



# ES1686dc

Enterprise-Class Storage



**High Efficiency**

Data reduction technology



**High Availability**

Active-active controller architecture



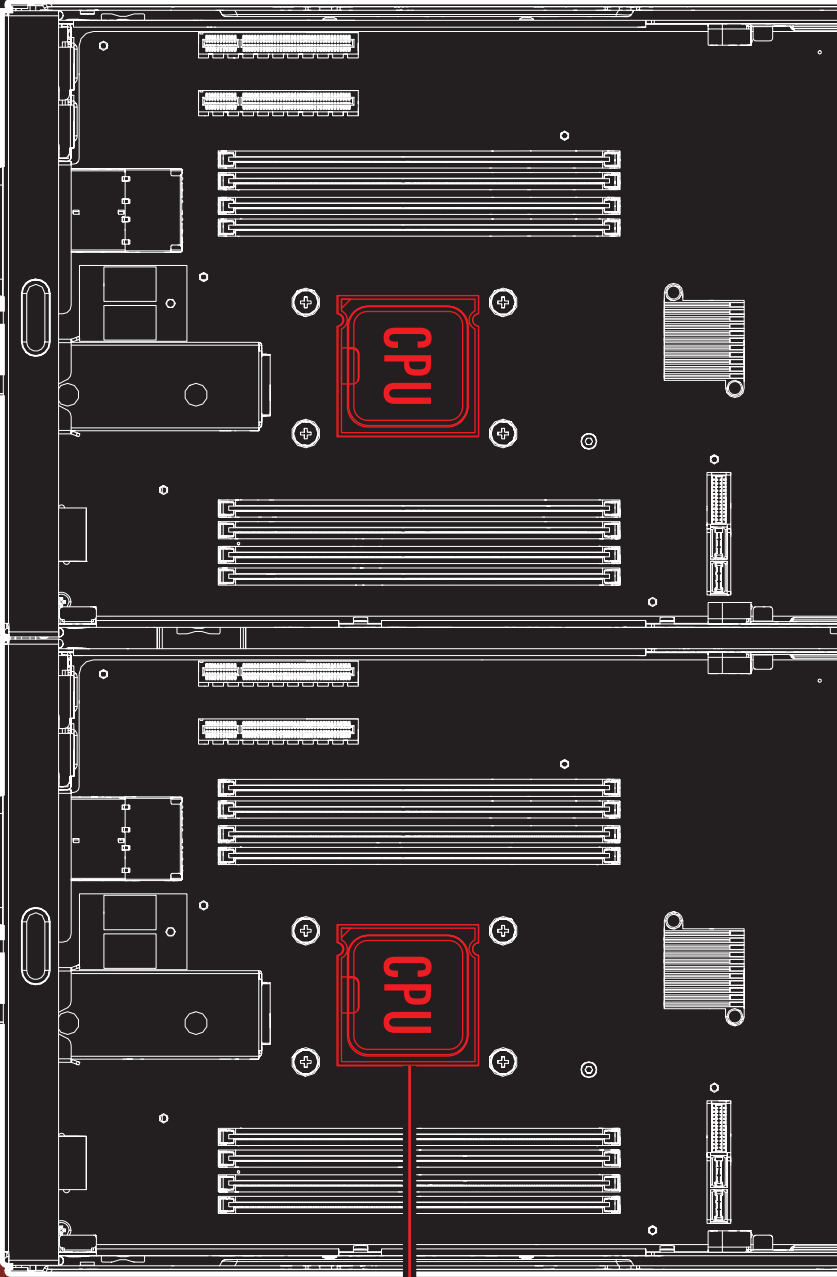
**Ensured Data Integrity**

ZFS file system

# Hardware Architecture

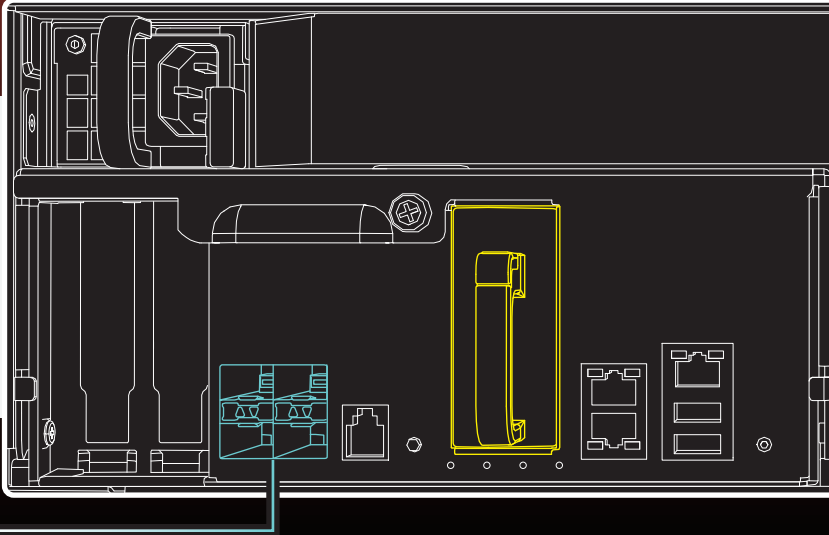
## Intel Xeon D-2100 series processor

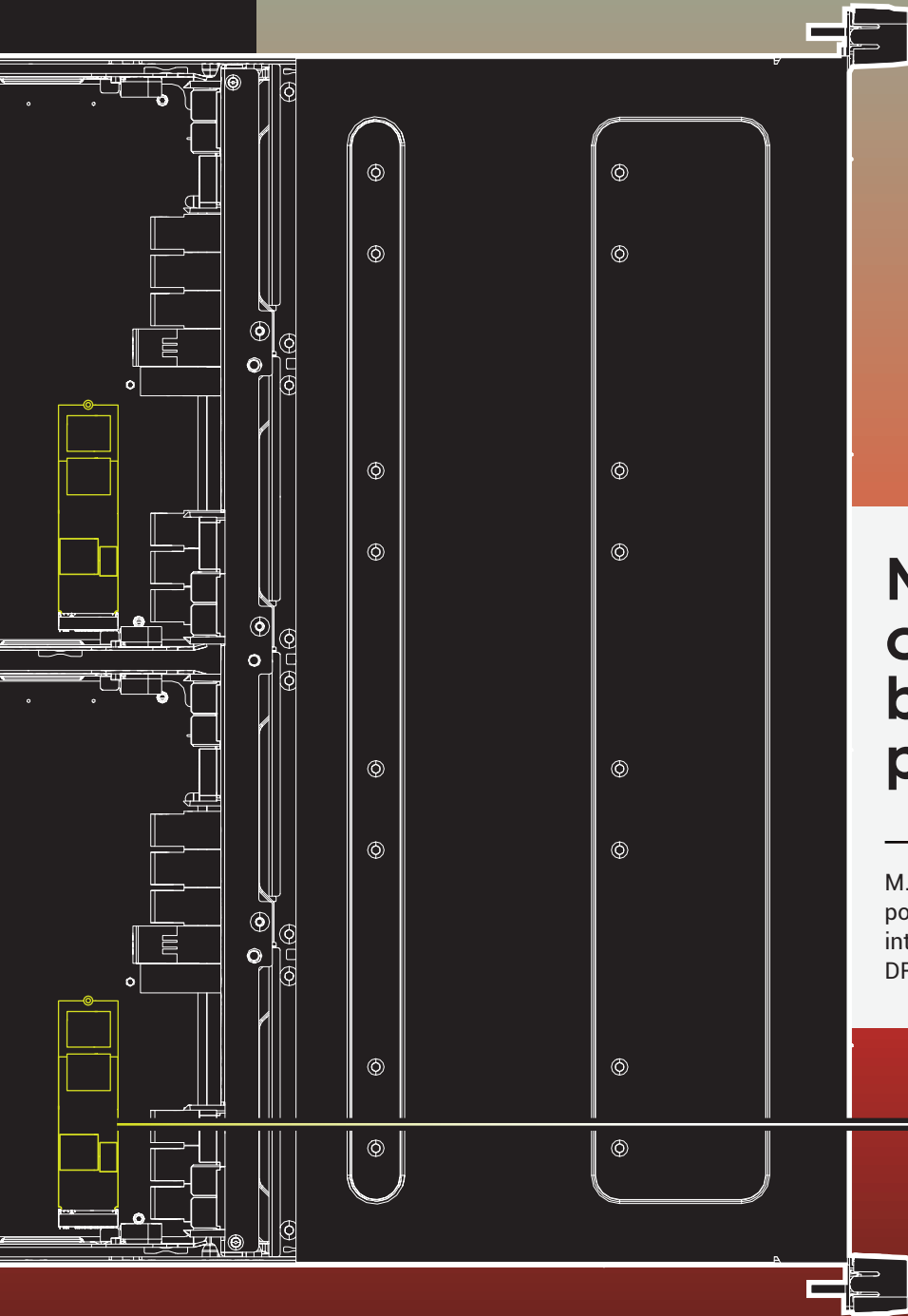
Provides the performance needed for enterprise-level storage and mission-critical applications.



## Built-in 10GbE SFP+ network interface

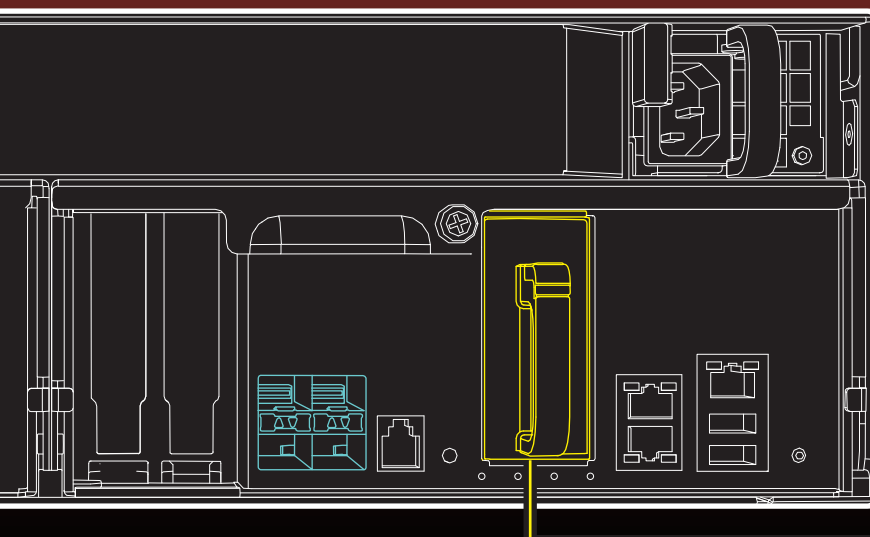
4x 10 GbE (SFP+) ports satisfy iSCSI, NFS, CIFS, and other data transmission needs.





## NVRAM write cache with battery data protection

M.2 SSD for copy-to-flash (C2F) backup. If a power outage occurs, the system ensures data integrity by moving write cache data from DRAM to M.2 SSD using BBU power.



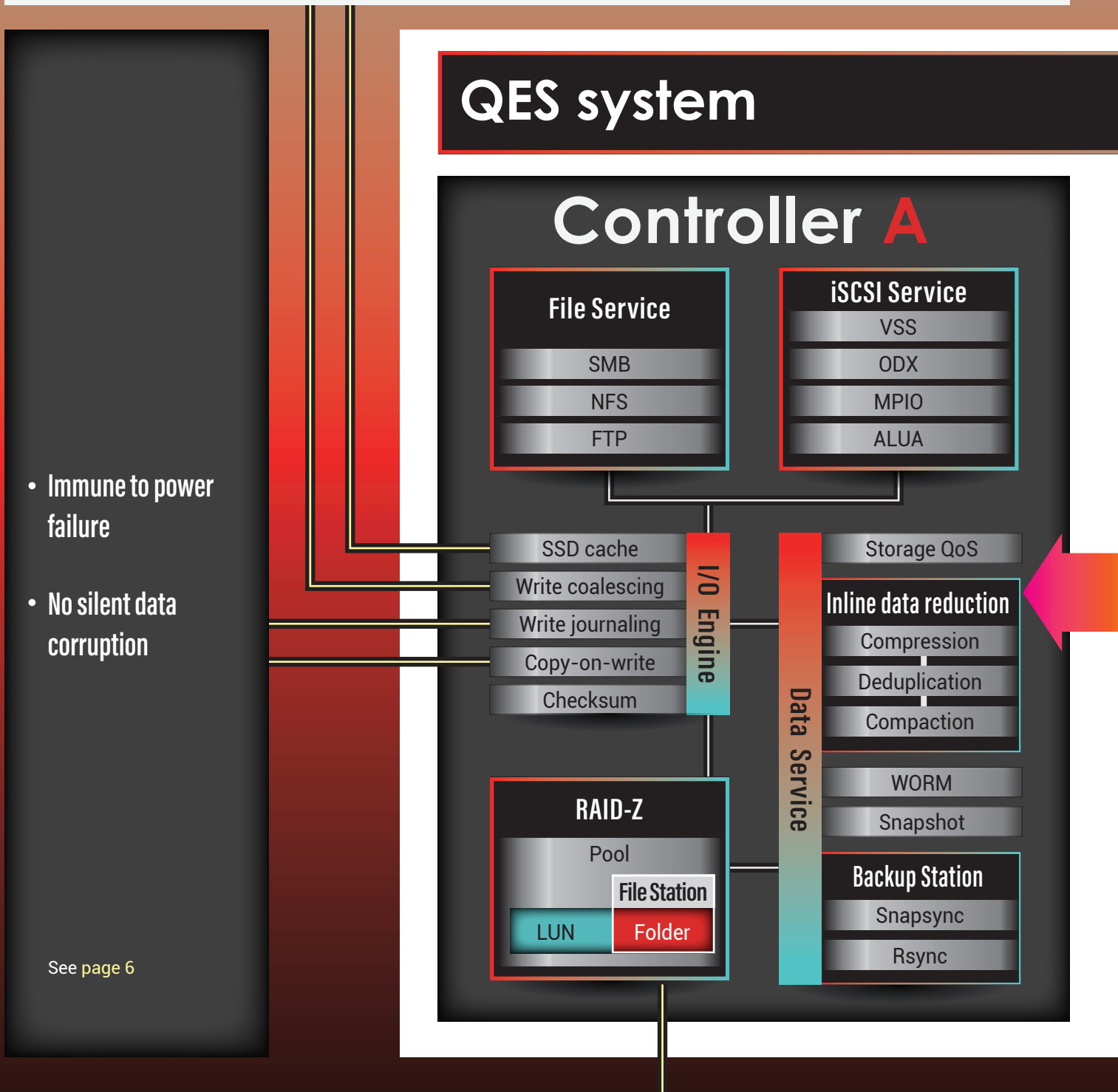
## Battery Backup Unit (BBU)

The hot-swappable battery provides sufficient power to maintain NVRAM during power outages.

# Software Architecture

## Excellent random read/write performance

SSD Cache allows the client to accelerate read performance on HDD-based storage pools. While write coalescing assists in transferring random writes to sequential writes to provide industry-leading performance.



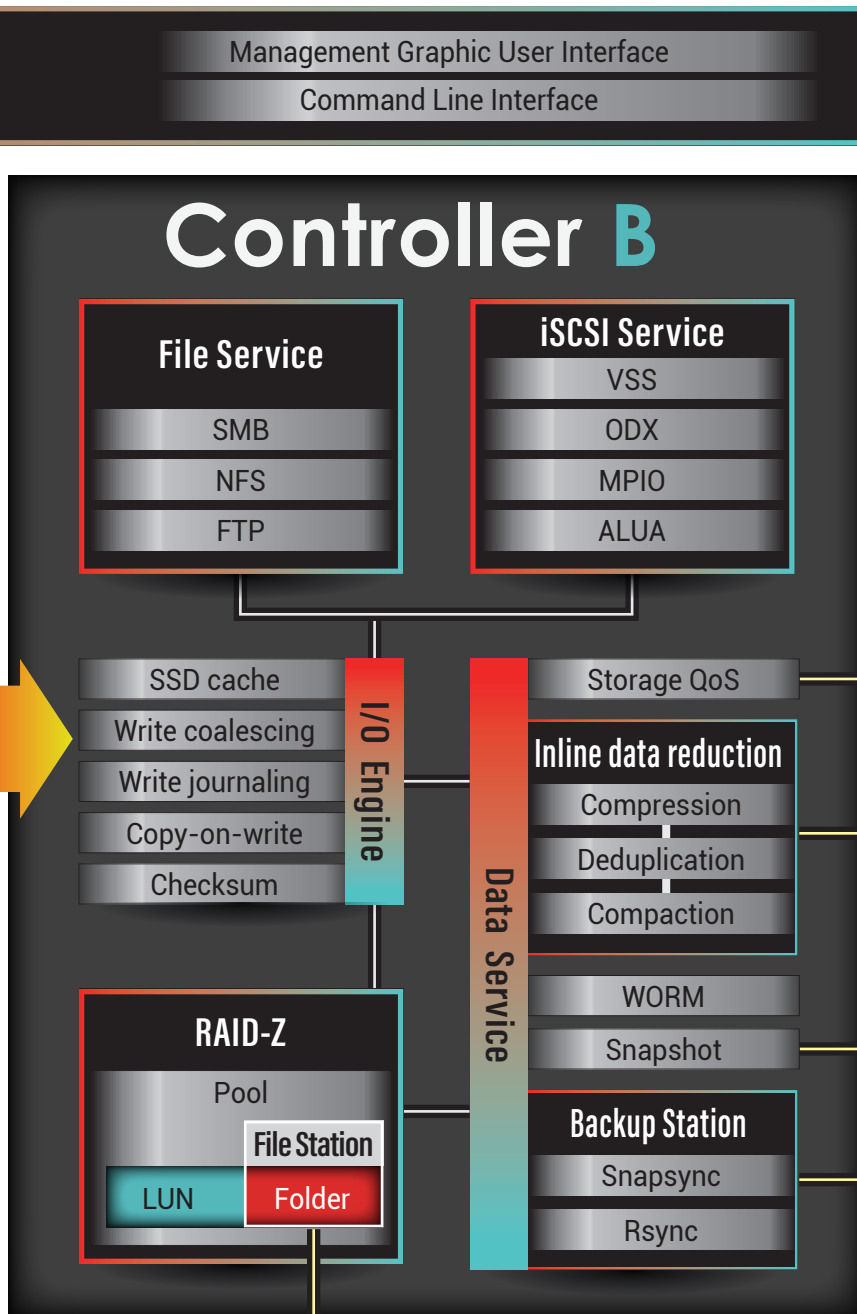
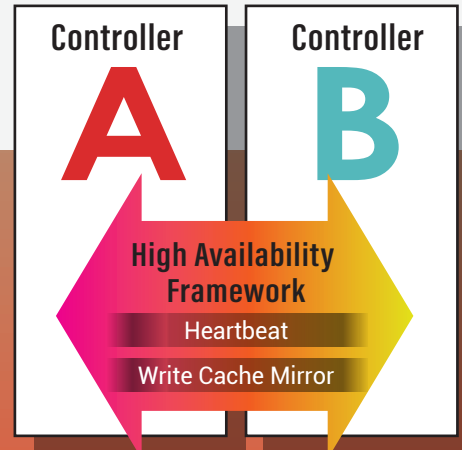
## RAID-Z supports triple-parity protection for large-capacity drives

Triple-parity RAID provides more protection for the system to finish rebuilding the array, which is especially useful for restoring high-capacity disks.



## High availability

The active-active controller architecture can withstand a single point of failure to ensure business continuity. The two controllers constantly synchronize write data and system status and are always ready to takeover in the event of controller failure.



- Solves the "Noisy Neighbor" effect
- Enhanced SSD lifespan
- Robust data protection

See pages 7 and 8

## File management with a visualized interface

Files are easily managed using the QES File Station.

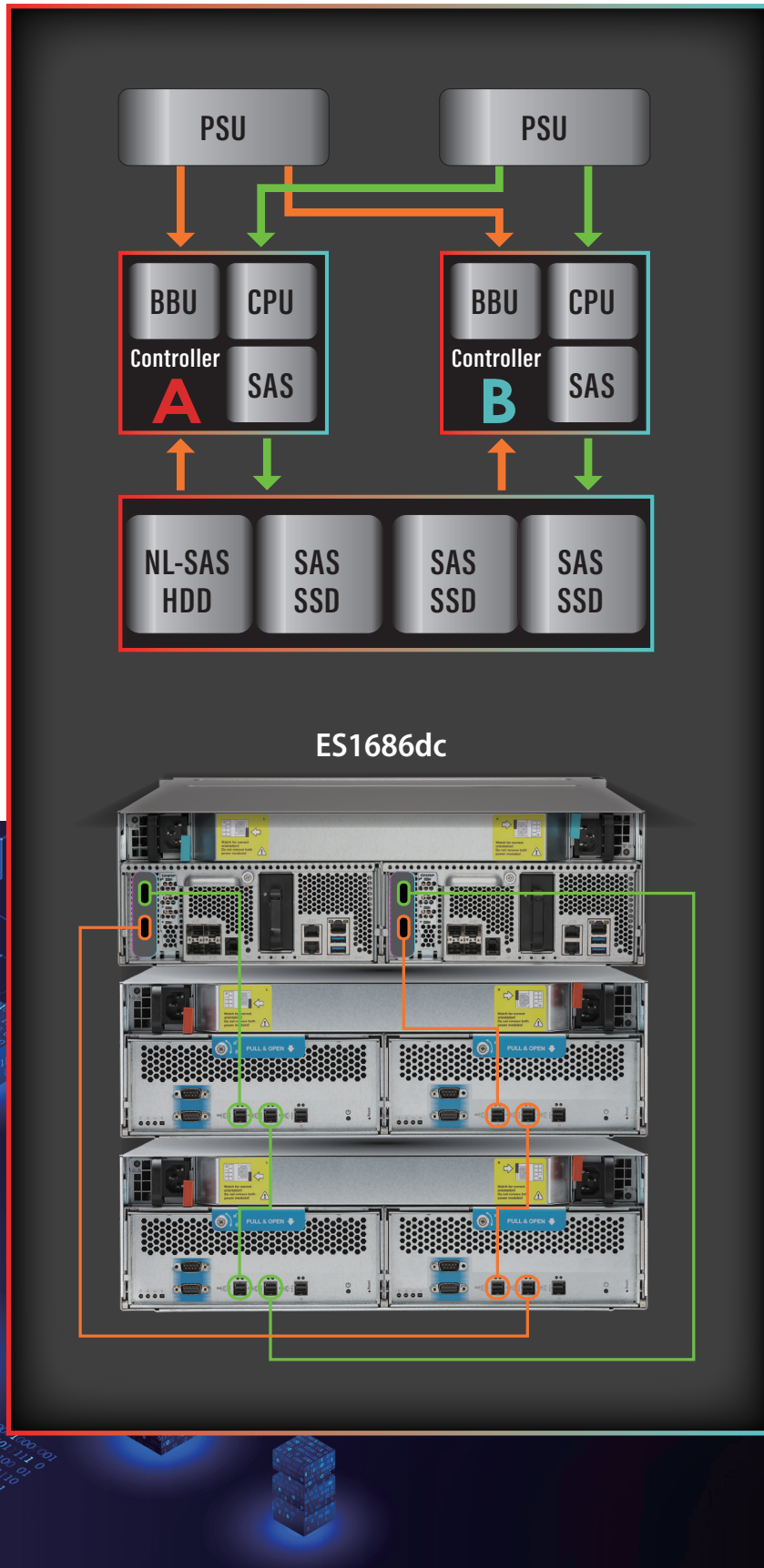
Built for mission-critical applications, the QNAP ES1686dc features ZFS, dual-active controllers, and a user-friendly GUI to provide users with ensured data integrity, high availability, and excellent performance.

## Redundant controllers ensure high availability

The redundant-controller design of the ES1686dc ensures uninterrupted operations. As the cache memory between the two controllers is continuously synchronizing with each other, if one of the controllers fails, the data written in cache memory can still be written to disks to ensure data integrity.

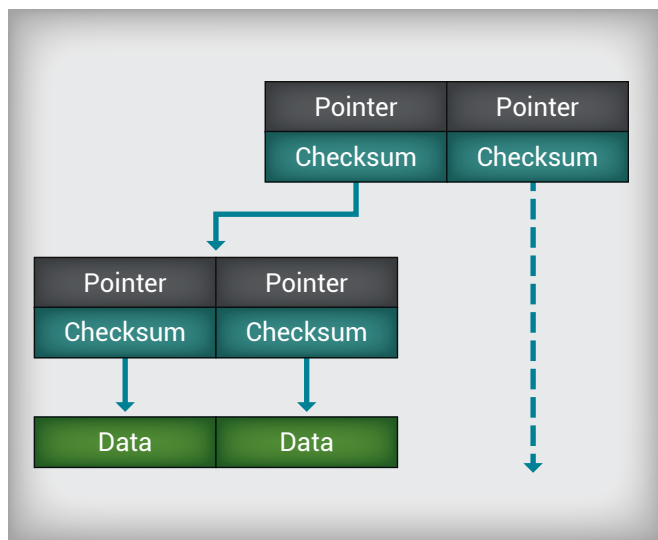
## Performance elasticity with active-active controller mechanisms

To ensure sufficient system resources during an unexpected controller failure, it is recommended to keep controller workloads at 50%. This configuration can then use the remaining system resources to reinforce performance-demanding applications during peak usage times.



## Robust data integrity with ZFS

ZFS is built to ensure data integrity, and features mechanisms suited for enterprise-level storage solutions.



### Protects against silent data corruption

Self-Healing

Within ZFS, each block of data is checksummed. When reading a RAID-Z block, ZFS compares it against its checksum, and if the data disks did not return the right answer, ZFS reads the parity and then figures out which disk returned bad data. Then, it repairs the damaged data and returns good data to the requestor, thus preventing silent data corruption.

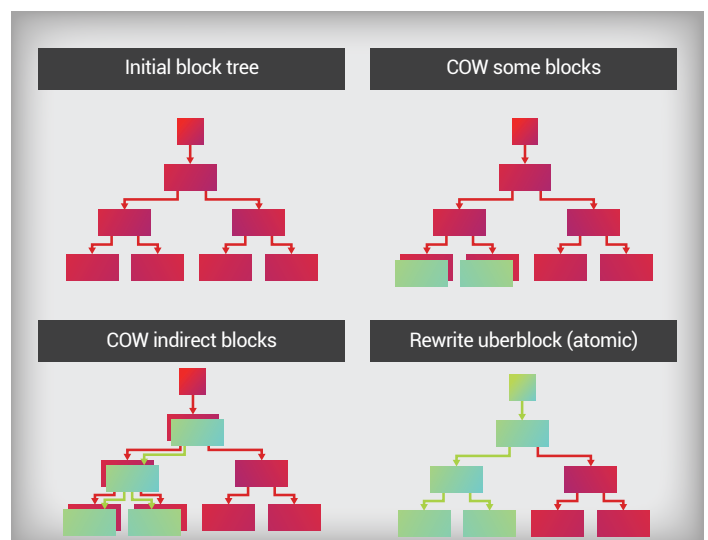
### Immune to power failure

Write Journaling

ZFS tracks file changes not-yet-committed to the file system by recording the intentions of such changes in its data structure. In the event of a system crash or power failure, ZFS checks the journal logs and then applies the scheduled changes, enabling the file system to be brought back online more quickly with a lower likelihood of becoming corrupted.

Copy-On-Write (COW)

ZFS uses a copy-on-write transactional object model. Blocks containing active data are never overwritten in place; instead, a new block is allocated, modified data is written to it, then any metadata blocks referencing it are similarly read, reallocated, and written. By operating with write journaling, the copy-on-write model ensures that users can still find the most-recent data before the latest write operation.

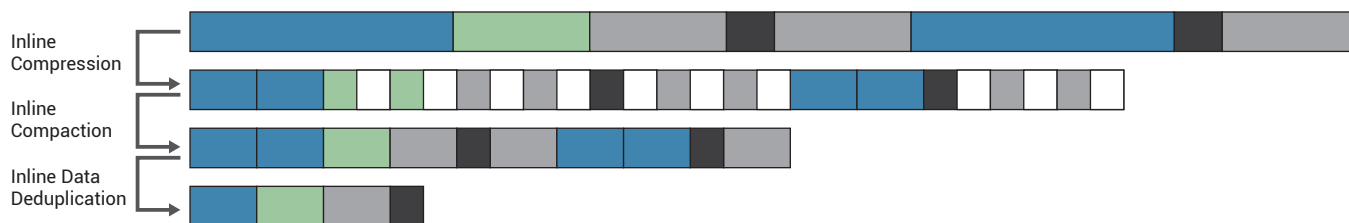


# Efficient data reduction with inline compression, deduplication, and compaction

The QNAP ES family features data reduction technology, making it especially useful for all-flash storage arrays.

## Reduce Storage Footprint

Every read-modify-write operation consumes the life of a flash cell. Inline data compression is being used to reduce the size of the data set to be stored. Data compaction stores multiple user data blocks and files within a single 4 KB block. Without data compaction, each file would get its own 4 KB block, consuming more 4KB blocks for the same amount of data. Inline deduplication then checks new data ready to be sent to storage against data that already exists in storage and doesn't store any of the redundant data it discovers. By minimizing the amount of physical blocks allocated for data storage, QNAP's data reduction technology helps to further extend the lifespan of users' SSDs - allowing the utilization of more cost-efficient SSDs without worrying about flash-cell wear-out.



## Robust Performance Optimization

### Performance optimization- Write coalescing

Write coalescing is a mechanism that transfers random writes (small blocks) into sequential writes (large blocks), which reduces the times of writes on drives. In an all-flash configuration, reduced write times result in minimized garbage collection, therefore minimizing the effect of write amplification.

### Use cost-efficient QNAP Drive Adapters to boost system performance

The QNAP Drive Adapter (QDA) allows users to install SATA disks on dual controller models. This enables users to utilize cost-efficient SATA SSDs on the dual-controller ES1686dc system for all-flash configurations and SSD Cache.

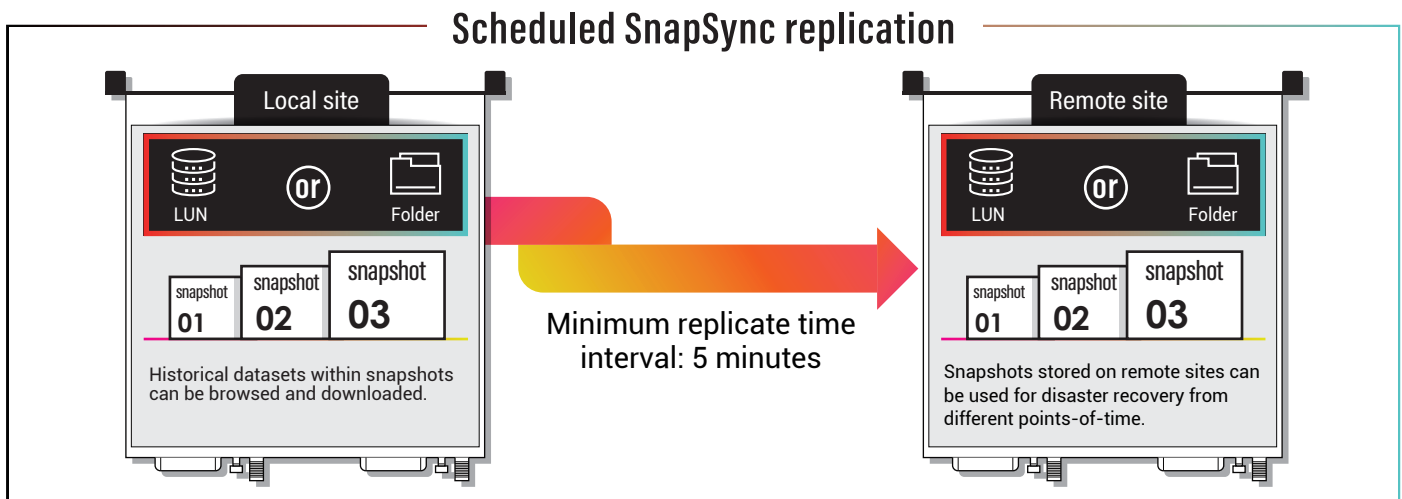
### Storage QoS

The ES1686dc is a powerful storage system that is capable of serving multiple applications in a single array. This raises the concern of the "Noisy Neighbor" effect where low-priority applications consume the resources necessary for more-important services. Storage QoS allows users to define the priority of every application running on the array by setting the system resources that should be allocated for LUNs and Shared Folders.



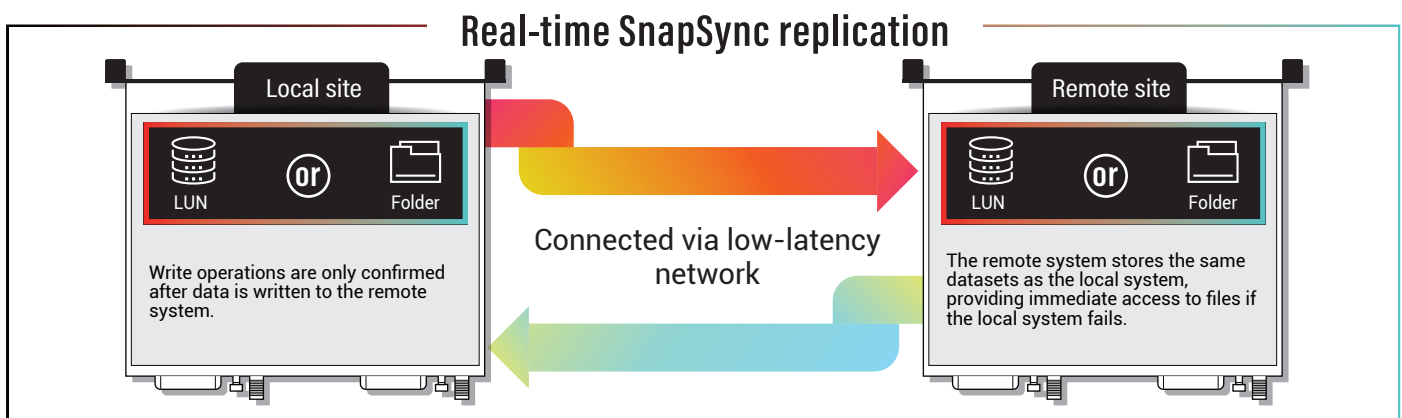
## Snapshot and SnapSync

QNAP NAS snapshots store differential datasets from folders and iSCSI LUNs with no performance impact. Snapshots can be further replicated to another QES system by using QNAP's SnapSync technology.



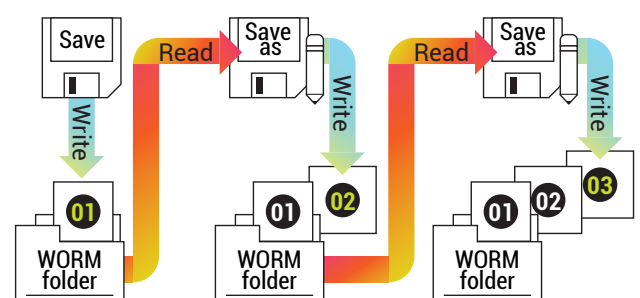
SnapSync creates either a real-time or a scheduled replication job between two QES systems. Disaster recovery can be performed through remote replication to minimize the impact from site failure, as data can be immediately retrieved from the remote backup site.

QES Backup Station allows browsing snapshot content, allowing users to download historical datasets without remounting the entire shared folder.



## WORM folder

With increasingly stringent regulations on how information is stored, many countries require government agencies, financial institutions, and healthcare providers to comply with strict data archiving regulations. To meet the security requirements of enterprise storage, the QNAP ES Series NAS has WORM functionality to help users protect important organizational information. WORM (Write Once, Read Many) is used to avoid modification of saved data. After this feature is enabled, data in shared folders can only be written, and cannot be deleted or modified to ensure data integrity. WORM folders can be deployed on thin-provisioning pools for future expansion flexibility as well as being configured with folder quotas for capacity management. Data reduction technology can also be applied to optimize storage utilization.



- Data cannot be deleted from the file system.
- Supports data retention periods and indefinite data retention.

## Hardware Specification

	ES1686dc-2123IT-64G	ES1686dc-2142IT-96G	ES1686dc-2142IT-128G
Form Factor	3U		
Processor	Intel Xeon D 4-core 2.2GHz	Intel Xeon D 8-core 1.9GHz	Intel Xeon D 8-core 1.9GHz
Memory	64GB	96GB	128GB
Max. Memory	1TB		
Memory slots	16 (DDR4, RDIMM/LRDIMM)		
Drive bays	16 x 3.5-inch SAS/SATA		
SSD cache	Yes		
Copy to Flash battery	12v, 2200mAh		
Management ports	1 per controller		
On-board network ports	4x 1GbE (RJ45) 8x 10GbE (SFP+)		
PCIe slots	4 (Gen3x8)		
USB ports	4 (USB3.0)		
Dimensions (mm)	132 x 483.05 x 630.62 mm		
Weight (kg)	32.69 kg (Gross) ; 25.83 kg (Net)		
Temperature	0 - 40 °C (32°F - 104°F)		
Relative humidity	5% - 95%		
Power supply	90~264VAC; 770W		
Power consumption	Normal 500.87W		
Noise	55.8 db		

## Expansion Enclosure Specifications

	EJ1600v2
Form Factor	3U rackmount
Host Interface	SAS 12Gbps
Dimensions	132 × 446.2 × 618 mm
Weight (Net)	33.76 kg (Gross), 24.11 kg (Net)
Drive slots	16 x 3.5-inch SAS/SATA
Temperature	0 - 40 °C (32°F - 104°F)
Relative Humidity	5~95% RH non-condensing, wet bulb: 27°C.
Power Supply	2x 450W, 90-240Vac~, 50-60Hz
Power Consumption	Normal: 344.19 W
Sound Level	53.5 db(A)

## Network Expansion Cards

Brand	Model	Description
QNAP	LAN-10G2T-X550	Dual-port (10GBASE-T) 10GbE network expansion card
Mellanox	MCX312B-XCCT	Dual-port (SFP+) 10GbE network expansion card
Mellanox	MCX311A-XCCT	Single-port (SFP+) 10GbE network expansion card
QNAP	LAN-40G2SF-MLX	Dual-port (QSFP+) 40GbE network expansion card

## Software Specification

<b>High Availability</b>	<b>Security</b>	<b>Thirty Party Plug-ins</b>
Active-active dual controller for NAS	Network access protection with auto-blocking: SSH, HTTP(S), FTP, CIFS/SMB	SMI-S Provider
Active-active dual controller for JBOD expander	CIFS/SMB host access control for shared folders	vSphere Web Client Plugin
MPIO for iSCSI high availability	FIPS 140-2 validated AES 256-bit volume-based and shared folder data encryption	VAAI Plug-in: NFS, iSCSI
Firmware update without interrupting service	Importable SSL certificates	VMware Storage Replication Adapter (SRA)
Link aggregation for network high availability	Instant alert via E-mail, SMS, beep	QNAP Cinder Driver for Openstack block storage
<b>Supported Client OS</b>	<b>Storage Management</b>	<b>Power Management</b>
Windows 7 (32/64-bit), Windows 8 (32/64-bit), Windows 10 (32/64-bit), Windows Server 2008 R2/2012/2012R2/2016	Storage space utilization monitoring	Wake on LAN
Apple Mac OS X	Storage pool with RAID 0, 1, 5, 6, 10, 50, 60, RAID TP, triple mirror	Automatic power on after power recovery
Linux and UNIX	Global hot spare	Network UPS support with SNMP management
<b>Supported Browsers</b>	SSD read cache	<b>Access Right Management</b>
Google Chrome	NVRAM write cache (BBU-protected)	Batch users creation
Microsoft Internet Explorer	Scheduled Backup Battery Unit (BBU) learning	Import/Export users
Mozilla Firefox	Share folder/LUN with thin provisioning	User quota management
Apple Safari	Checksum for end-to-end data integrity	Local user access control for CIFS/SMB and FTP
<b>Multilingual Support</b>	Silence error detection and self-healing	<b>Domain Authentication Integration</b>
Chinese (Traditional & Simplified), Czech, Danish, Dutch, English, Finnish, French, German, Greek, Hungarian, Italian, Japanese, Korean, Norwegian, Polish, Portuguese (Brazil), Romanian, Russian, Spanish, Swedish, Thai, Turkish	Pool scrub for data verification	Microsoft Active Directory support
<b>File System</b>	Share folder quota management	LDAP client
ZFS	Inline deduplication for shared folder/LUN	Domain users login via CIFS/SMB, FTP
<b>Networking</b>	Inline compression for shared folder/LUN	<b>Administration</b>
TCP/IP (IPv4 & IPv6)	Inline encryption for shared folder/LUN	Multi-window, multi-tasking based system management
10 Gigabit NICs with jumbo frame (LACP, Load Balance, Failover, Round Robin)	WORM (Write Once Read Many) for shared folder	Movable Icons and personalized desktop
Service binding based on network interfaces	Storage QoS (Quality of Service) for shared folder/LUN	Smart toolbar and dashboard for neat system status display
Proxy server	Shared Folder/LUN snapshot	Smart Fan control
Protocols: CIFS/SMB2/SMB3, NFS v3/NFS v4, FTP, FTPS, TFTP, HTTP, HTTPS, SSH, iSCSI, SNMP, SMTP, and SMSC	Online pool, share folder, and LUN expansion	SNMP (V1/V2 & V3)
iSER (iSCSI Extensions for RDMA)	S.M.A.R.T. Information for drives and Predictive S.M.A.R.T. Migration	Resource monitor
Bonjour Discovery	SSD Life monitors the remaining lifespan of solid-state drives	Network recycle bin for file deletion via CIFS/SMB, File Station and FTP
<b>File Server</b>	Time-Limited Error Recovery (TLER)	Smart file filter
Shared folder for CIFS/SMB, NFS and FTP	JBOD ID Reinitialized	Comprehensive logs (events & connection)
File sharing across Windows, Mac, and Linux/UNIX		Syslog client management
Windows ACL		System settings backup and restore
		Command Line Interface (CLI)

# ES1686dc

Enterprise ZFS ES1686dc



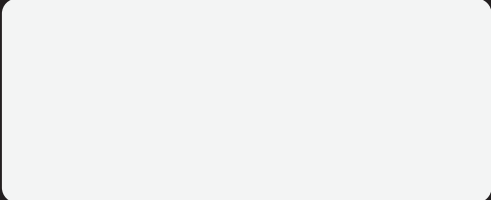
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