QNAP

QuTS hero

h 4.5.2

Support SnapSync DR solution and prevent simultaneous multi-SSD failures with QSAL

Agenda

01 | The latest changes in h4.5.2

02 | Live Demo

03 | QuTS hero Recap

04 | Recommended Models

QuTS hero 4.5.2

QNAP

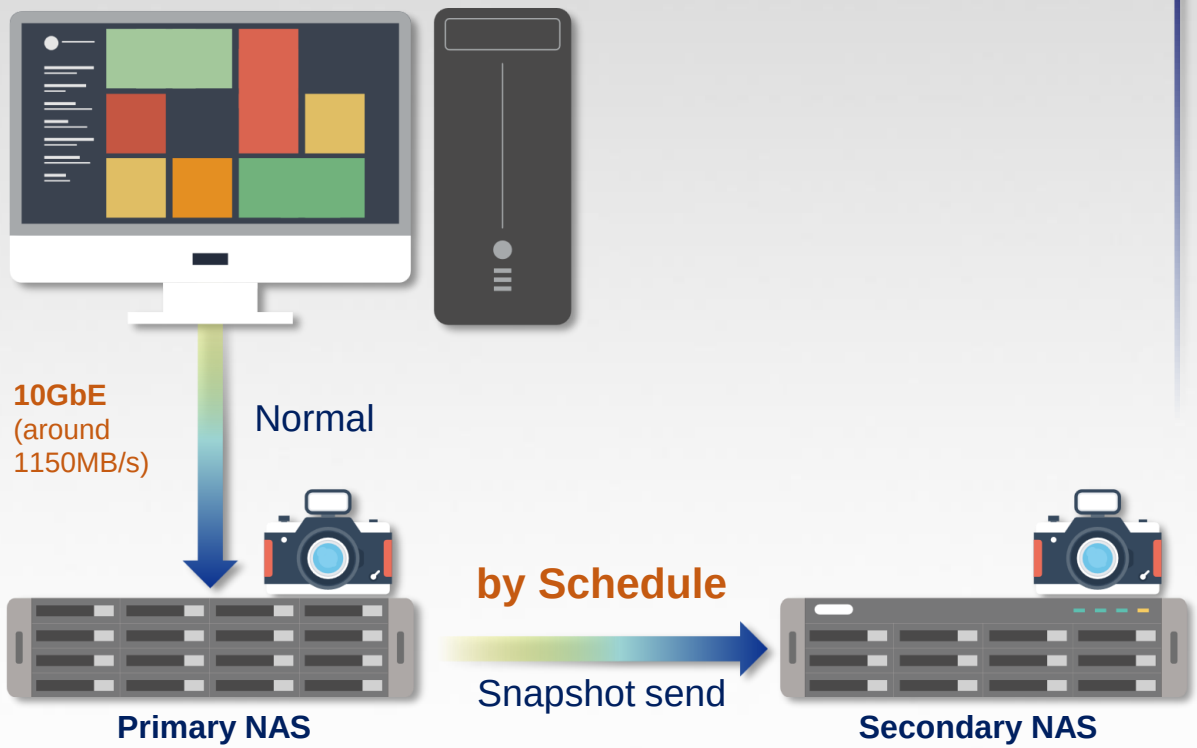
The latest changes in h4.5.2

QuTS hero

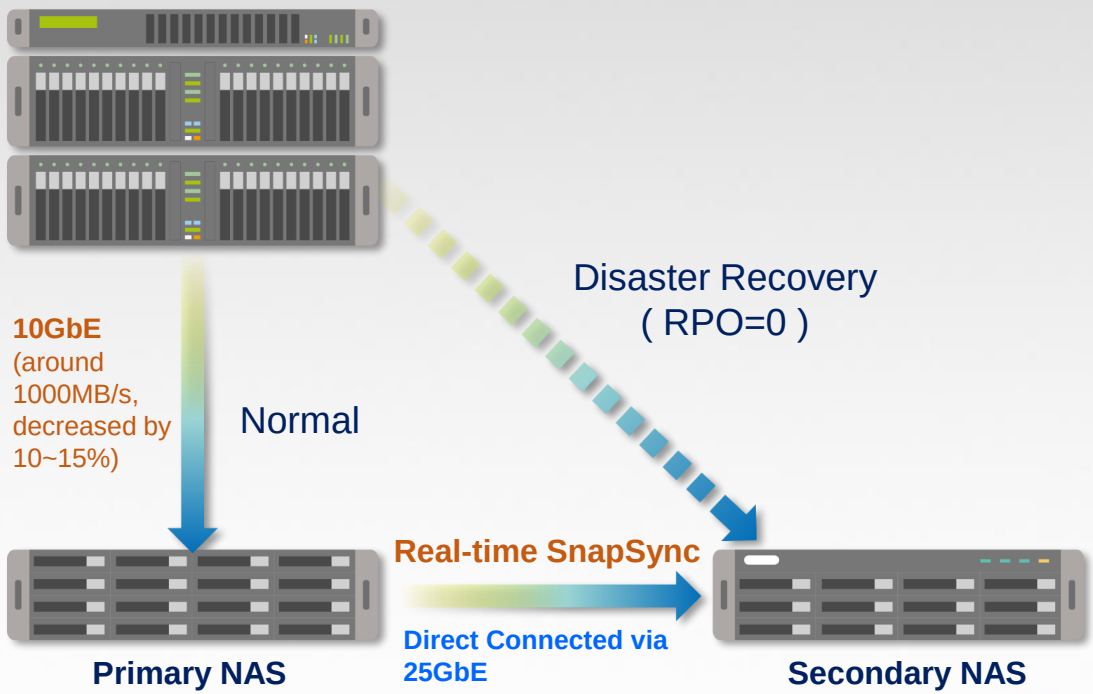
TVS-h1288X / TS-h1683XU-RP / TS-h2490FU

SnapSync – cost-effective replication solution for backup, data protection & disaster recovery

Scheduled SnapSync: 5min~60min



Realtime SnapSync: RPO=0

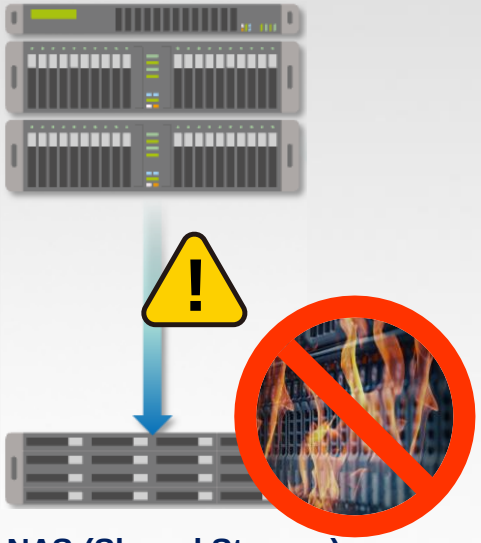


QuTS hero 4.5.2

How to do when disasters happen

If unfortunately a disaster happens

Production Server

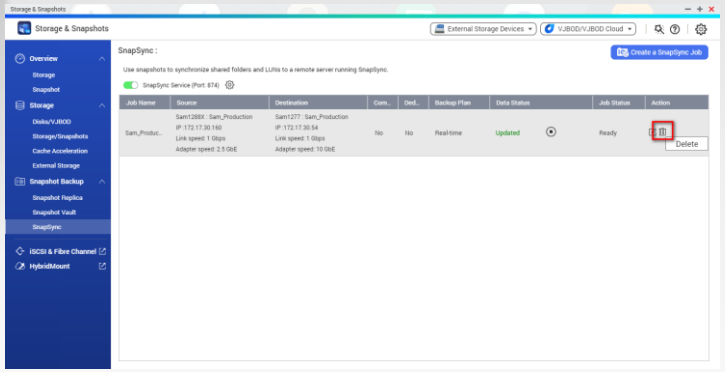


NAS (Shared Storage)

(1) Delete SnapSync task

Primary NAS
192.168.100.100

Secondary NAS
192.168.100.200



- The exclusive permissions of the folder will be removed when deleting the SnapSync task.

COMING SOON

Note: Disaster Recovery automation via VMware SRM will be supported in the future.

(2-A) Remount to secondary NAS IP

Production Server

Mount Target = 192.168.100.200

Or

(2-B) Change the secondary NAS IP as same as original primary NAS.

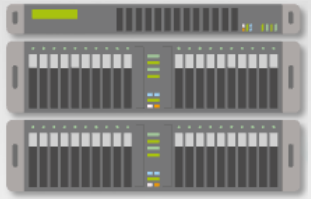
Secondary NAS
192.168.100.200 => 192.168.100.100

QuTS hero 4.5.2

Best Practices for the configuration of Realtime SnapSync

Before SnapSync Protection

Production Server



10GbE
(1150MB/s)

NAS (Shared Storage)

Best Practices for Configuration

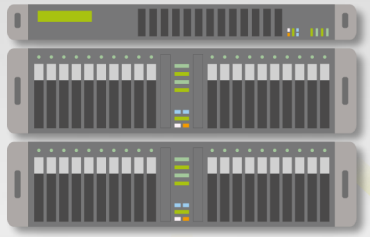
Primary NAS → Secondary NAS

Direct Connected via 25GbE

1. The I/O performance of the secondary NAS should be the same as the primary NAS.
2. Recommended to connect the two networks directly to avoid interference and reduce latency. (If it is a long-distance transmission, the latency should be less than 5ms, and the maximum cannot exceed 10ms, otherwise you can also consider using schedule SnapSync)
3. QNAP 25GbE is recommended (slightly higher than the transfer rate of production server)

After Realtime SnapSync enabled

Production Server



10GbE performance when SnapSync enabled
(1000MB/s, decrease around 10~15%)

10GbE

Primary NAS

Real-time SnapSync

Direct Connected via 25GbE

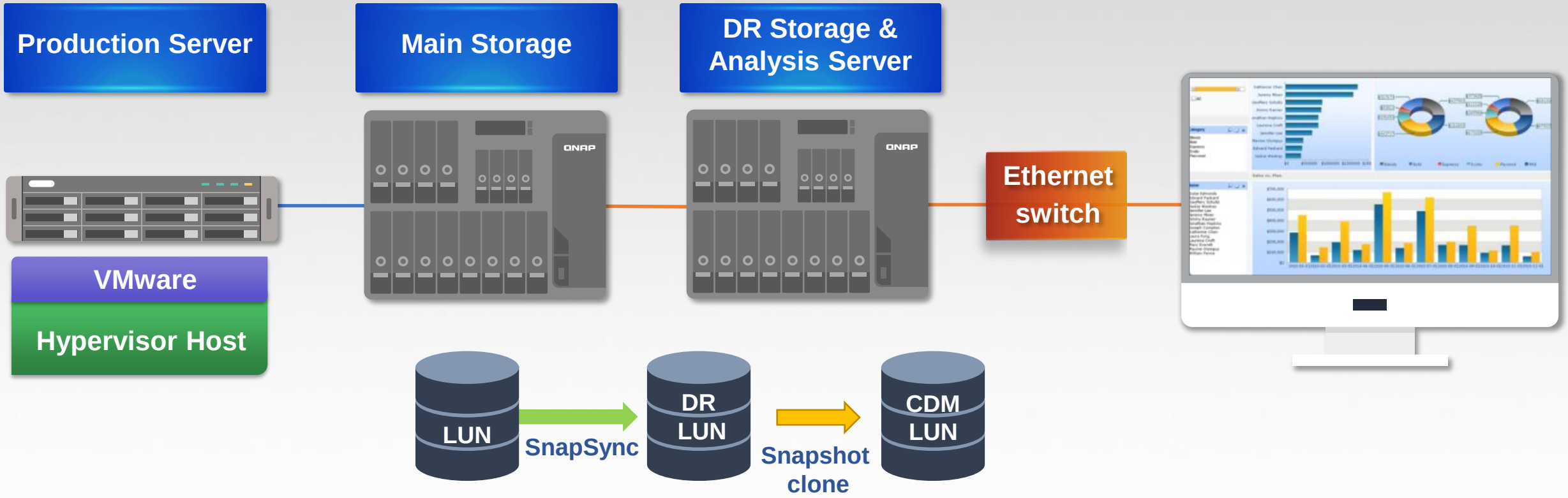
Secondary NAS

QNAP Lab Test Environment:
IO mode: sync = standard, Block size = 128K, Jumbo Frame (MTU) = 9000

Also supports QES NAS SnapSync to QuTS hero NAS

QuTS hero 4.5.2

DR backup and CDM (Copy Data Management)



QuTS hero 4.5.2

The benefit of SnapSync

Lowest RPO

Real-time replication - Reduce downtime and protect against data loss

Cost Efficiency

Reduce Cost & Network Bandwidth: built-in compress / dedup for transmission

Flexibility & Scalability

Distribute big Amount of data easily for enterprise data migration and copy

Reliability & Compliance

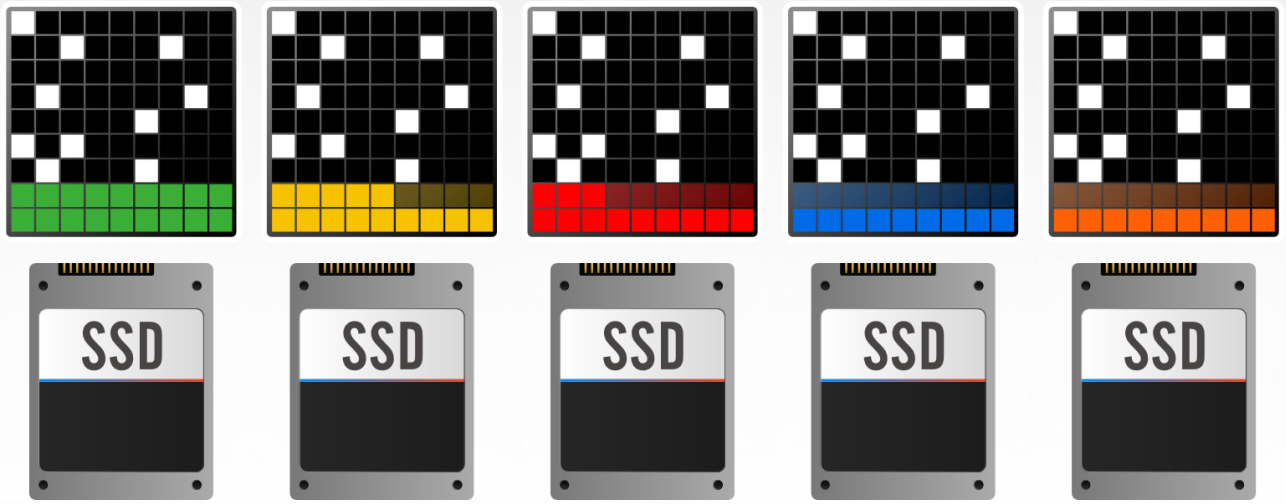
Data retention, compliance, and multi-version requirement

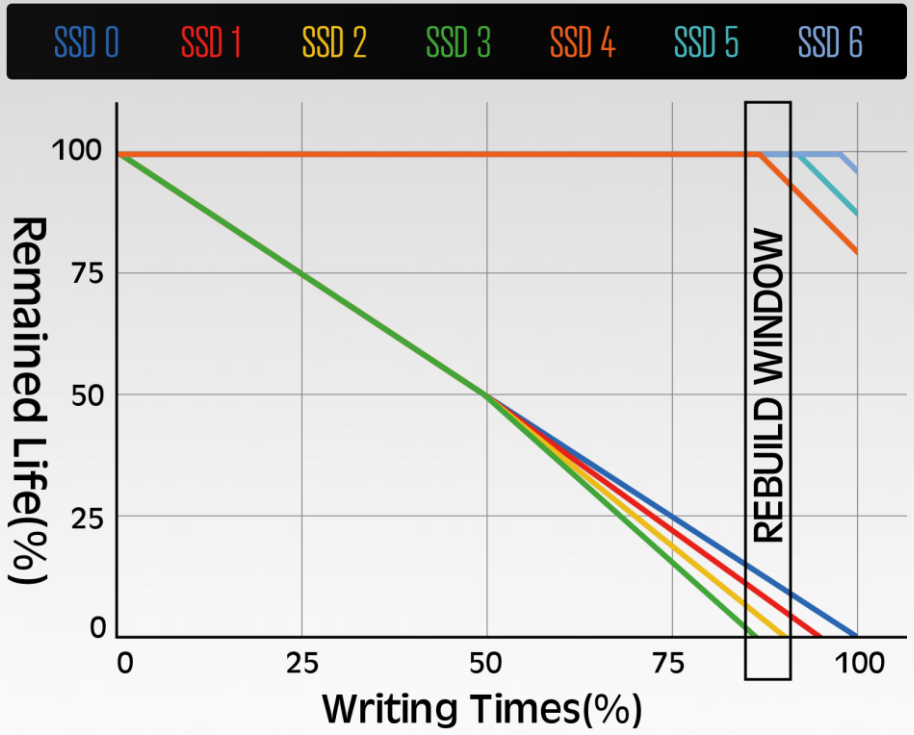
Data Independence & Consistency

CDM (Copy Data Management) for data analytics, without affecting production server.

QNAP Patented QSAL technology: preventing multiple SSD malfunctioning at the same time

QSAL (QNAP SSD Anti-wear Leveling) When SSD life falls below 50%, the SSD OP would be dynamically adjusted to achieve the life control of each SSD, and to ensure that there is enough rebuild time at the end of the previous SSD life to avoid RAID damage.



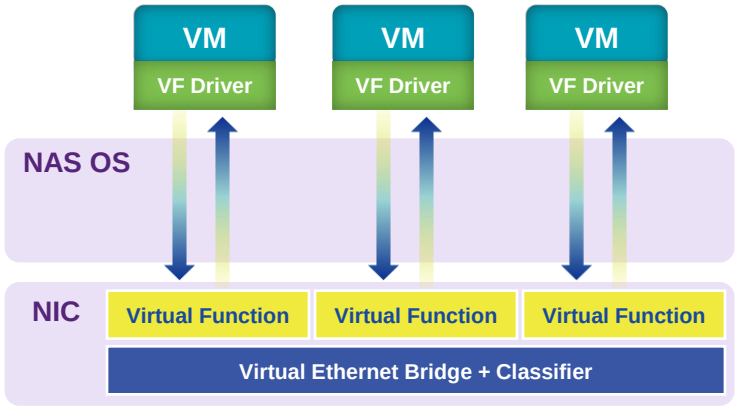


For SSD RAID 5 / 6 / 50 / 60 / TP (Triple Parity), QSAL will be enabled by default automatically.

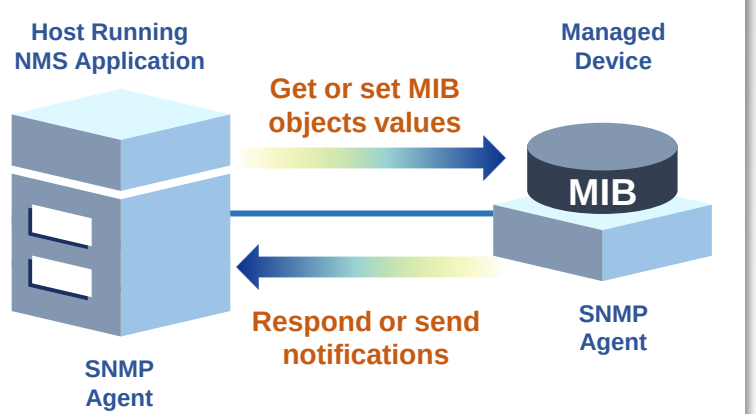
QuTS hero 4.5.2

Like QTS, h4.5.2 also supports the new 100GbE adapter, the virtualized SR-IOV function, and the updated SNMP module.

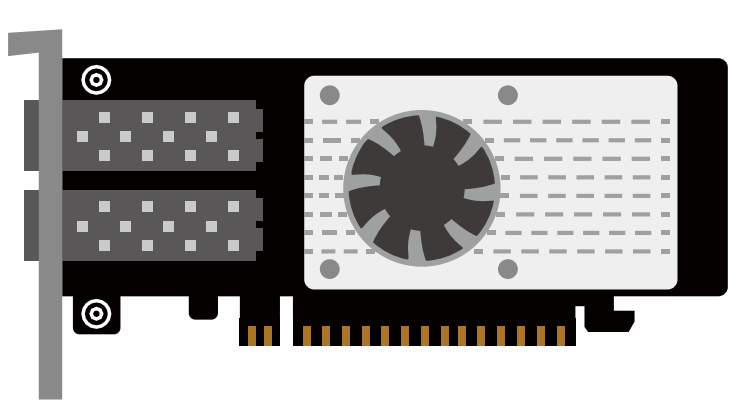
SR-IOV virtualized network



Updated SNMP module



100Gbps ultra speed network QXG-100G2SF-E810



QuTS hero 4.5.2

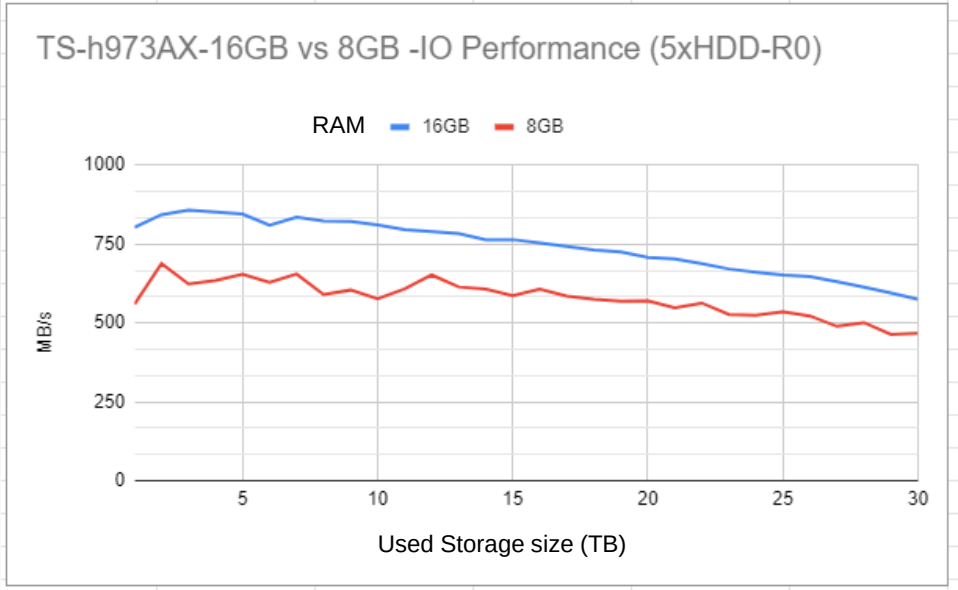
ZFS structure consideration:

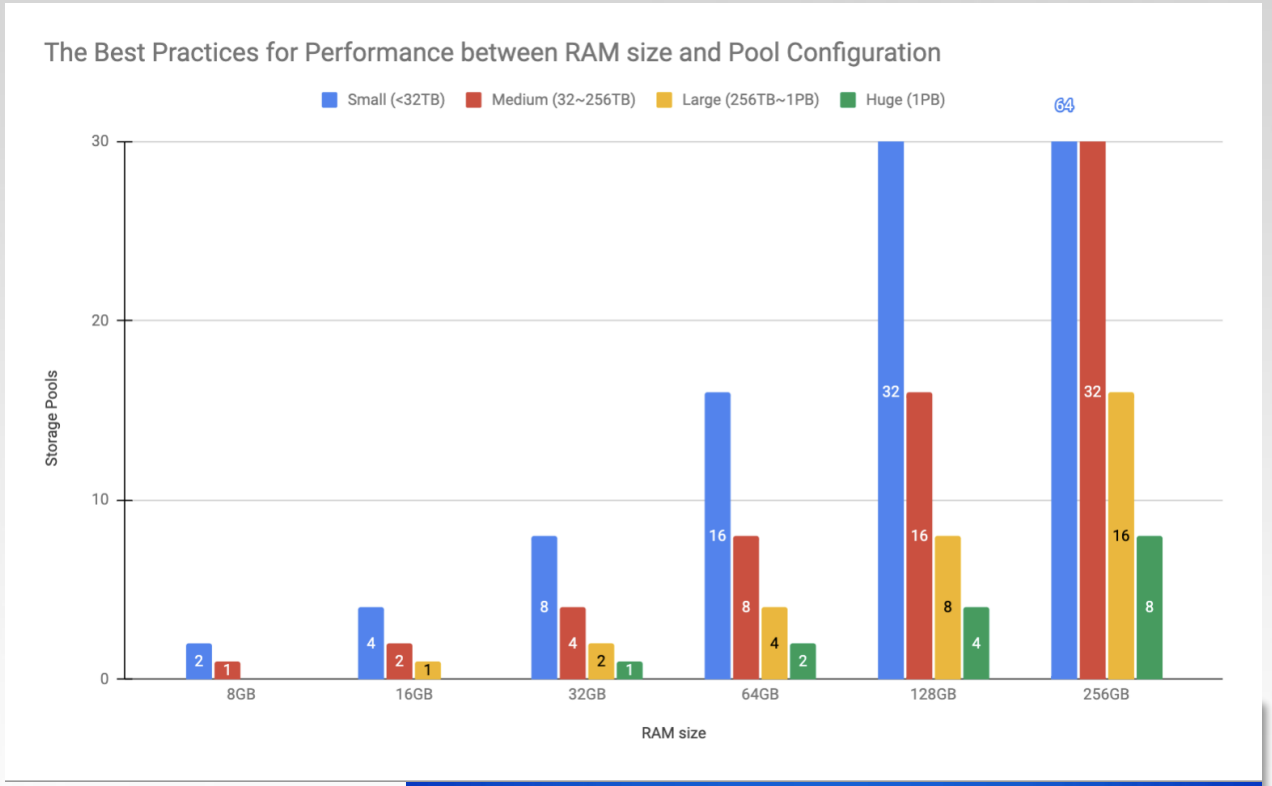
Performance dependency between memory size and storage pools

Using entry-level model TS-973AX as a reference,

We already created one SSD pool and one HDD pool around 35TB.

The performance difference of the HDD pool is displayed





Choose sufficient memory for different storage configurations for better performance.

QNAP

LIVE DEMO

QuTS hero

TVS-h1288X / TS-h1683XU-RP / TS-h2490FU

QNAP

QuTS hero Recap

QuTS hero

TVS-h1288X / TS-h1683XU-RP / TS-h2490FU

QuTS hero: The best Unified Hybrid Storage

Most Affordable Hybrid Storage

- Data Self-healing
- ZFS on Linux
- Cloud Ready
- Flash Endurance
- Virtualization Ready
- 65,536 Snapshots

Unified

Google Azure aws 阿里云

Microsoft vmware

QuTS hero 4.5.2

QuTS hero Highlights

Data Efficiency

- Offers inline compression & inline deduplication for better storage utilization
- ZIL & L2ARC
- Write Coalescing
- Pool over-provisioning

Data Protection

- The native ZFS snapshot feature allows smart definitions of guaranteed snapshots
- A nearly unlimited number of 65,536 snapshots (supports folder/LUN)
- SnapSync
- More RAID types available
- WORM (write once read many)

Data Integrity

- QuTS hero no longer needs file system checks (FSCK), with ZFS Mirror layer, COW (copy on Write) could keep the data integrity.

Stability & Scalability

- Provide ECC RAM supported model to reach the enterprise level stability
- Provide the service of SSD/HDD life prediction
- Easily expanded to PB-level storage space.

App & Converged

- Supports all app, VMs, and containers. Users could easily deploy the vRouter/ vFirewall, and use many popular packages nginx/ httpd / mangoDB / redis / ShadowSocks

QuTS hero 4.5.2

QNAP

Chapter

01

DATA EFFICIENCY

QuTS hero

TVS-h1288X / TS-h1683XU-RP / TS-h2490FU

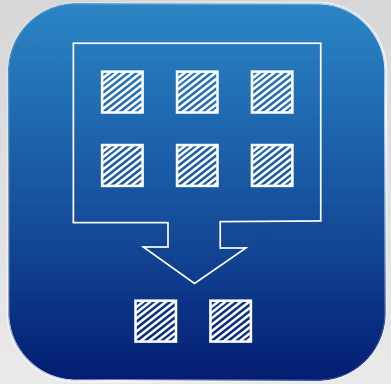
Powerful Data Reduction

Thin shared folder / Thin LUN

It default on Thin provisioning, and dynamically adjusts the size according to use needs to achieve the most effective space utilization.

Inline Data Compression

Inline compression can save physical storage space and improve I/O bandwidth and memory usage which may have a positive impact on overall system performance.



Inline Data Deduplication

Inline deduplication is block-based and is carried out before data is written to storage. This greatly optimizes storage usage while significantly decreasing storage capacity requirements.

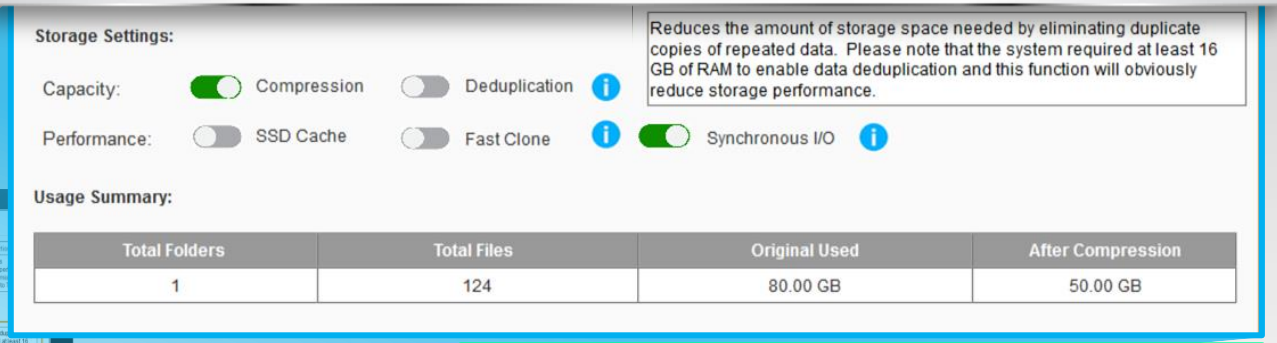
QuTS hero 4.5.2

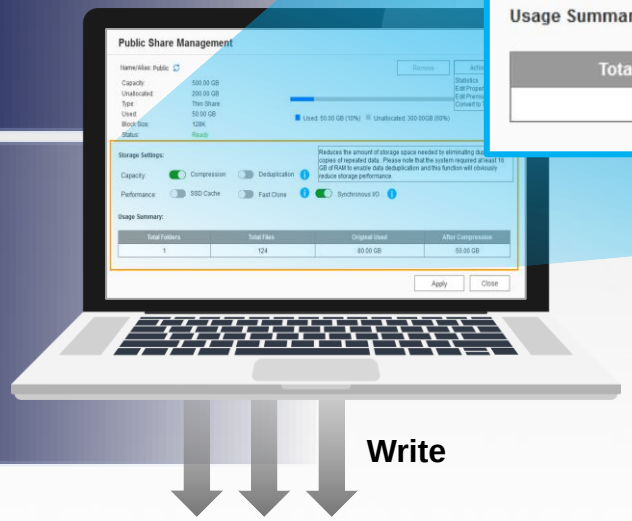
Reduce writing also means to extend the SSD endurance

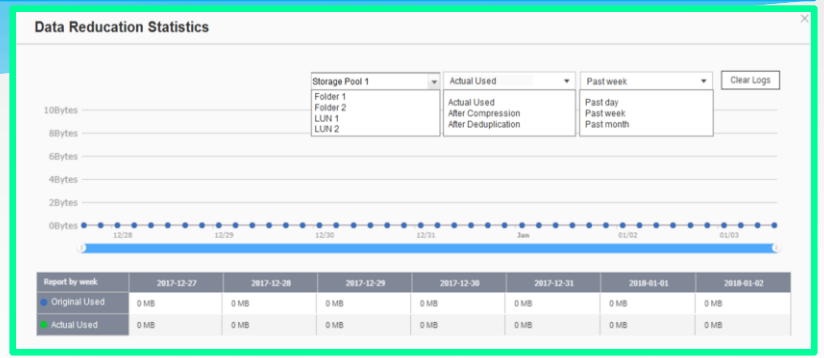
Only available when inline process before writing

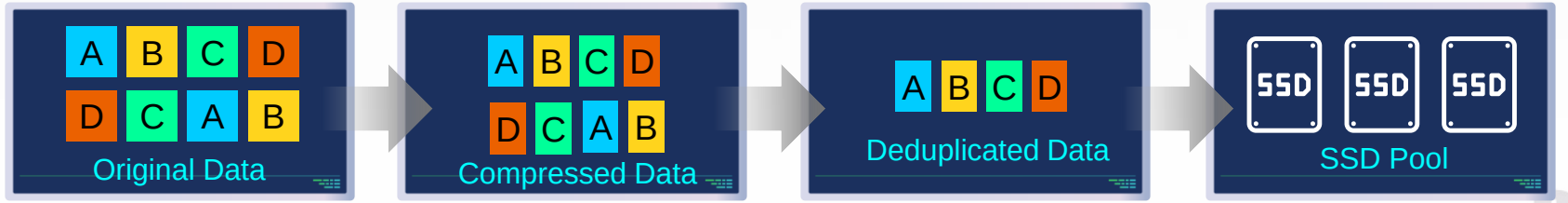
ZFS file system with inline deduplication compression features.

It's the best choice to pair with the all-flash and SSD storage because it reduces the data size and pattern that need to be written to the SSD directly.









Compression

Deduplication

Write to drive as sequential as much as possible.

Deduplication requirement:

- **minimum 16GB RAM**
- **Recommended 64GB RAM or more**

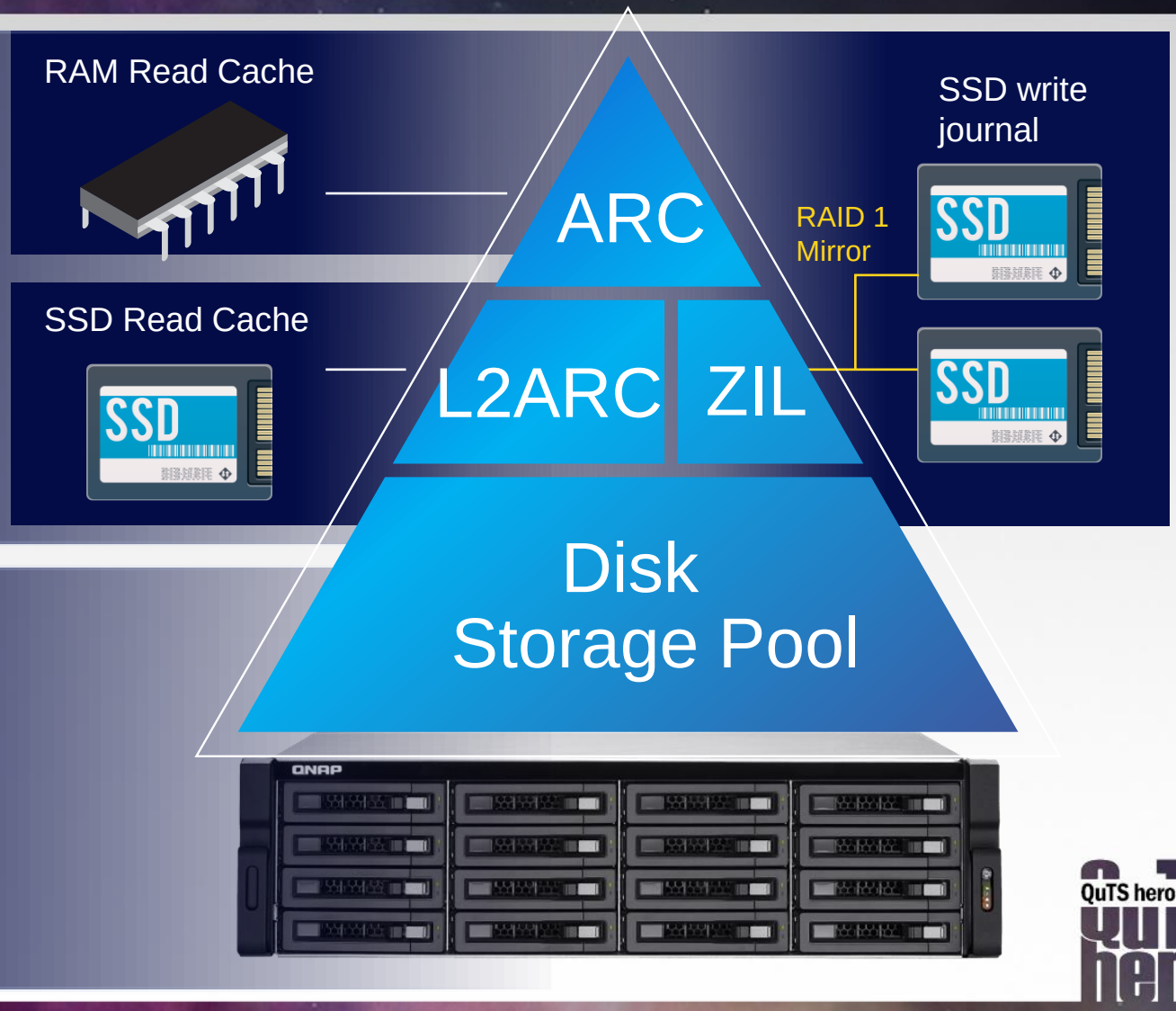
L2ARC cache, and ZIL which provide power loss protection

Layer-2 Adaptive Replacement Cache: (L2ARC)

- Ideal for SSD read cache
- Large "hybrid" cache
- Read performance enhancements

ZFS Intent Log: (ZIL)

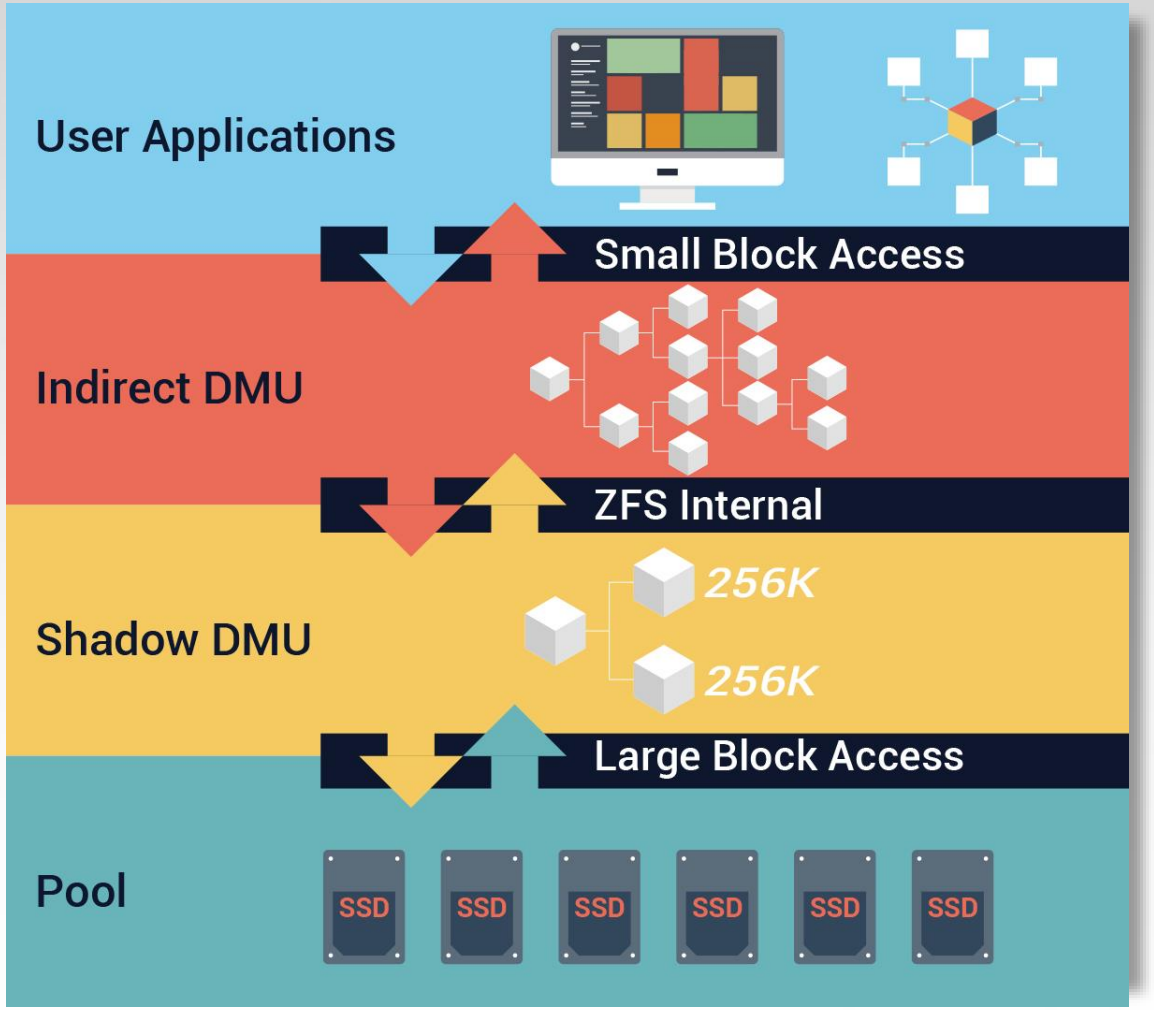
- Ideal for SSD write log
- Write Data integrity (COW)
- Provides the power loss protection for writing data.



QuTS hero 4.5.2

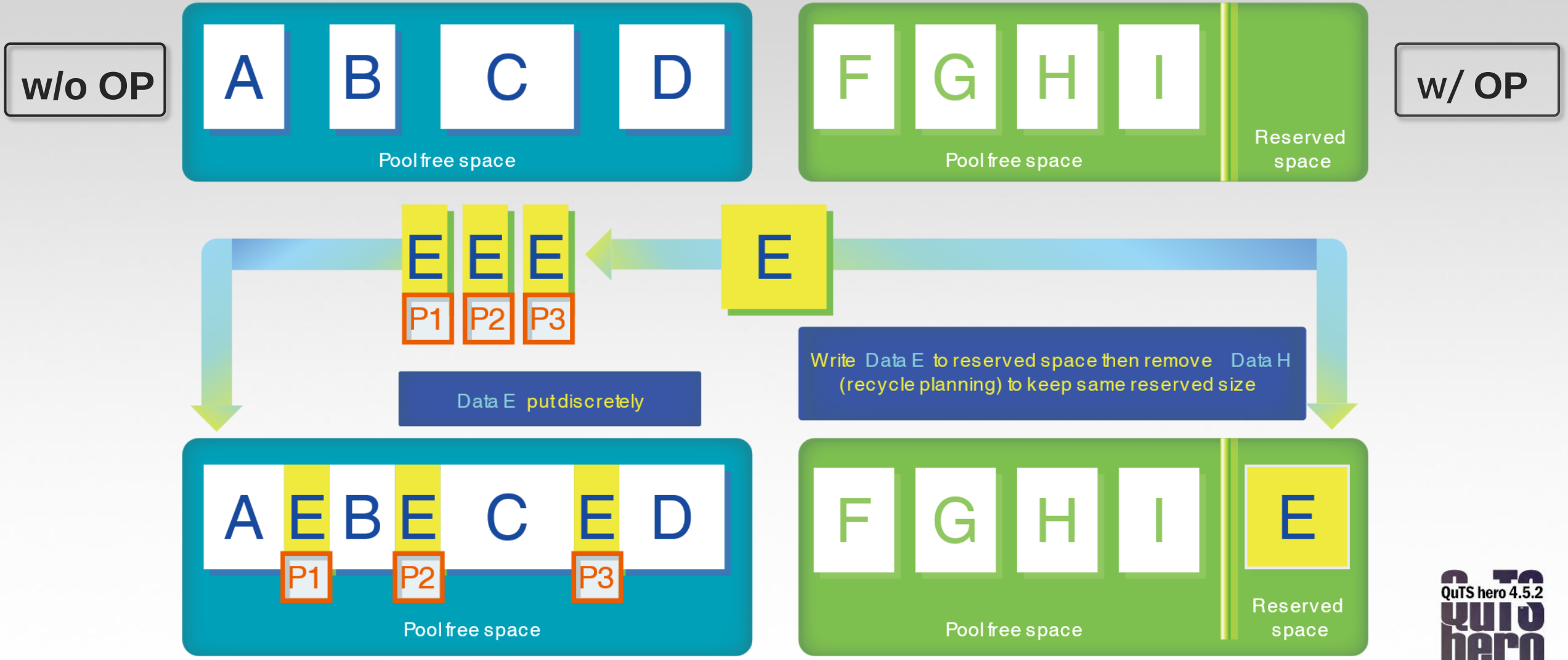
Write Coalescing: improve the random access

QNAP exclusive Write Coalescing algorithm that transform all random write to sequential writes along with reduced I/O.



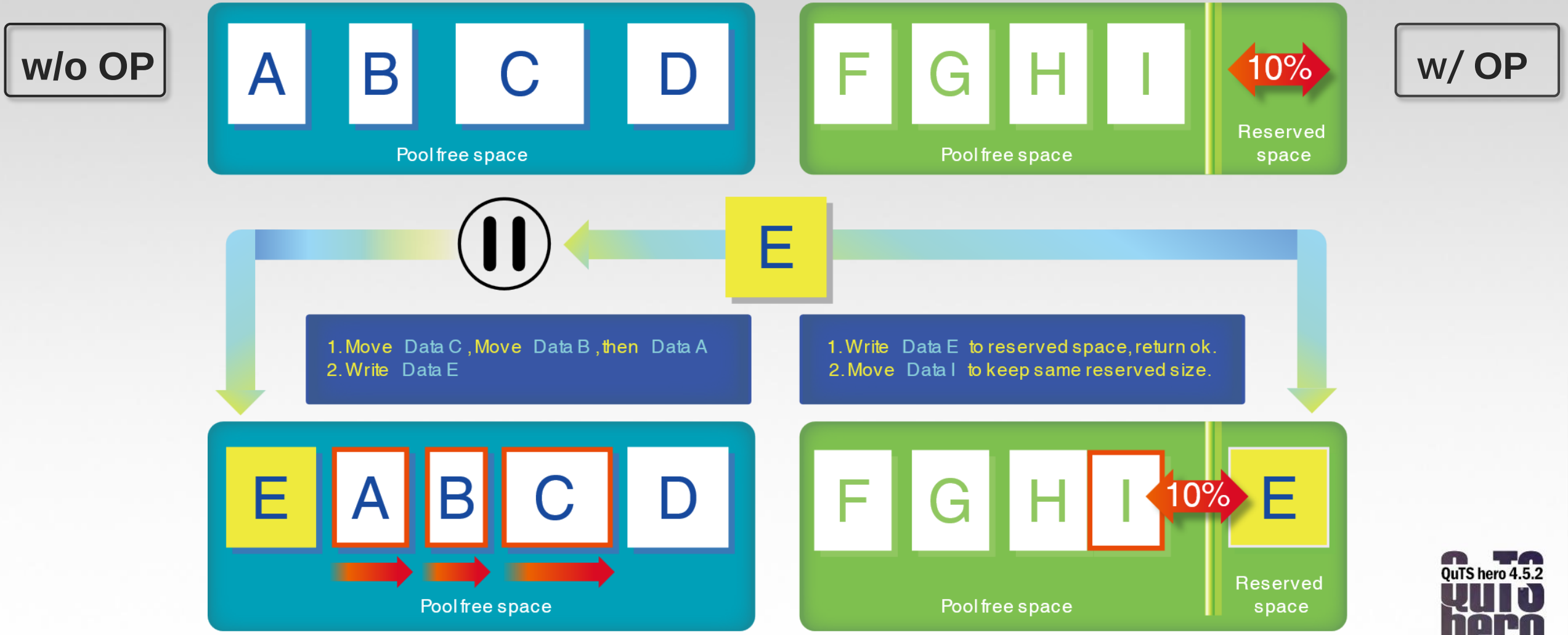
QuTS hero 4.5.2

Pool over-provisioning: Improve the performance for fragmented pool (The scenario when big block write to HDD)

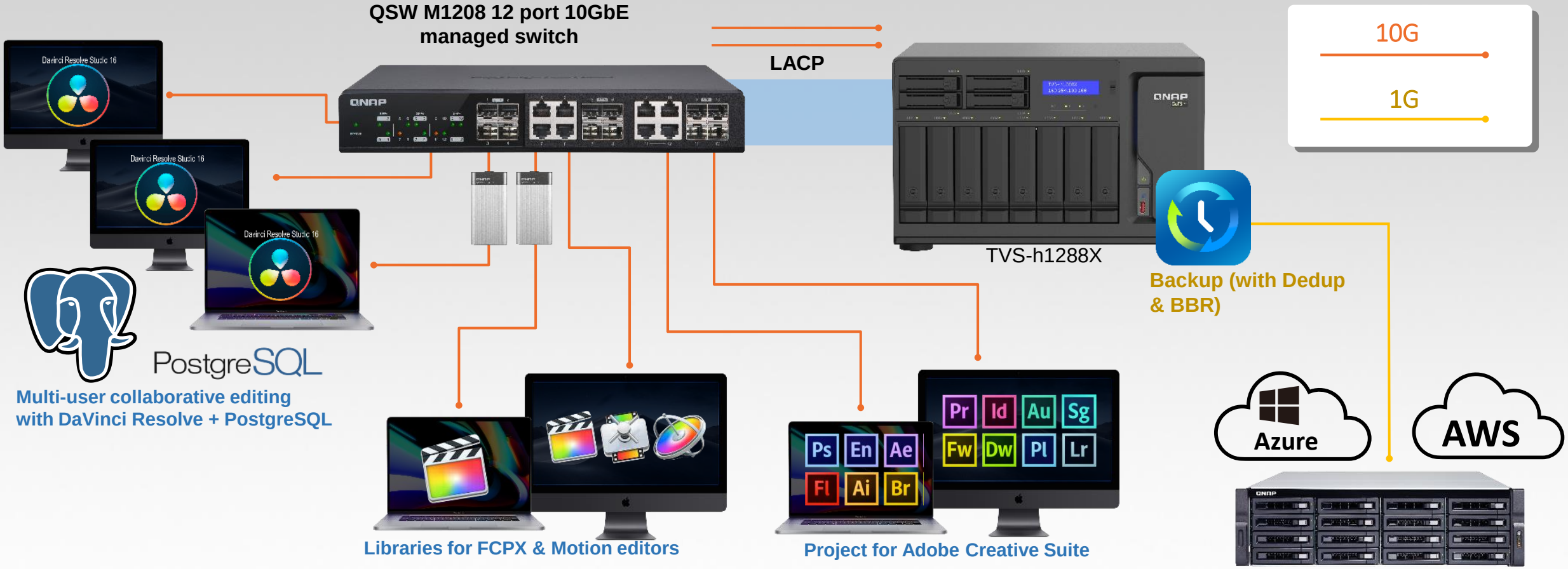


QuTS hero 4.5.2

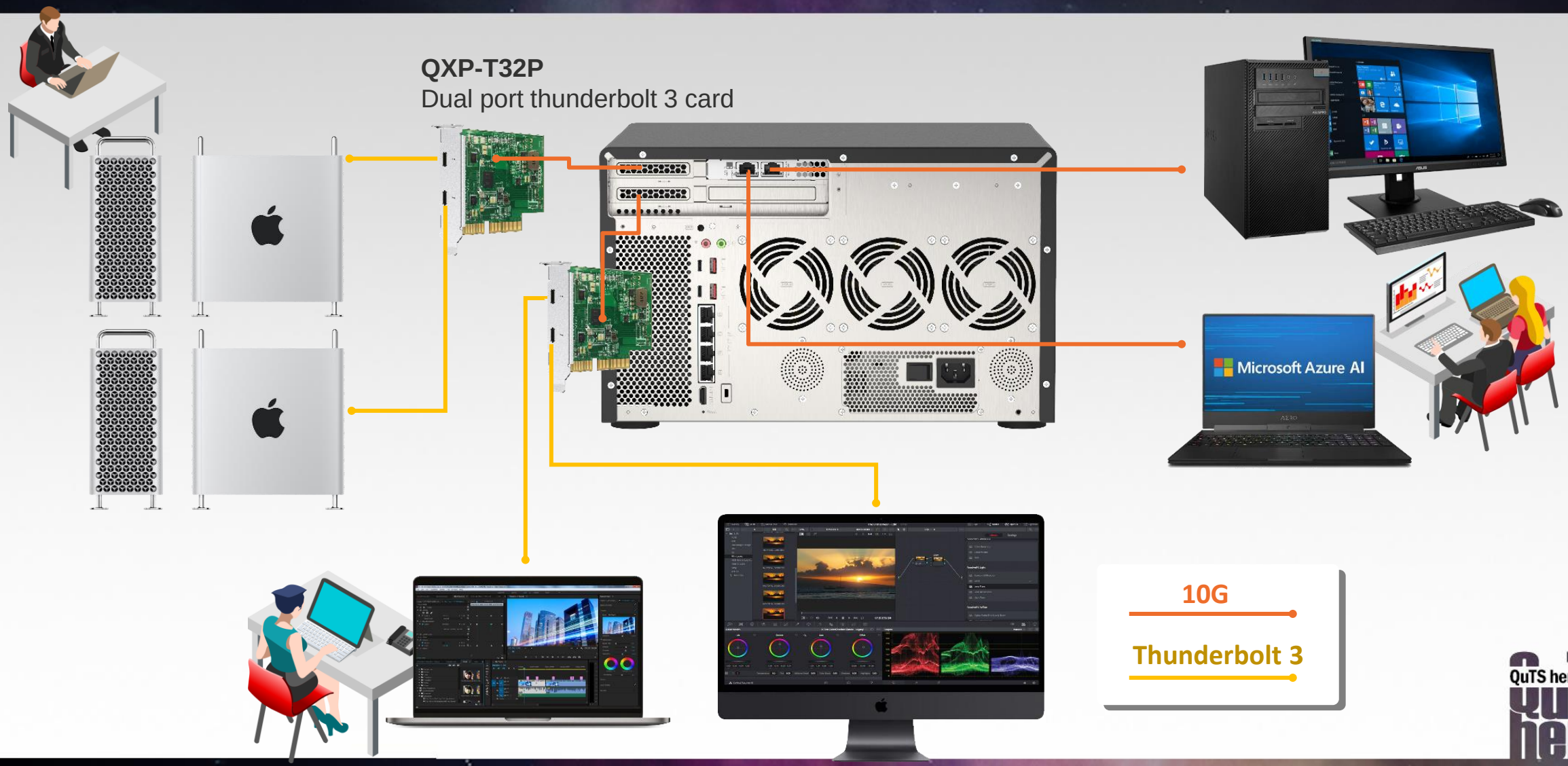
Pool over-provisioning: Improve the performance for fragmented pool (The scenario when big block write to HDD)



Supports multi-editors collaboration



Multiple users can also directly connect to NAS for file sharing and video editing



Chapter

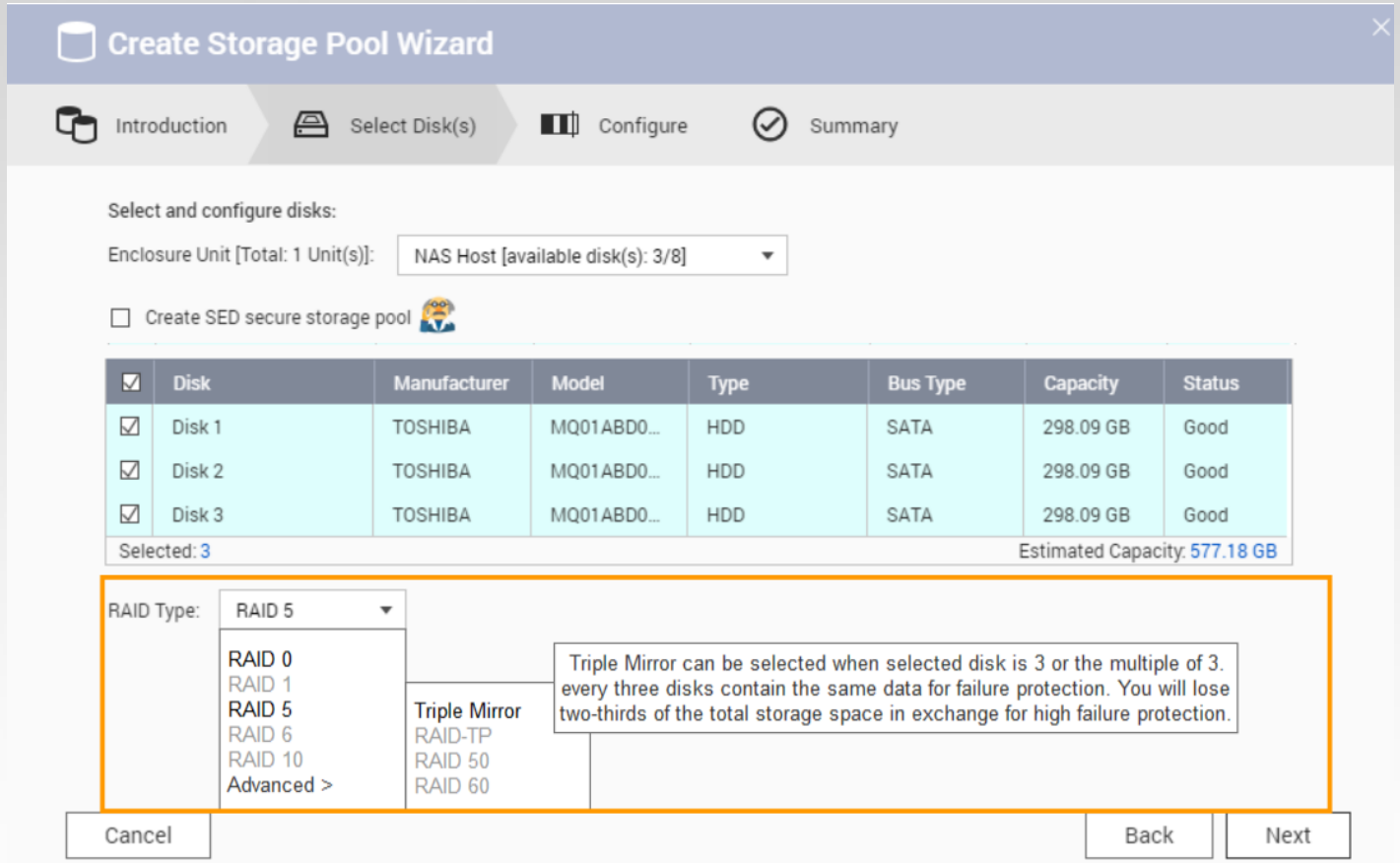
02

DATA PROTECTION

QuTS hero

TVS-h1288X / TS-h1683XU-RP / TS-h2490FU

Create Storage Pool with new RAID



Here RAID 5 = ZFS RAIDz1, RAID 6 = ZFS RAIDz2, TP = Triple Parity = ZFS RAIDz3

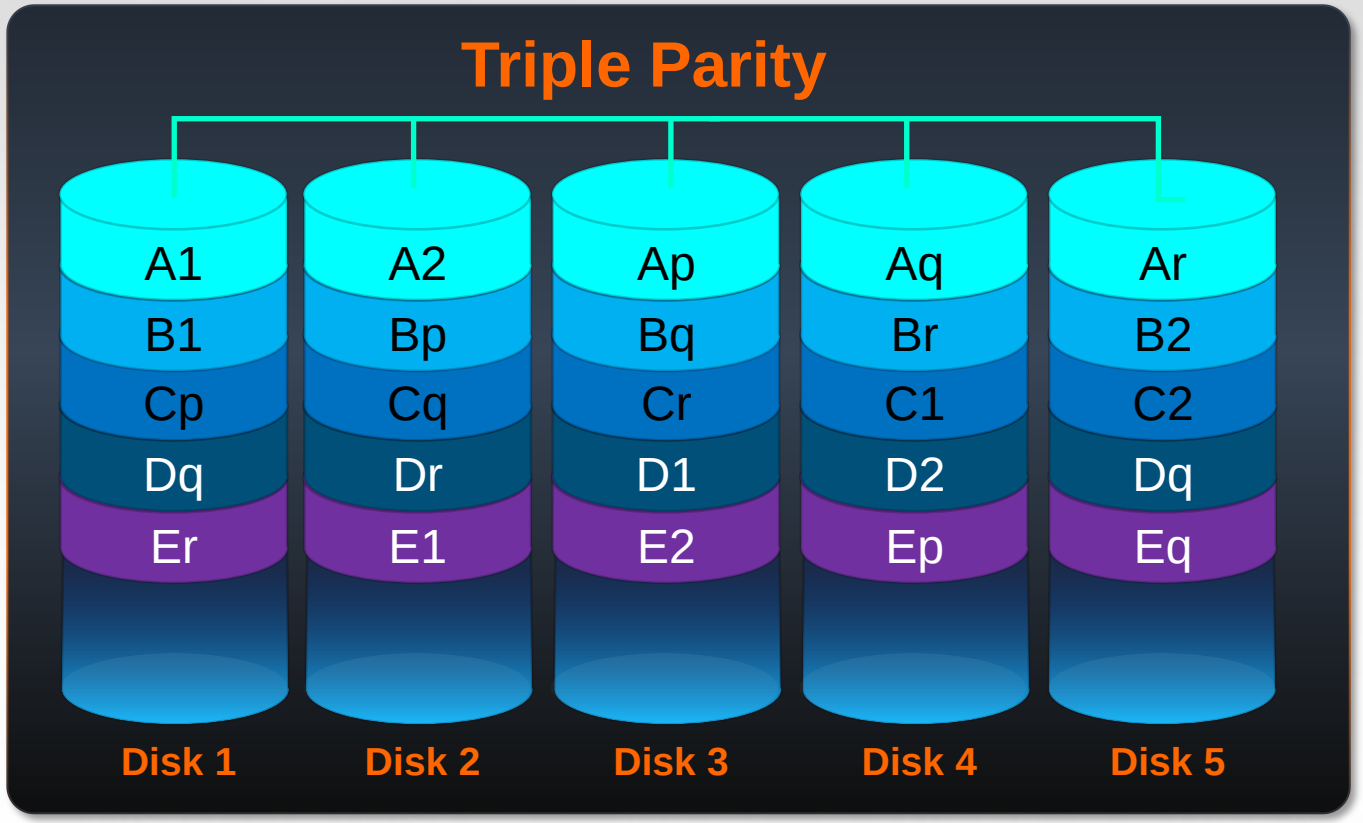
Static Volume is not supported in QuTS hero.

Storage Pool is a must for advance RAID types to be available.

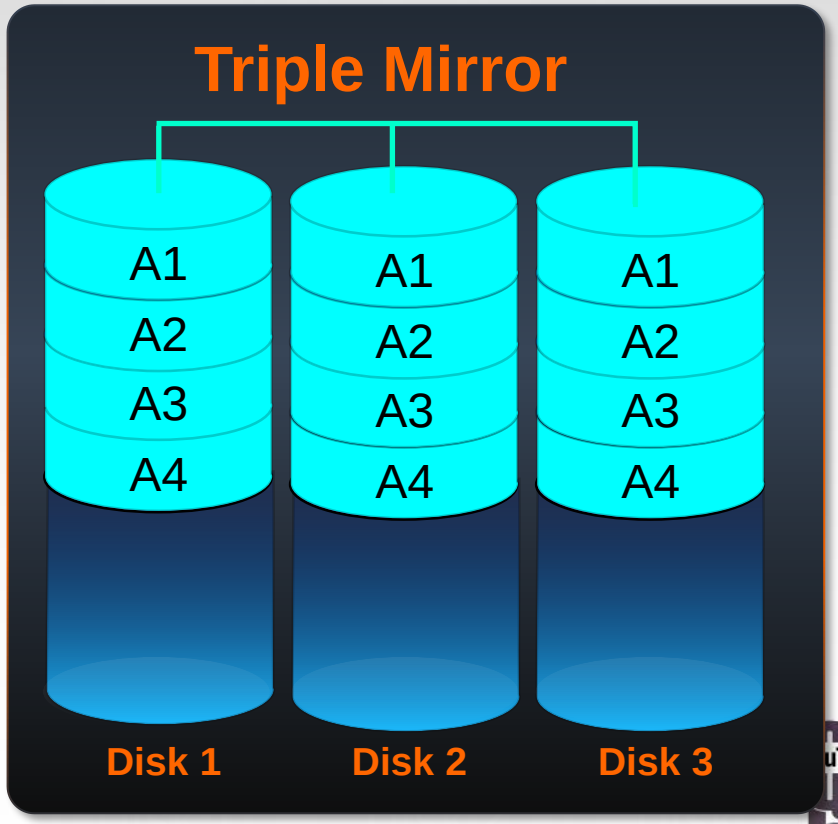
QuTS hero 4.5.2

Safer RAID types: Triple Parity & Triple Mirror

Even if three hard disks are damaged at the same time, this RAID service can keep going (redundant tolerance of 3 sets of parity information)



3 sets of identical data for redundant tolerances, will give you 3 times the protection.



The difference of the method of capacity upgrade

- QuTS hero's ZFS RAID expansion method id different than QTS EXT4, cannot add disk to online expansion
- 1~2 empty bays/slots only can be used as hot spare
- Reserve multiple slots to add the entire set of RAID at once, and build a Striped RAID to expand the overall capacity.

Capacity Upgrade	QuTS hero	QTS
Add disk to online expansion	X	V
Add entire RAID to Storage Pool	V	V
Replace Disks one by one	V	V
JBOD expansion	V	V

You should reserve enough disk slots to facilitate future capacity expansion needs, or consider the expansion JBOD to meet the demand for increased capacity.

Snapshot Protection (65,536)

Shared Folder Snapshot

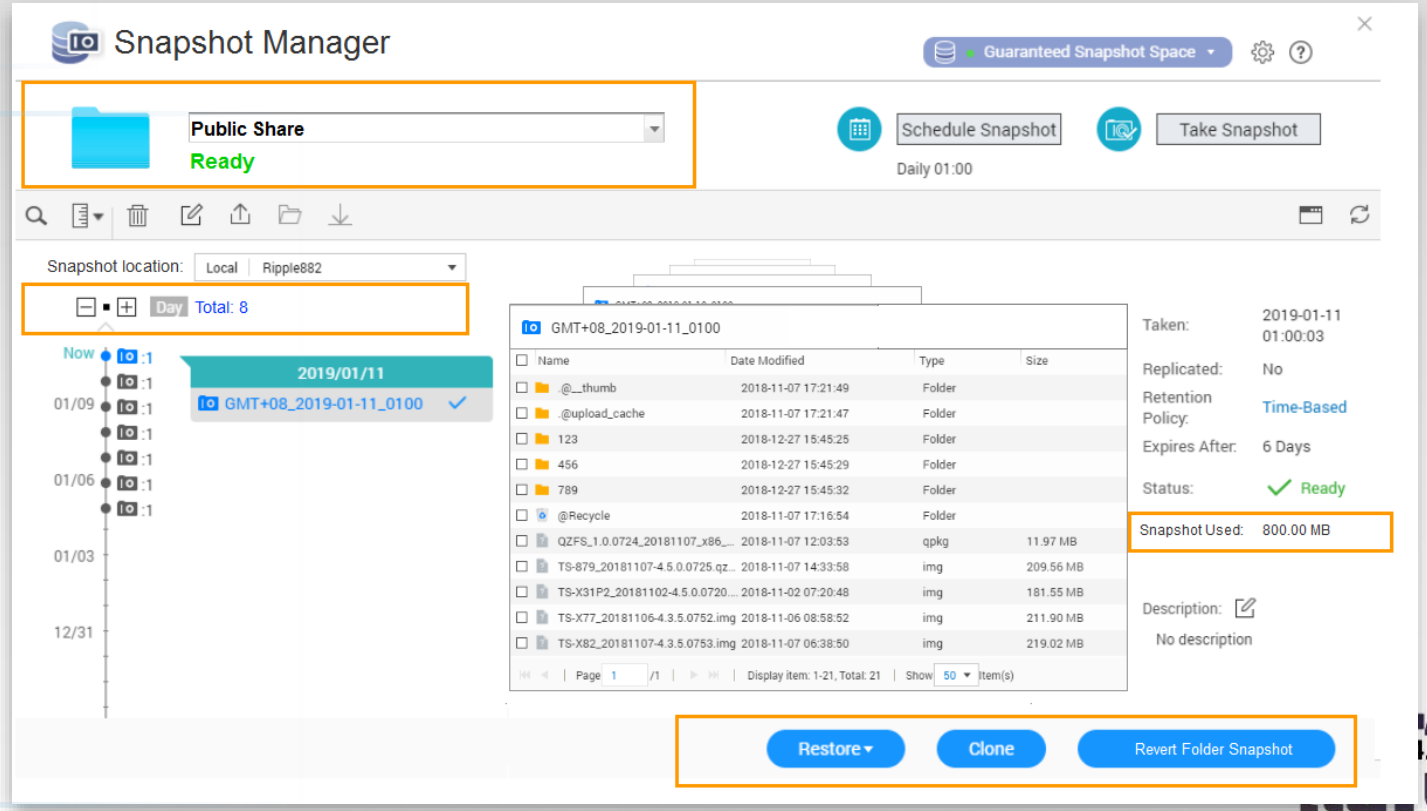
LUN Snapshot

NAS Maximum Snapshot
65,536

Shared Folder Snapshot

iSCSI LUN Snapshot

Snapshot Manager is operated based on shared folder. With [Clone], [Restore] & [Folder Revert] support.

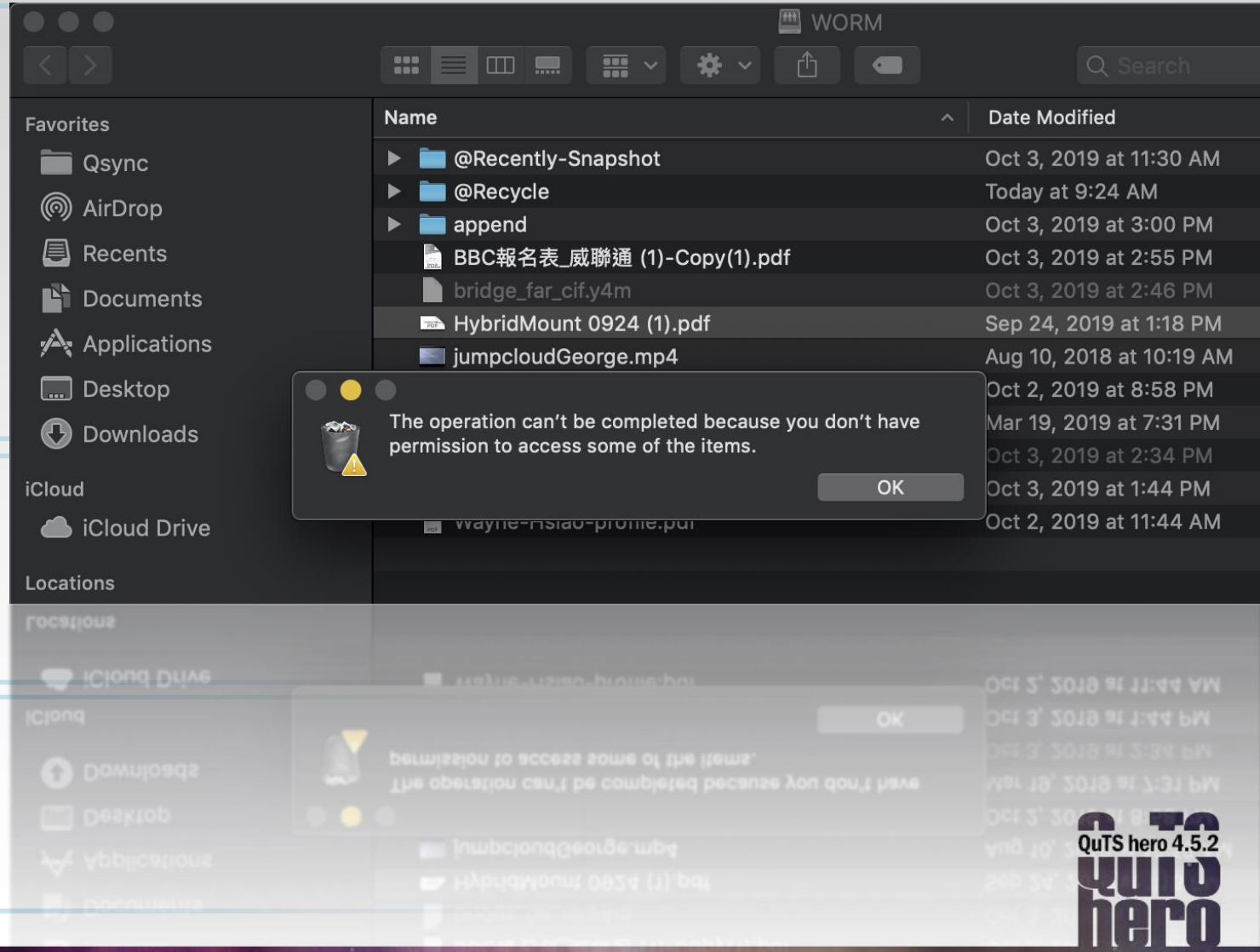


WORM (Write Once Read Many times)

WORM is used to avoid modification of saved data. Once this feature is enabled, data in shared folders can only be read and cannot be deleted or modified to ensure data integrity.

Enterprise Mode: remove the shared folder through QuTS hero UI or SSH commands (QCLI).

Compliance Mode: Have to take the Storage Pool offline and remove the Pool if want to destroy data.



QuTS hero 4.5.2

Three-layer backup solution:

Provide you the most complete data backup protection

RPO: daily / schedule

HBS 3:
File level, multi-version management

RPO: hourly

Snapshot & Replica:
Block level, multi-version management, ZFS provides the most lightweight snapshot without affecting storage performance at all.

new

RPO: Realtime

SnapSync:
Block level, Mirror the data copy and always kept up to date.

QuTS hero 4.5.2

Chapter

03

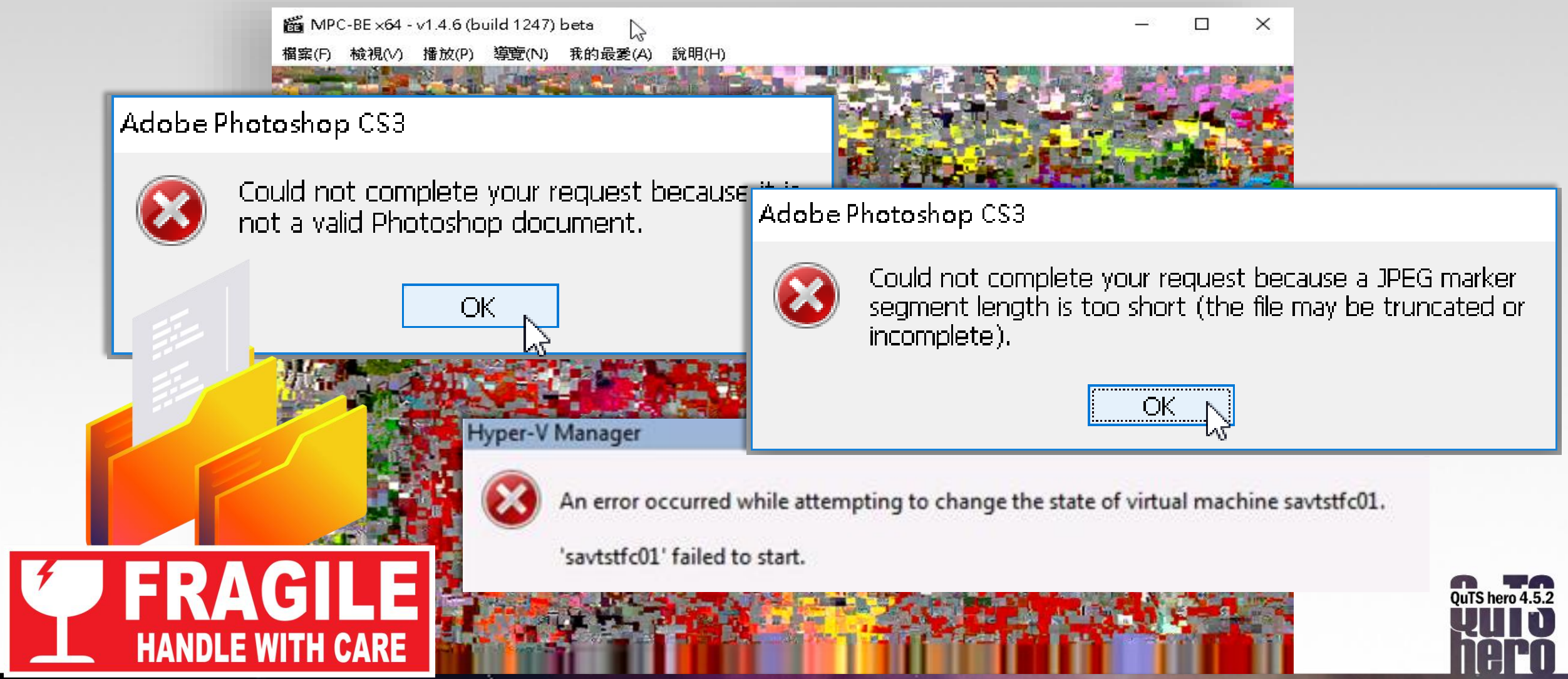
DATA INTEGRITY

QuTS hero

TVS-h1288X / TS-h1683XU-RP / TS-h2490FU

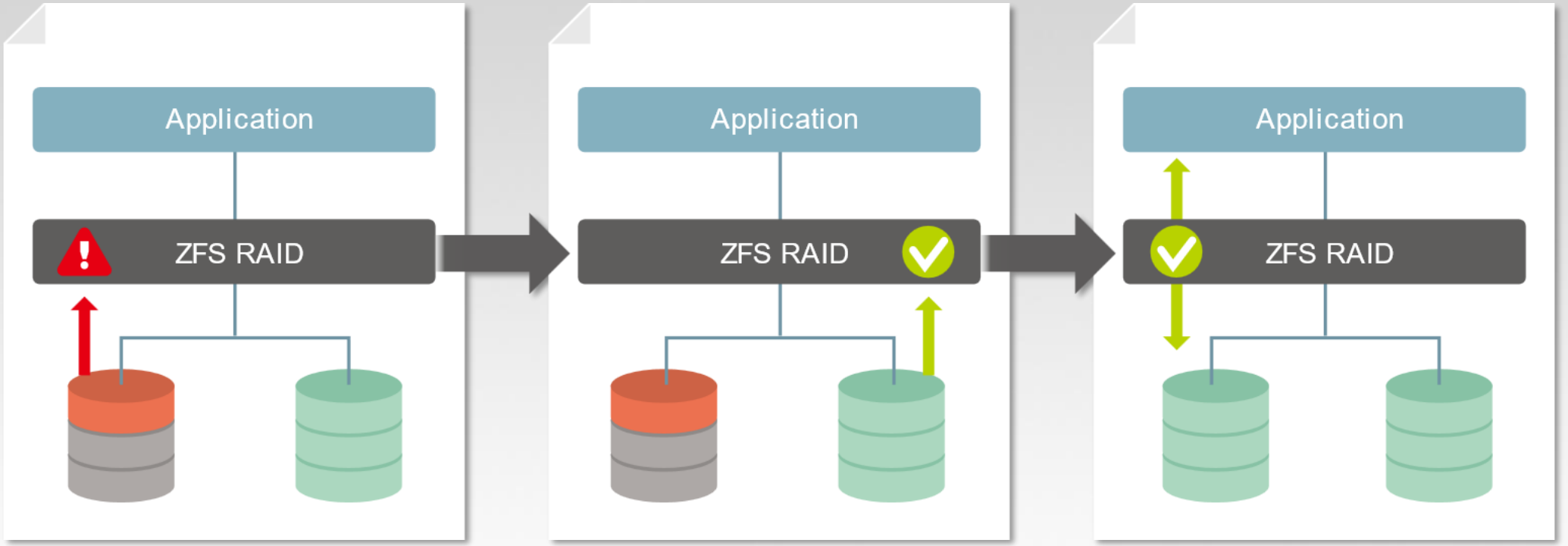
Data is weaker than you think

Everything looks good but…



QuTS hero 4.5.2

Silent Data Corruption & Data self-healing (Checksum)



Found that checksum and data did not match, the data was damaged.

Get the correct data from Data Copy

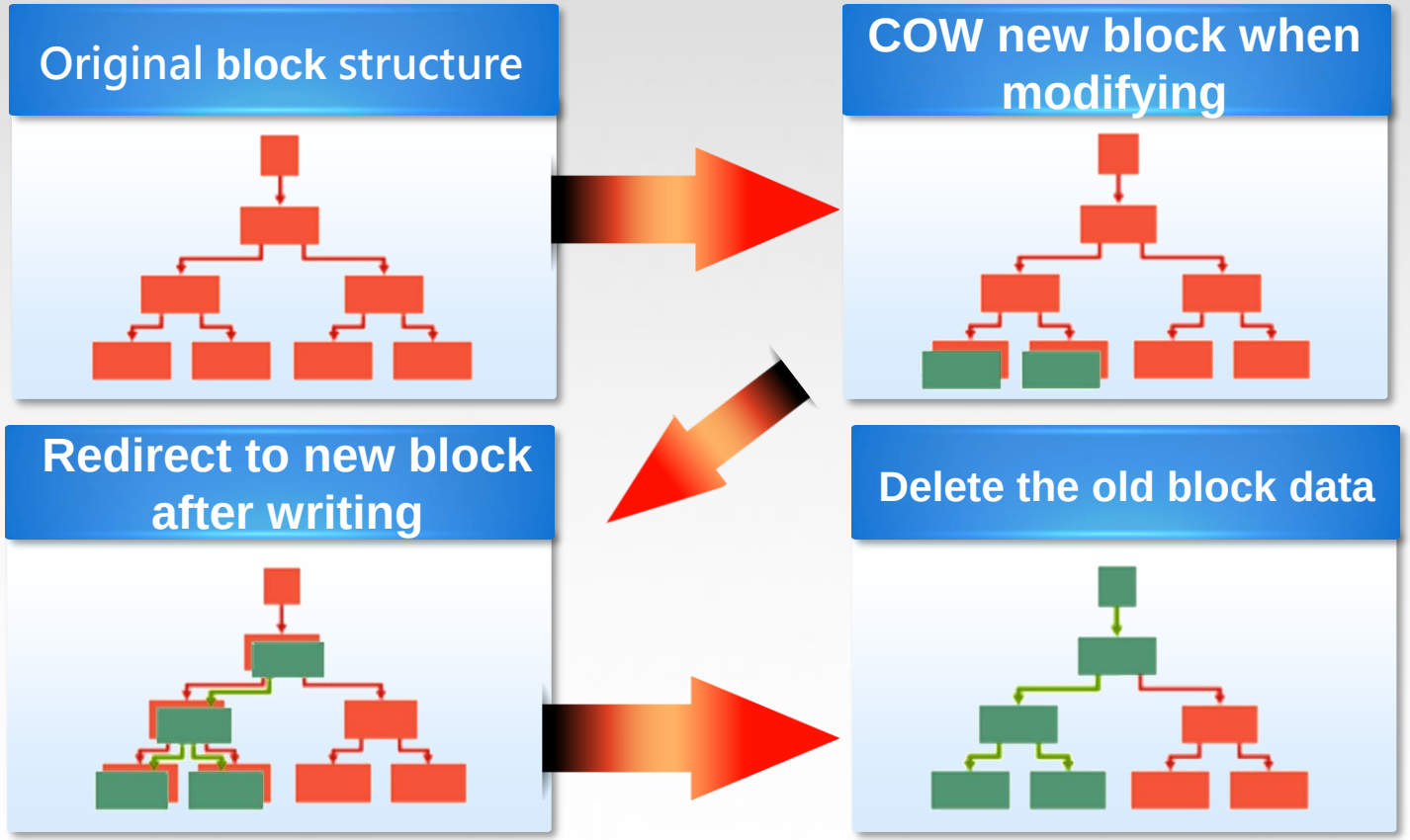
Submit the correct data to the application, and automatically repair the damaged data.

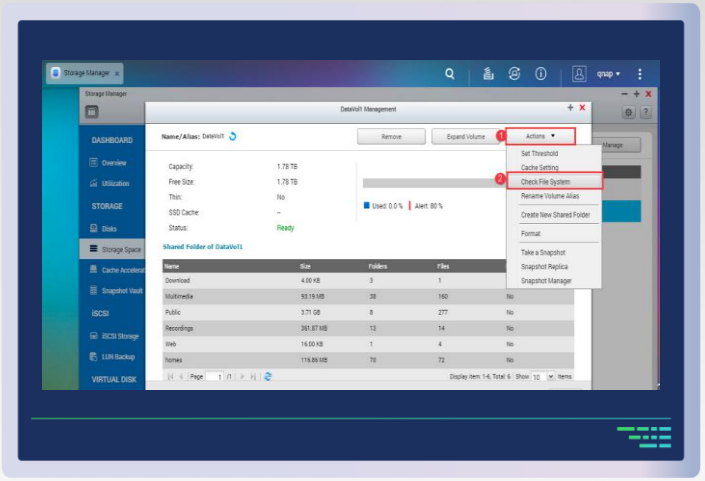
Avoid data silent corruption that occurred on running system

QuTS hero 4.5.2

COW (copy on write) avoid data loss that occurred on power outage

- ZFS has no need to use traditional journal to protect metadata, because they are never updated in-place.
- COW mechanism will copy the written data to the new block and redirect the index to the new block after writing.





No more “check file system”

QuTS hero 4.5.2

Chapter

04

STABILITY & SCALABILITY

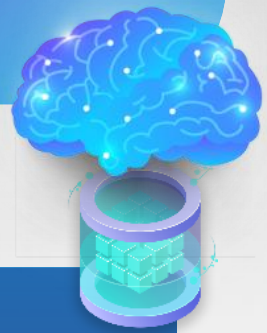
QuTS hero

TVS-h1288X / TS-h1683XU-RP / TS-h2490FU

Amazing massive storage:

The best data carrier of big data analysis/edge computing/AI inference

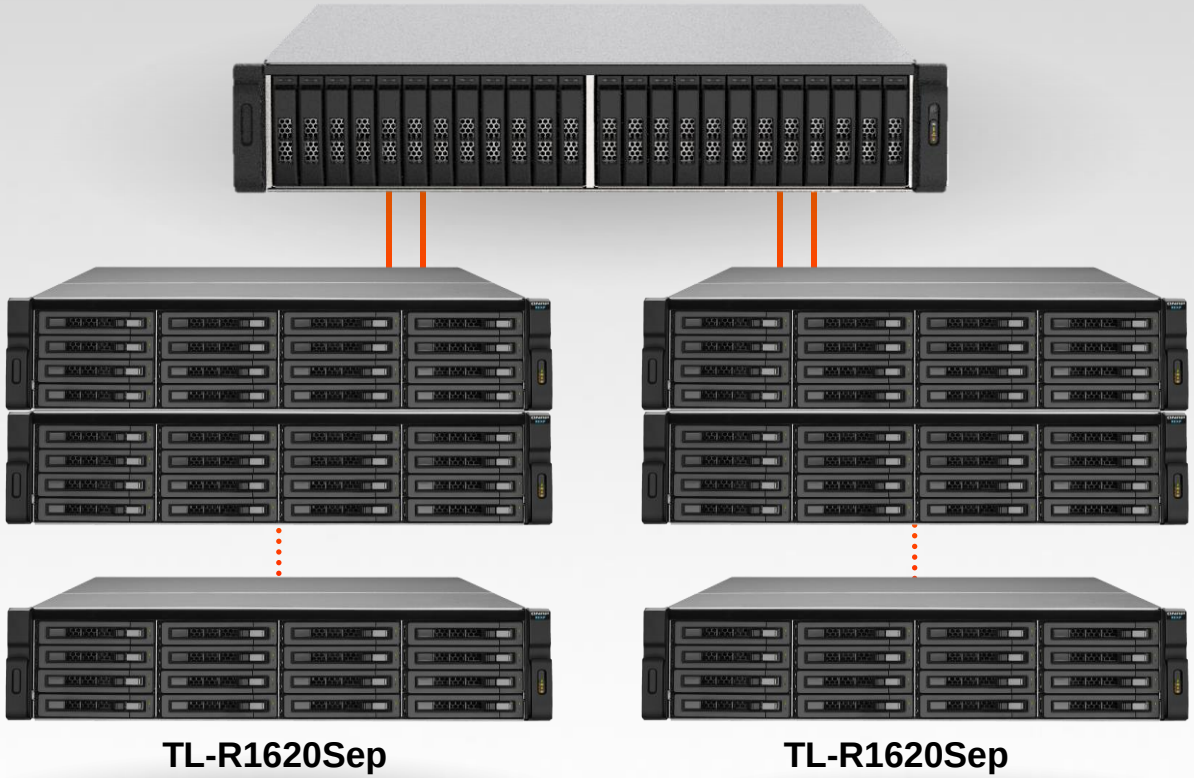
Only PB-level shared folder is enough to store the huge data matrix.



Deep Learning

QuTS hero 4.5.2

SAS 12Gb/s JBOD Expansion



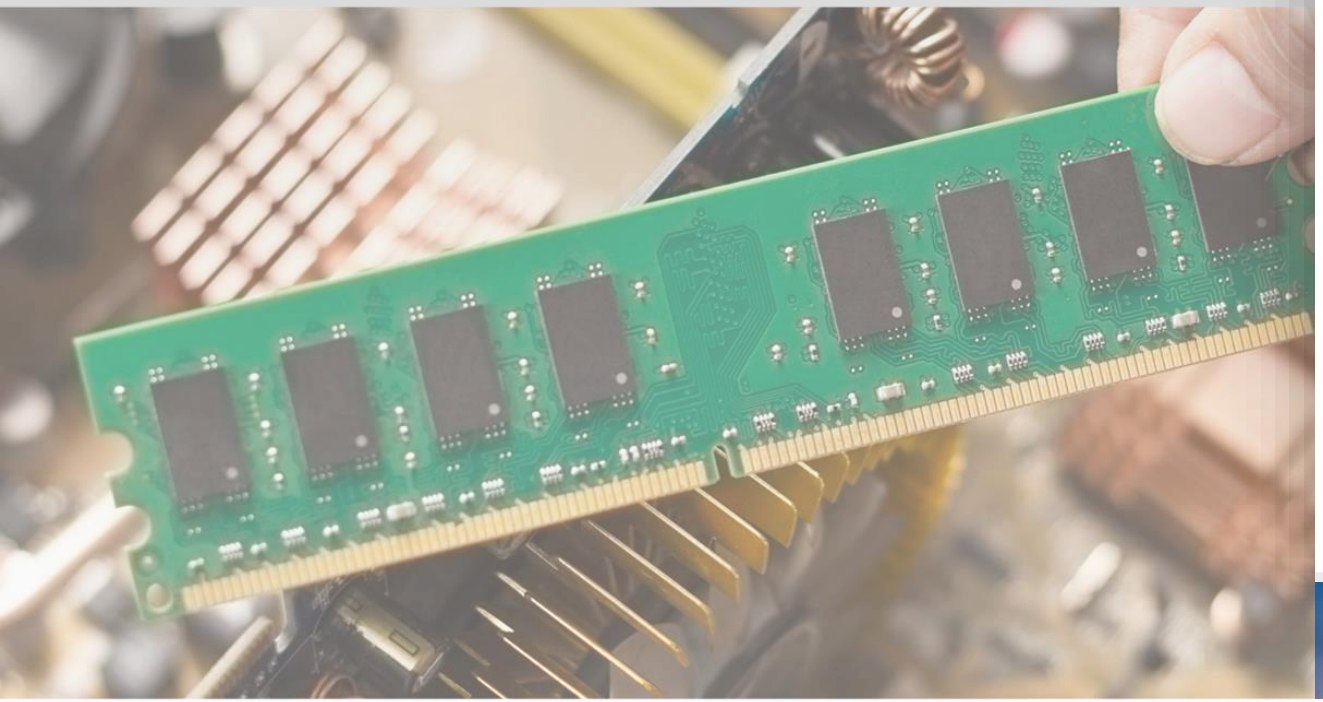
QXP-820S/1620S SAS HBA (Optional)

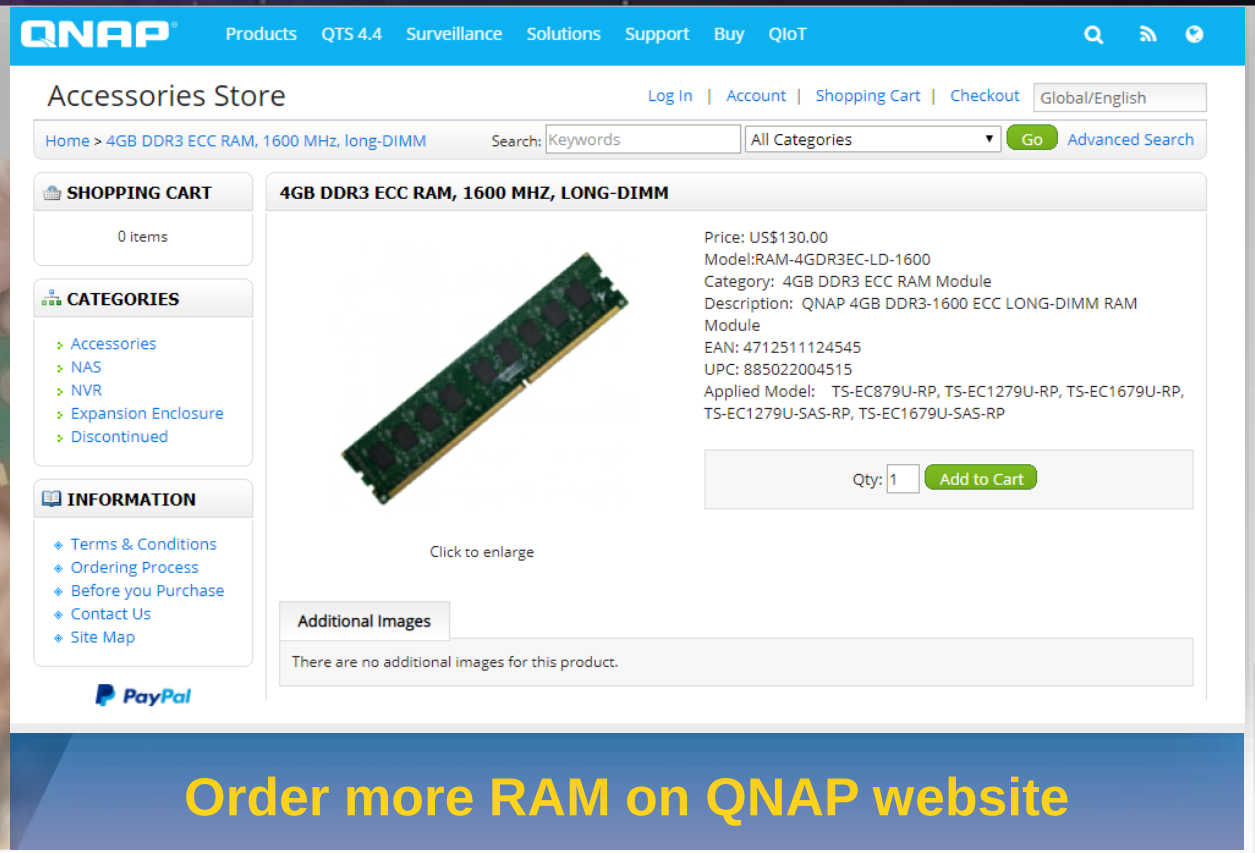
- Each NAS can connect up to 16 JBODs (REXP/TL-R1220Sep/TL-R1620Sep)
- Each NAS supports 256 HDD Drives for 4.6PB of raw capacity

QuTS hero 4.5.2

Recommended to use ECC Memory (Error Correcting Code)

ECC Higher reliability and data integrity





Order more RAM on QNAP website

The NAS supports ECC memory for auto error correction. ECC is not mandatory for ZFS. It's just a really, really good idea. It allows ZFS to make its data integrity guarantees that it claims to make. Any data storage on any filesystem will benefit from ECC RAM.

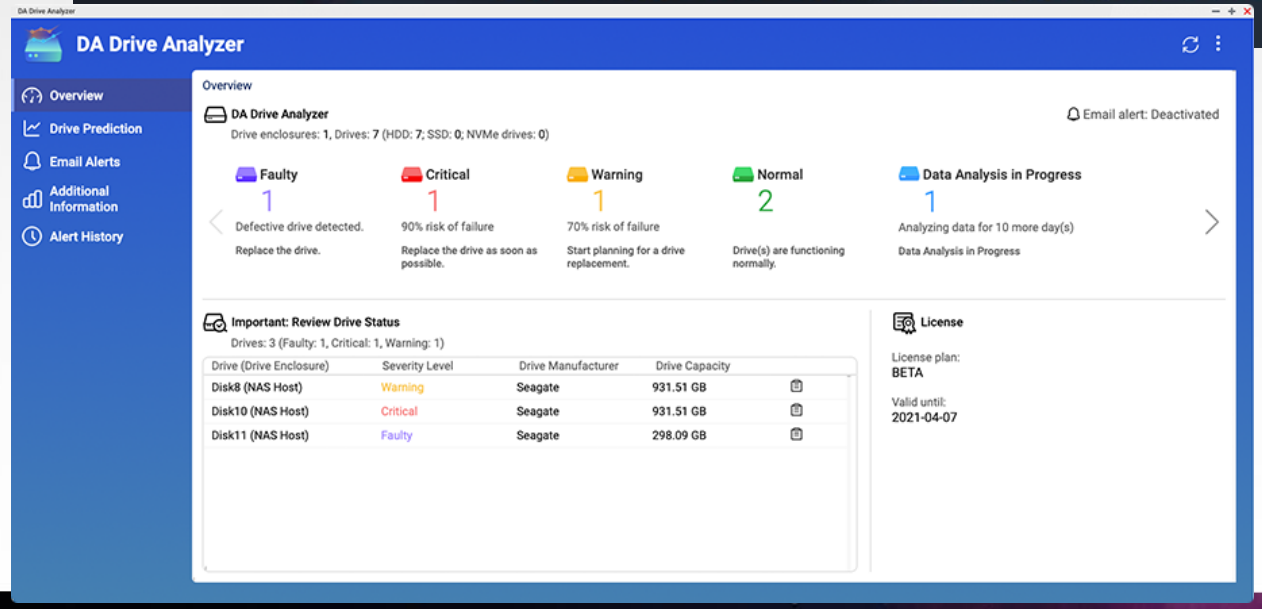
QuTS hero 4.5.2

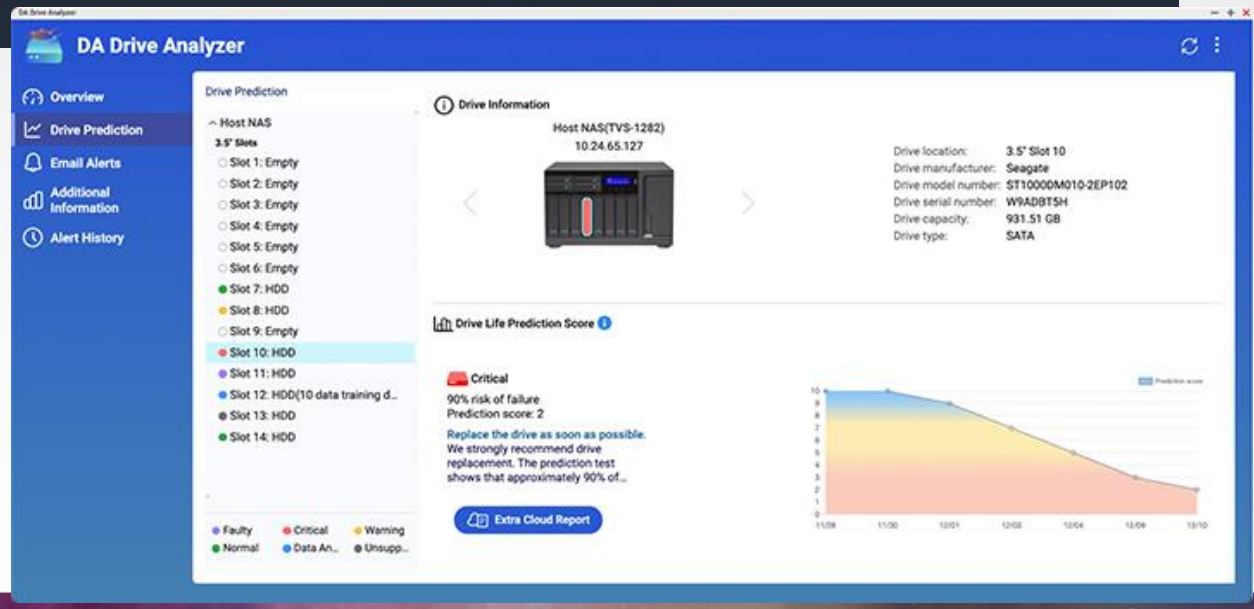
SSD / HDD Life Prediction

Powered by ULINK, DA Drive Analyzer leverages cloud-based AI to protect against server downtime and data loss by recommending replacing drives before they fail.

DA Drive Analyzer

Predict Drive Failure and Minimize Downtime





Chapter

05

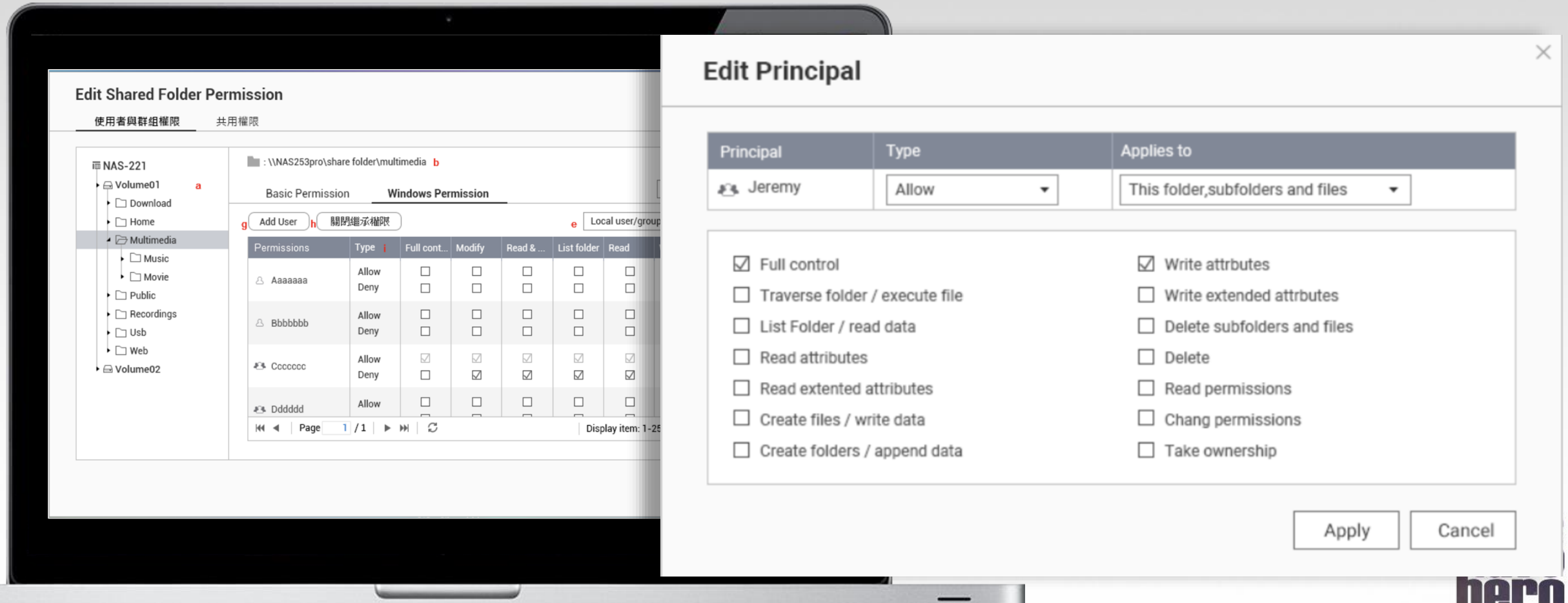
APP & CONVERGED

QuTS hero

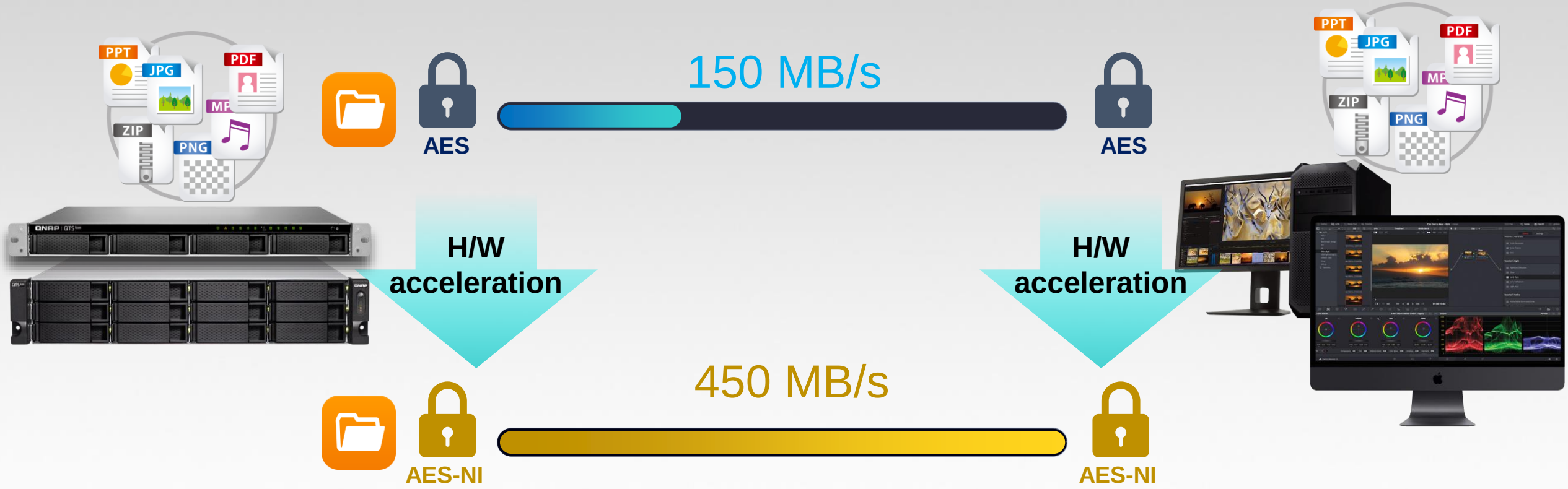
TVS-h1288X / TS-h1683XU-RP / TS-h2490FU

More detailed Access Control

14 Windows ACL Permission



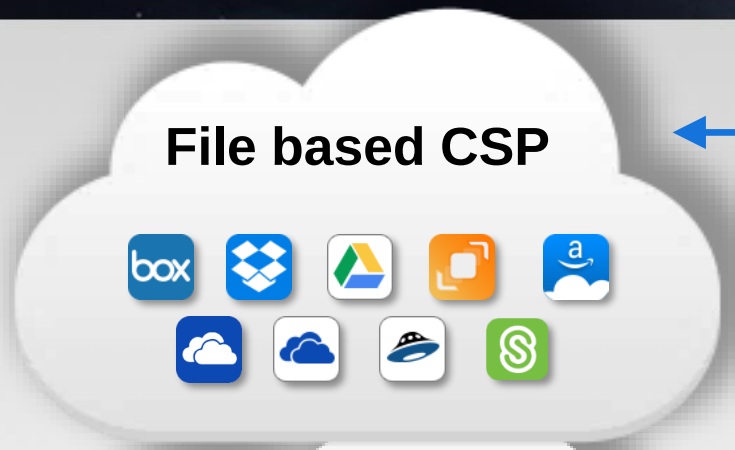
AES-NI accelerated for SMB3 Signing and Encryption

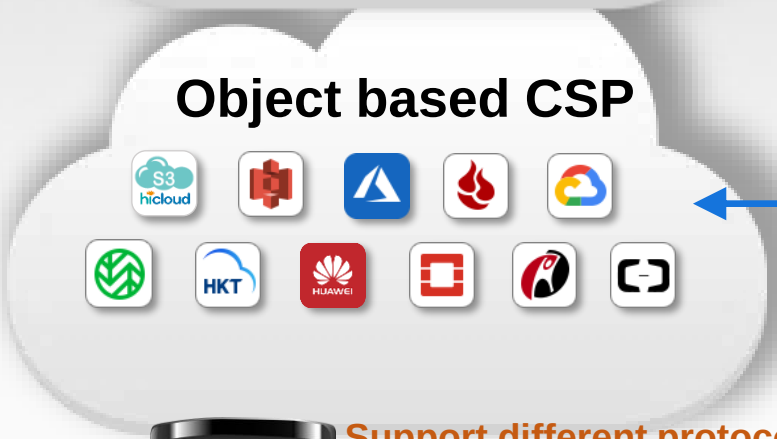


AES-NI accelerated for SMB3 Signing and Encryption

QuTS hero 4.5.2

Convert your local storage to public cloud with different protocols





HDD volume for cloud gateway

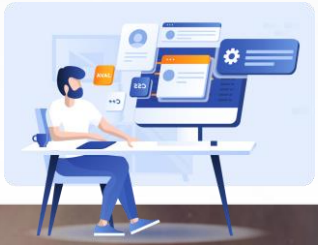
SSD volume for local service

HybridMount

VJBOD Cloud

QuObject

Application Server
(iSCSI Initiator)



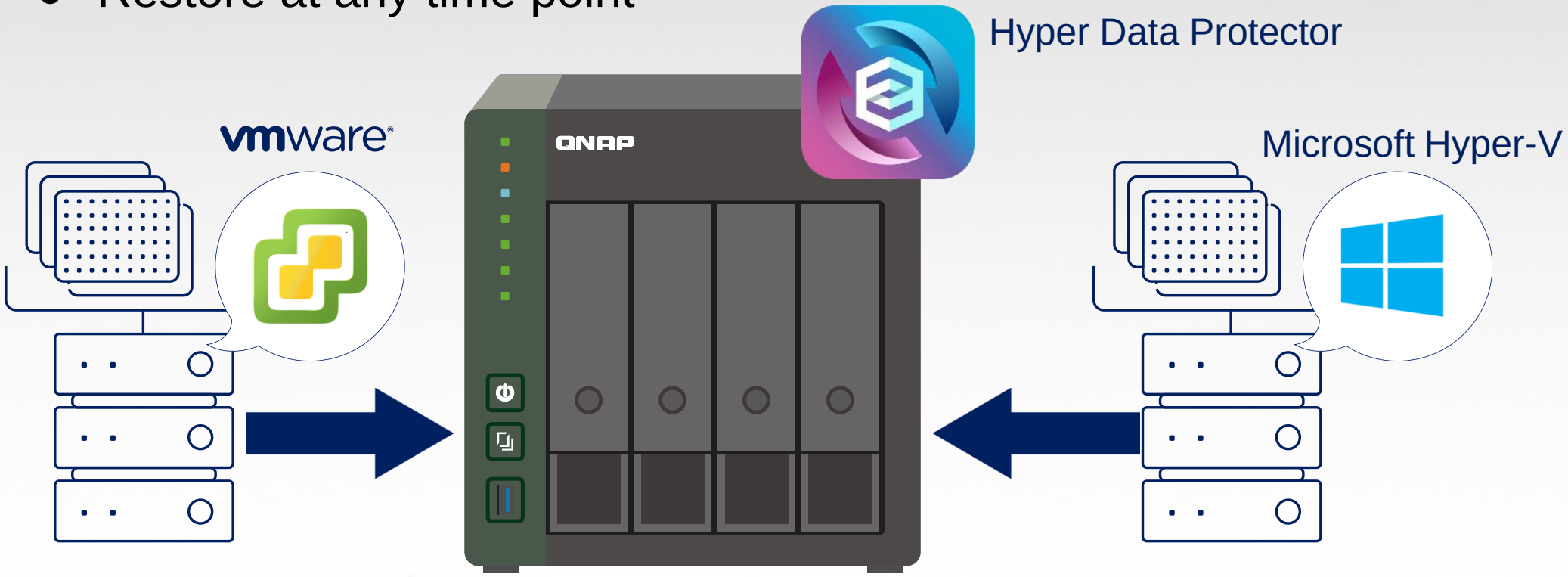
QuTS hero 4.5.2

Support different protocol

SMB, AFP, NFS, iSCSI, FTP, FibreChannel, S3, WebDAV

Hyper Data Protector: All-in-one active backup solution for virtual machines

- Supports VMware, Microsoft Hyper-V
- Unlimited VM backups and license-free
- Active backup solution
- Restore at any time point



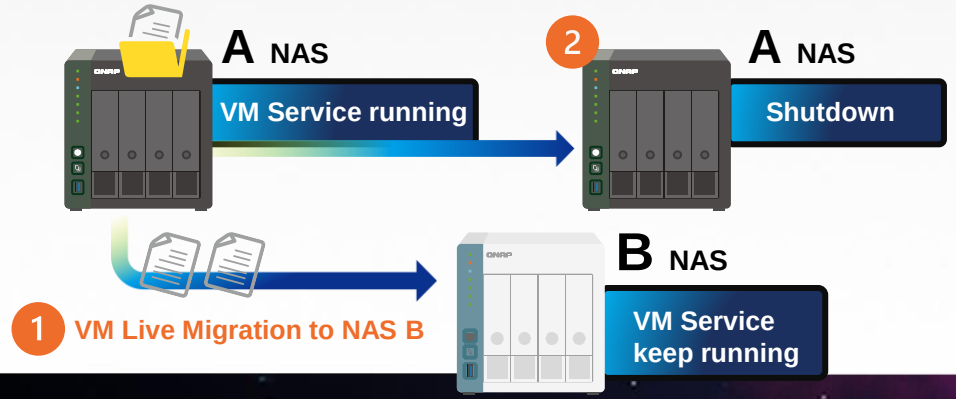
QuTS hero 4.5.2

All-in-one server to host virtual machines and containers

Virtualization Station

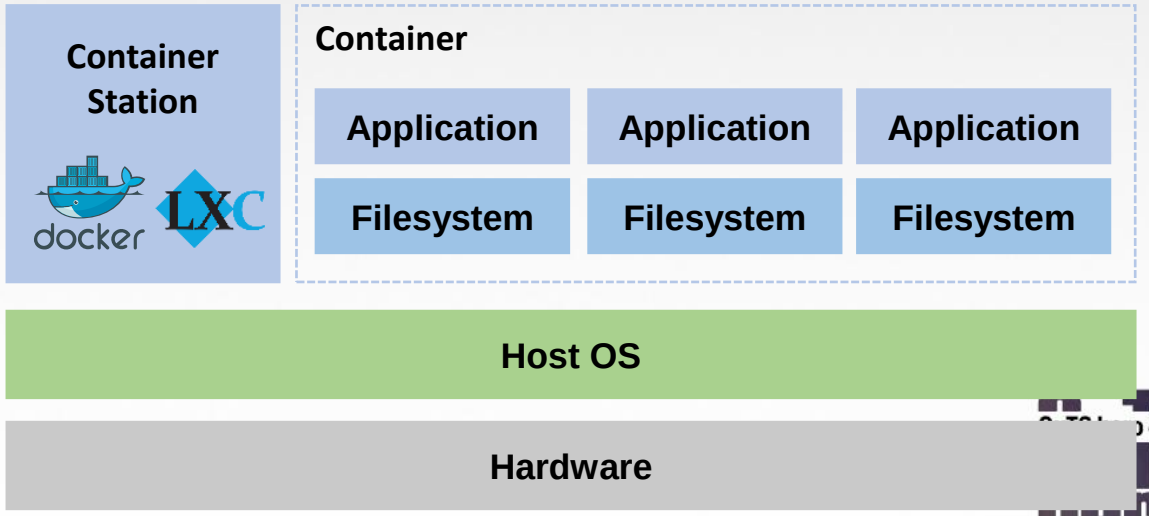
- Supports to run the Virtual machine such as Windows, Linux®, UNIX® and Android.

- Supports VM Live Migration



Container Station

- QNAP's Container Station exclusively integrates LXC and Docker lightweight virtualization technologies, allowing you to download apps from the built-in Docker Hub Registry.



QNAP

QuTS hero edition

Recommended Models

QuTS hero

TVS-h1288X / TS-h1683XU-RP / TS-h2490FU

Recommended Models

The best flagship of Desktop

TVS-h12/1688X

- 12/16 bay (4 x 2.5” + 8/12 x 3.5”)
- Intel® Xeon® W-1250 6-core 3.3 GHz
- Max 128GB RAM
- Supports Thunderbolt Expansion card

QuTS hero edition

The most cost-effective choice for large-capacity

TS-h1683XU

- 16 bay (16 x 3.5”)
- Intel® Xeon® E-2236 6-core 3.3 GHz
- Max 128GB RAM

QuTS hero edition
TS-h1683XU-RP

The best AFA model for 10000 connections / Virtualized / AI

TS-h2490FU

- 24 bay (24 x 2.5”)
- AMD EPYC 7302P 16-core 3.3 GHz
- Max 4TB RAM

QuTS hero edition

QSAL
dynamic distribution

QuTS hero 4.5.2

Comparison between QTS and QuTS hero

	QuTS hero	QTS
Filesystem	**ZFS**	Ext4
SSD Cache	Read cache	**R/W cache** / Read cache / **Write cache**
Inline Compression	**Yes** (LZ4 compression, ideal for RAW & documents)	N/A
Inline Deduplication	**Yes** (At least 16 GB RAM or more)	N/A
Offline Deduplication (QuDedup)	Yes (HBS)	Yes (HBS)
Power Failure Protection (Hardware)	UPS	UPS
Power Failure Protection (Software)	ZIL Copy-on-Write (Service continues after power recovery)	N/A (Risk of file system-level corruption on power-loss and system downtime required for "Check File System")
Permission Management	Rich ACL (14 types)	POSIX ACLs (3 types) + certain special permissions
Capacity Upgrade Method	Add entire RAID / Replace Disks / JBOD Expansion	**Add Single Disk** / Add entire RAID / Replace Disks / JBOD Expansion
Data Integrity (Safety)	**Better (Self-Healing & COW)**	Standard
Overall Performance	Requires higher-performance CPU and more memory	**Better**
Pool Limitation	**1PB** (Need more memory to handle the metadata if big pool or multiple pools)	300TB
Recommendation SSD Configuration for Video Editing Applications	Use SSD Pools Note: Set the block size 128K when creating Folders/LUNs, and select All I/O mode.	Editing (from original/RAW files): Use SSD Pools Post Production: Enable Read/Write cache Note: Set the block size to 32K or 64K when creating Volumes, and choose "All I/O" for cache mode.

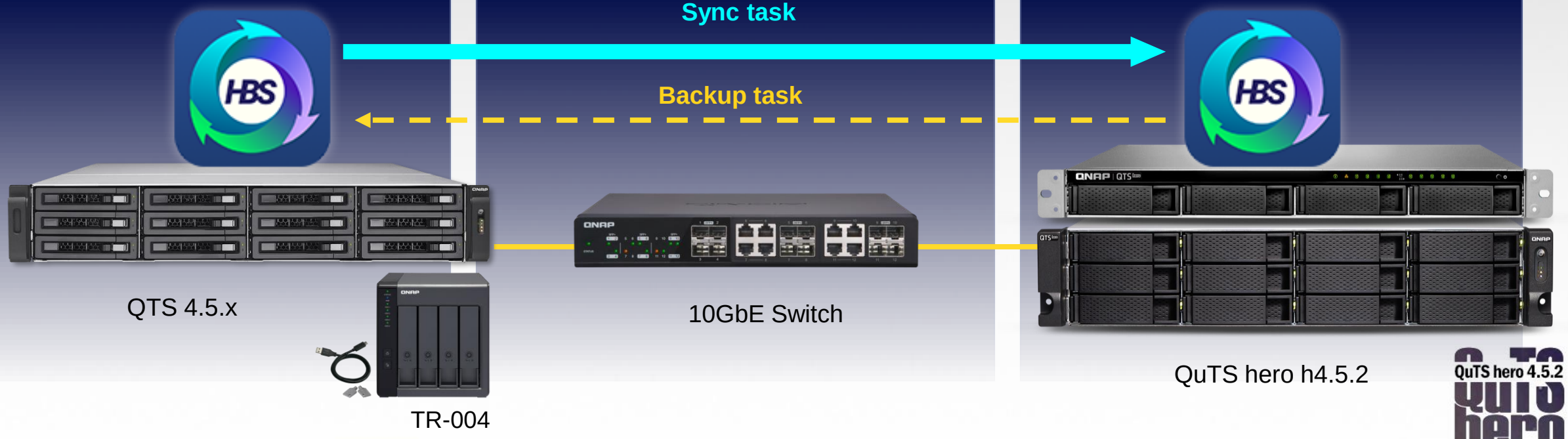
Migrate data from QTS to QuTS hero

Use HBS to run sync task

Use [Import/Export Users] to migrate the user settings from QTS NAS to QuTS hero NAS.

Use HBS to sync data to TS-004/TR-002 (external mode) and then the copy data to the QuTS hero NAS

After data migration, QTS can be used as backup storage.



QNAP

QuTS hero

h 4.5.2

QuTS hero

Is your best choice!

Copyright © 2021 QNAP Systems, Inc. All rights reserved. QNAP® and other names of QNAP Products are proprietary marks or registered trademarks of QNAP Systems, Inc. Other products and company names mentioned herein are trademarks of their respective holders.