226S (Single)
Form Factor	4U 24-bay, LFF	3U 16-bay, LFF	2U 12-bay, LFF	2U 26-bay, SFF	4U 24-bay, LFF	3U 16-bay, LFF	2U 12-bay, LFF	2U 26-bay, SFF	4U 24-bay, LFF	3U 16-bay, LFF	2U 12-bay, LFF	2U 26-bay, SFF
RAID Controller	Dual-active or Single-upgradable controller				Dual-active or Single-upgradable controller				Dual-active or Single-upgradable controller			
Processor	Intel® Xeon® 4-core processor (8-core processor models are also available)				Intel® 4-core processor				Intel® 2-core processor			
Memory (Per Cpntroller)	DDR4 ECC 8GB, up to 128GB (four DIMM slots, insert two DIMMs or more will boost performance)				DDR4 ECC 4GB, up to 128GB (four DIMM slots, insert two DIMMs or more will boost performance)				DDR4 ECC 4GB, up 32GB (two DIMM slots, insert two DIMMs will boost performance)			
Host Connectivity (per Controller)	Host Card Slot 1 (optional): 4 x 16Gb FC (SFP+) ports 2 x 16Gb FC (SFP+) ports 4 x 10GbE iSCSI (SFP+) ports 2 x 10GbE iSCSI (RJ45) ports 4 x 1GbE iSCSI (RJ45) ports Host Card Slot 2 (optional): 4 x 16Gb FC (SFP+) ports[1] 2 x 16Gb FC (SFP+) ports[1] 4 x 10GbE iSCSI (SFP+) ports[1] 2 x 10GbE iSCSI (RJ45) ports 4 x 1GbE iSCSI (RJ45) ports											
	Built-in 2 x 10GBASE-T iSCSI (RJ45) ports Built-in 1 x 1GbE management port											
Expansion Connectivity (per Controller)	Built-in 2 x 12Gb/s SAS wide ports (SFF-8644)											
Drive Type	Mix & match 3.5" & 2.5" SAS, NL-SAS, SED HDD 2.5” SAS, SATA[2] SSD			2.5" SAS, NL-SAS, SED HDD 2.5” SAS, SATA[2] SSD	Mix & match 3.5" & 2.5" SAS, NL-SAS, SED HDD 2.5” SAS, SATA[2] SSD			2.5" SAS, NL-SAS, SED HDD 2.5” SAS, SATA[2] SSD	Mix & match 3.5" & 2.5" SAS, NL-SAS, SED HDD 2.5” SAS, SATA[2] SSD			2.5" SAS, NL-SAS, SED HDD 2.5” SAS, SATA[2] SSD
Expansion Capabilities	Up to 10 expansion units using XD5324 (LFF 24-bay), XD5316 (LFF 16-bay), XD5312 (LFF 12-bay), XD5326 (SFF 26-bay) 12Gb SAS expansion enclosure Up to 4 expansion units using third party (LFF 102-bay) 12Gb SAS expansion enclosure											
Max. Drives Supported	432	424	420	434	432	424	420	434	432	424	420	434
Dimension (H x W x D)	19” Rackmount 170.3 x 438 x 515 mm	19” Rackmount 130.4 x 438 x 515 mm	19” Rackmount 88 x 438 x 515 mm	19” Rackmount 88 x 438 x 491 mm	19” Rackmount 170.3 x 438 x 515 mm	19” Rackmount 130.4 x 438 x 515 mm	19” Rackmount 88 x 438 x 515 mm	19” Rackmount 88 x 438 x 491 mm	19” Rackmount 170.3 x 438 x 515 mm	19” Rackmount 130.4 x 438 x 515 mm	19” Rackmount 88 x 438 x 515 mm	19” Rackmount 88 x 438 x 491 mm
Memory Protection	Cache-to-Flash module (optional) Battery backup module + Flash module (To protect all memory capacity) Super capacitor module + Flash module (To protect up to 16GB memory per controller)											
LCM	USB LCM (optional)											
Power Supply	770W/850W 1+1 redundant 80 PLUS Platinum											
Fan Module	2 x hot pluggable / redundant fan modules											
Warranty	System : 3 years Battery backup module / Super capacitor module : 1 year											
Regulatory	CE, FCC, BSMI, VCCI, KCC											
Temperature	Operating temperature : 0°C to 40°C Shipping temperature : -10°C to 50°C											
Relative Humidity	Operating relative humidity : 20% to 80% non-condensing Non-operating relative humidity : 10% to 90%											

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[1] Slot 2 provides 20Gb bandwidth.
[2] 6Gb MUX board needed for 2.5" SATA drives in dual controller system.

XCubeDAS Hardware Specifications

Model Name	XD5324D (Dual) XD5324S (Single)	XD5316D (Dual) XD5316S (Single)	XD5312D (Dual) XD5312S (Single)	XD5326D (Dual) XD5326S (Single)
Form Factor	4U 24-bay, LFF	3U 16-bay, LFF	2U 12-bay, LFF	2U 26-bay, SFF
I/O Controller	Dual-active or Single-upgradable controller			
Host & Expansion Connectivity (per Controller)	5 x 12Gb/s SAS wide ports (SFF-8644)			
Drive Type	Mix & match 3.5" & 2.5" SAS, NL-SAS HDD 2.5” SAS, SATA[2] SSD			2.5" SAS, NL-SAS HDD 2.5” SAS, SATA[2] SSD
HBAs & RAID Cards Support[3]	Broadcom (LSI) 12Gb/s & 6Gb/s SAS HBAs Broadcom (LSI) 12Gb/s & 6Gb/s SAS RAID Controller Cards ATTO 12Gb/s & 6Gb/s SAS HBAs ATTO 6Gb/s SAS RAID Controller Cards			
OS Support	Windows Server 2008, 2008 R2, 2012, 2012 R2, 2016 Storage Spaces SLES 10, 11, 12、RHEL 5, 6, 7 CentOS 6, 7、Solaris 10, 11 FreeBSD 9, 10、Mac OS X 10.11 or later VMware, Hyper-V, & Citrix			
Dimension (H x W x D)	19” Rackmount 170.3 x 438 x 515 mm	19” Rackmount 130.4 x 438 x 515 mm	19” Rackmount 88 x 438 x 515 mm	19” Rackmount 88 x 438 x 491 mm
Power Supply	770W/850W 1+1 redundant 80 PLUS Platinum			
Fan Module	2 x hot pluggable / redundant fan modules			
Warranty	System : 3 years			
Regulatory	CE, FCC, BSMI, VCCI			
Temperature	Operating temperature : 0°C to 40°C Shipping temperature : -10°C to 50°C			
Relative Humidity	Operating relative humidity : 20% to 80% non-condensing Non-operating relative humidity : 10% to 90%			

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[2] 6Gb MUX board needed for 2.5" SATA drives in dual controller system.
[3] The HBAs and RAID controller cards also specify the maximum number of drive/device support. Broadcom (LSI) 12Gb/s SAS HBA supports up to 1,024 drives/devices, Broadcom (LSI) 12Gb/s SAS RAID controller card up to 240 drives/devices, and ATTO 12Gb/s SAS HBA supports up to 2,048 drives.