Application Server ⊕ Storage Server

TDS-16489U

Hyperconverged Enterprise NAS

Big Data Data Center

Hyperconverged High-performance Computing, Virtualization, Storage, and Application server in one chassis for streamlined efficiency and manageability

QNAP Hyperconverged Enterprise NAS

- Hardware Architecture - Software Capability

Double-Take® Availability™ Disaster Recovery

Comprehensive high availability and data protection

PCIe SSD NVMe

Offers the best random read performance

Massively parallel I/O throughput with cutting-edge flash technology

Converged Application Scenario 1

GPU Pass-through for a multitude of applications

Converged Application Scenario 2

Running Windows Exchange, SQL, Active Directory and DNS with virtual machines

Converged Application Scenario 3

Big data storage and analytics

Overview

QNAP NAS are a family of modern converged storage systems with a wide range of models to suit all budgets from home users, college dormitories to large data centers. With the introduction of the TDS-16489U, QNAP continues to demonstrate its ability to offer a complete product portfolio that fits for every SMB and small to medium enterprise, including a wide range of hard disk models and iSCSI SAN solutions.

The wider industry continues to face enormous challenges around archiving and indexing large volumes of digital data over long periods. The volume of data that must be retained and managed is rapidly increasing while IT budgets are either stagnant or even decreasing. This has led to a growing demand for intelligent data management to address the growth of data cost requirements.

The QNAP TDS-16489U is a cost effective, highly flexible Dual CPU NAS. Featuring four 10GbE SFP+ ports and 12Gb/s SAS, the TDS-16489U absolutely ensures extremely fast data pass through.. The advent of affordable PCIe SSD further enhances the opportunity to exploit extremely high I/O performance and significantly amplifies every aspect of the TDS-16489U's performance. QNAP's flexible storage solutions incorporate features such as tiered storage, snapshots, thin provisioning, and LUN backup to better match specific business requirements and cope with recovery scenarios.

The recent update to Virtualization Station 2.0 saw the introduction of Software Defined Networking, VM Snapshot technology, and GPU Pass-through, alongside various interface refinements. These improvements ensure the highest degree of flexibility and performance for your virtualized environments, dramatically improving server utilization, resource allocation, and ease of management. Added support for the AMD Radeon™ R7 and R9 series for GPU Pass-through to virtual machines means GPU intensive workstations now enjoy even better performance metrics.

QNAP addresses scalability with 12Gb/s SAS JBOD Expansion enclosures capable of accommodating storage growth on-demand, incrementally, and cost-effectively. As more organizations seek to transform their data into a powerful strategic asset, deploying expansion enclosures serves a dual strategy for an organization to both provide extra capacity, but also to bolster its disaster recovery strategy. In addition to primary storage and expansion enclosures QNAP NAS fully embrace a Hybrid Cloud strategy. Seamless integration with several public cloud providers guarantees that your data can continue to evolve, in a stable, reliable hybrid environment with agile elastic provisioning as required.

The TDS-16489U is particularly well suited to environments that experience unpredictable performance and capacity demands, where rapid response to new application requests and extreme economic efficiency are benchmark capabilities while remaining simple and scalable enabling you to grow cost effectively while reducing operational overhead.

TDS-16489U
Hardware Architecture

10/40GbE Ethernet ports
Ultra-low latency networking for iSCSI/NFS data transfer, a breakthrough in virtualized environments

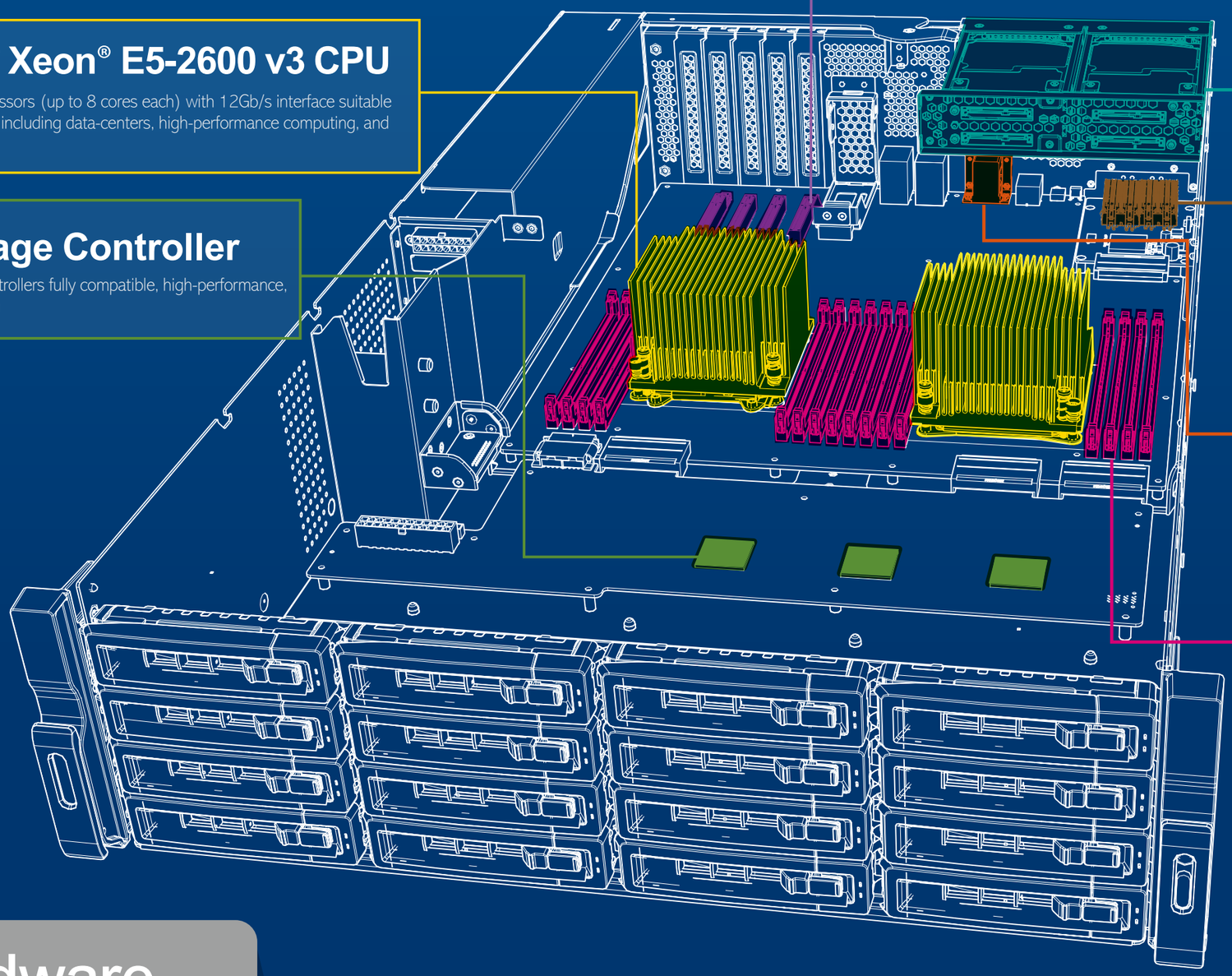
AMD Radeon™ R7 and R9 Series External Graphics Cards
Energy-saving and high-performance GPU Pass-through to virtual machines with OpenGL/OpenCL/Microsoft® DirectX Support

NVMe PCIe SSD
Best-of-breed extreme I/O acceleration

12Gb/s SAS HBA
2 x high-speed 12Gb/s mini-SAS interfaces for 12Gb/s JBOD expansion

Dual Intel® Xeon® E5-2600 v3 CPU
2 x enterprise class processors (up to 8 cores each) with 12Gb/s interface suitable for demanding workloads including data-centers, high-performance computing, and big data analytics.

Data Storage Controller
3 x LSI® 12Gb/s SAS controllers fully compatible, high-performance, dedicated data bandwidth



4 x 2.5 SSD
Dedicated flash cache

4 x 10GbE SFP+ Ports
Built-in 10GbE SFP+ ports to satisfy high-speed data transfer with iSCSI/NFS/CIFS

IPMI Remote Management
Intelligent system management, monitoring, control, and alerts to reduce maintenance costs

16 x DIMM Slots
Install up to 1TB memory with 16 x 64GB DIMMs

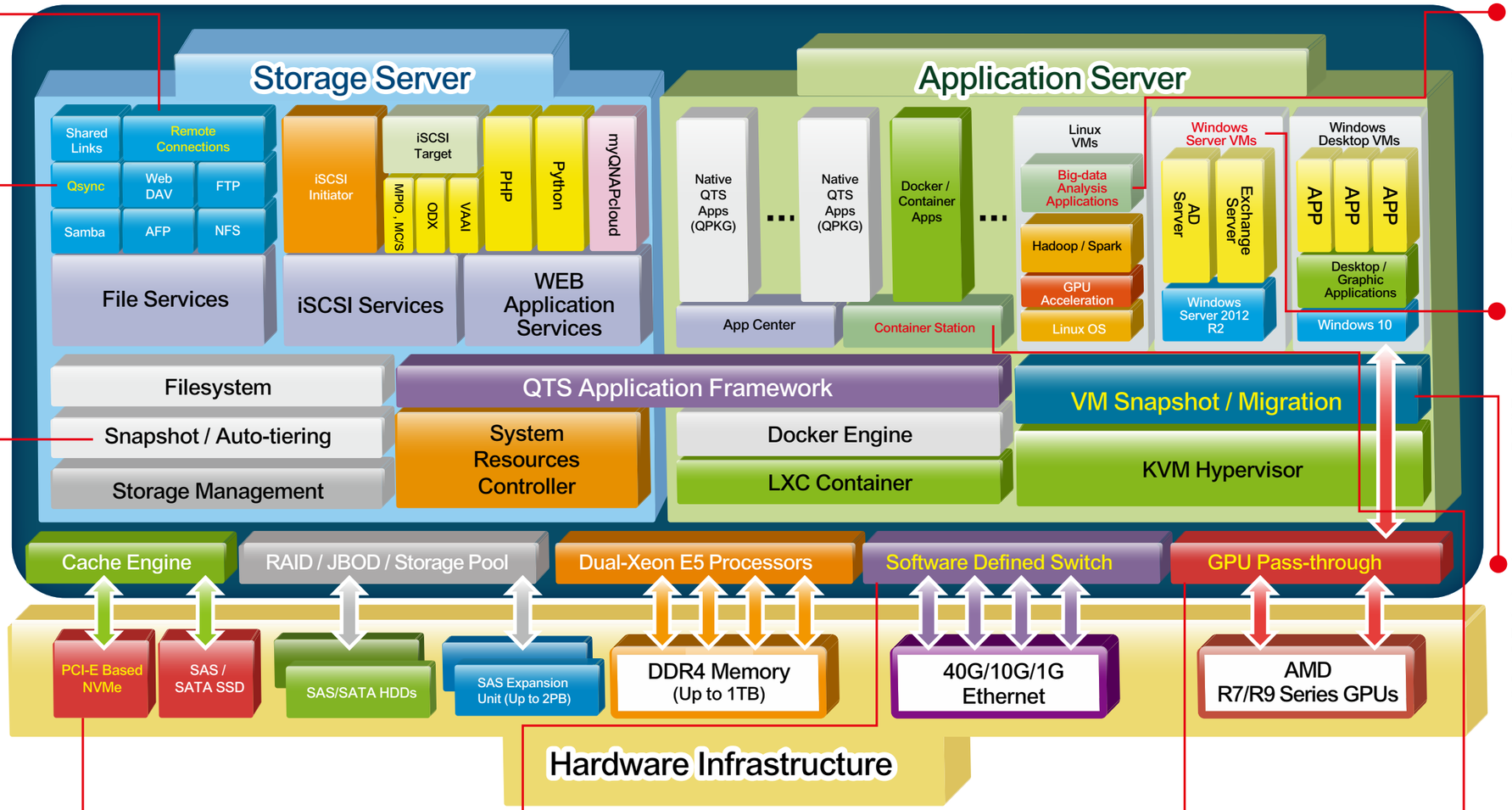
Hardware Customization and Expansion

Expansion opportunities with choices of quad, hex, or octa-core E5-2600 v3 CPUs and four PCIe slots

Hyperconverged NAS Server

TDS-16489U Software Architecture

Application Server + Storage Server



Remote Connection

With the new remote connection function, File Station now enables management of files on local, remote, and cloud storage across geographical boundaries and platforms from a single window. Remote connection enables you to carry out file management tasks from remote to local devices and vice versa from a single management window. Remote connection fully supports connection to multiple cloud services including Google Drive™, Dropbox™, Microsoft OneDrive®, Amazon Cloud Drive™, and Yandex.Disk™ in addition to network protocols such as CIFS/SMB, FTP, and WebDAV.

Qsync Central Station 2.0

Qsync Central Station 2.0 supports file synchronization between multiple devices enabling you to use a smart phone, tablet, computer, or web access to browse through synchronized files. When your computer is offline, edit the files offline or view the files on the local Qsync folder, and as soon computer is back online Qsynch will resume the data synchronization. Delete files from your mobile device, and instead leave them on your NAS to save the storage space of your local device. Use the powerful features of Qsync Central Station 2.0 to collaborate with your colleagues, or share music with your friends.

Qtier™

QNAP's auto-tiering technology Qtier™ is a multi-tier storage management system. Qtier automatically moves the most active data to the high-performance drives while less active data is migrated to high-capacity drives. This alleviates the burden on administrators by supporting tasks of performance pre-estimation, layout design, and relocation of data according to performance and budgets. Use Qtier to get an overview of all data waiting to be processed, in the migration phase, and data that has been processed. If administrators need to perform administrative tasks or there are bandwidth requirements for external connections, the administrators can pause data migration for a period. Further, assigning weights to data can help adjust bandwidth allocation, in addition to alleviating congestion between internal data migration and external I/O.

Non-Volatile Memory express (NVMe) Cache

NVMe standardizes the PCIe SSD interface and unlocks the potential of PCIe SSDs. The TDS-16489U fully supports SSD caching with NVMe reducing latency, enabling high levels of parallelism, and delivering outstanding I/O.

Software Defined Networking (SDN)

The advantages of SDN are well established and incorporate the clean separation between physical and virtual networks using hypervisor networking while maintaining full visibility across both the physical and the virtual networks. More importantly, for SMB the benefits include the ability to start small and grow incrementally over time while enabling micro-segmentation for multitenant networks. In deploying a software-defined switch, users are able to build a flexible, efficient network to connect both the upper service protocols and the lower physical layers. Customization of network topology is also simplified through different networking modes (i.e. Bridged, External only, and Isolated). Moreover, full support for 40 GbE transmission and port-trunking enable an extremely fast and secure network environment with full load-balancing capabilities.

GPU Pass-through

Graphics capabilities have long been an issue on virtualized platforms. GPU passthrough solves this issue in that an external dedicated GPU can be assigned directly to a VM to provide full support for rich 3D graphics. The TDS-16489U supports AMD Radeon™ R7 and R9 Series*.

Big Data Analytics

The TDS-16489U provides the heavy-duty compute, capacious memory, and mammoth storage capabilities required to drill through extremely demanding big data analytics workloads. The TDS-16489U intelligently uses NVMe PCIe SSD caching, and auto-tiering to dramatically reduce data storage demands; while, big data tools such as Hadoop and Apache Spark can be deployed easily with Container Station or Virtualization Station. Because the computation and data transmission all occur via internal buses, running Big Data analysis on the TDS-16489U is massively more efficient. This all provides further ROI in that developers no longer worry about the

Windows Server VMs

Running Windows services (such as Active Directory and Exchange Server) on virtual machines vastly reduces costs on all fronts. The Virtualization Station in QTS provides a stable environment and efficient storage, providing greater advantages than a normal server with a storage device for running the aforementioned services.

Virtual Machine High Availability and Migration

With the Double-Take® Availability™ solution, high availability, and disaster recovery are efficiently implemented with failover across virtual machines. This ensures that operations are quickly recovered whenever system failures occur.

Container Station

Container Station incorporating Docker® streamlines application deployment and migration on virtualized and distributed environments. The LXC (the lightweight Linux Container) enables deployment of high -performance lightweight virtualized Linux® environments on your NAS.

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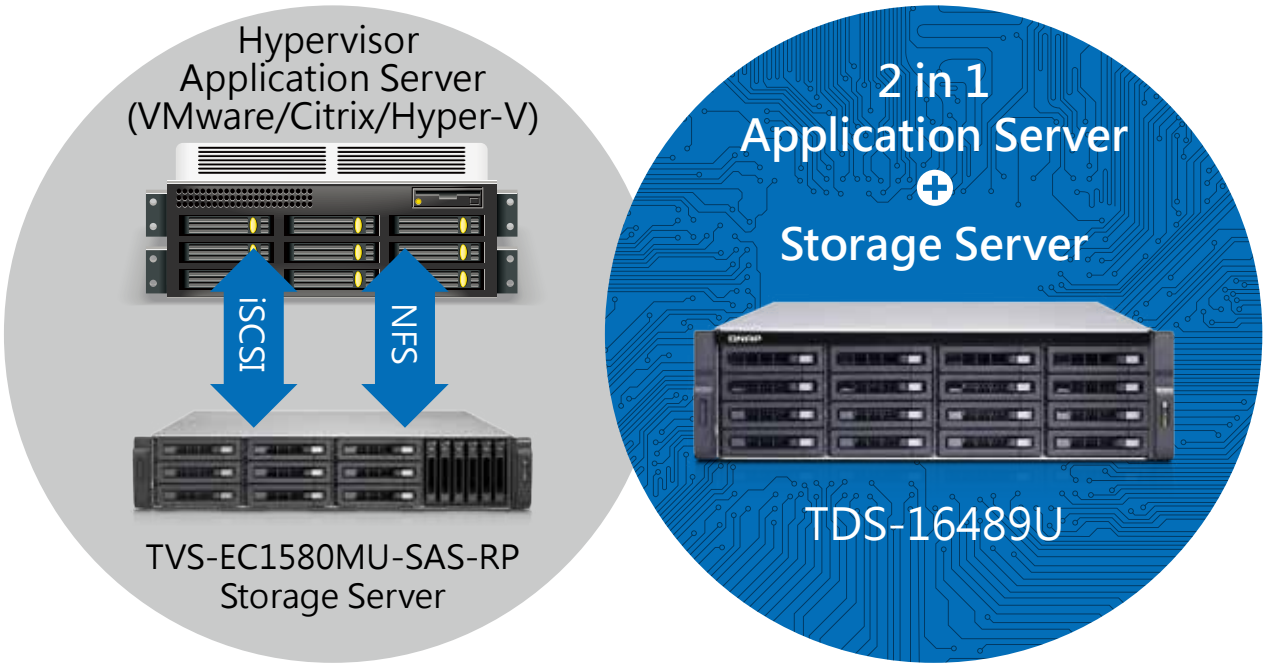


Previous Solution

New Solution

Application Server and Storage Server

Virtualization applications typically comprise:

- High-performance application server based on dual Intel E5 CPU;
- VMware®, Citrix®, or Windows Hyper-V: for virtualization deployment;
- Storage server: This component (QNAP TVS-EC1580MU-SAS-RP in our solution) is used to mount storage using iSCSI/NFS for the application server;
- High-speed connection: 10GbE or 40GbE.

IT administrators deploying this architecture must choose between:

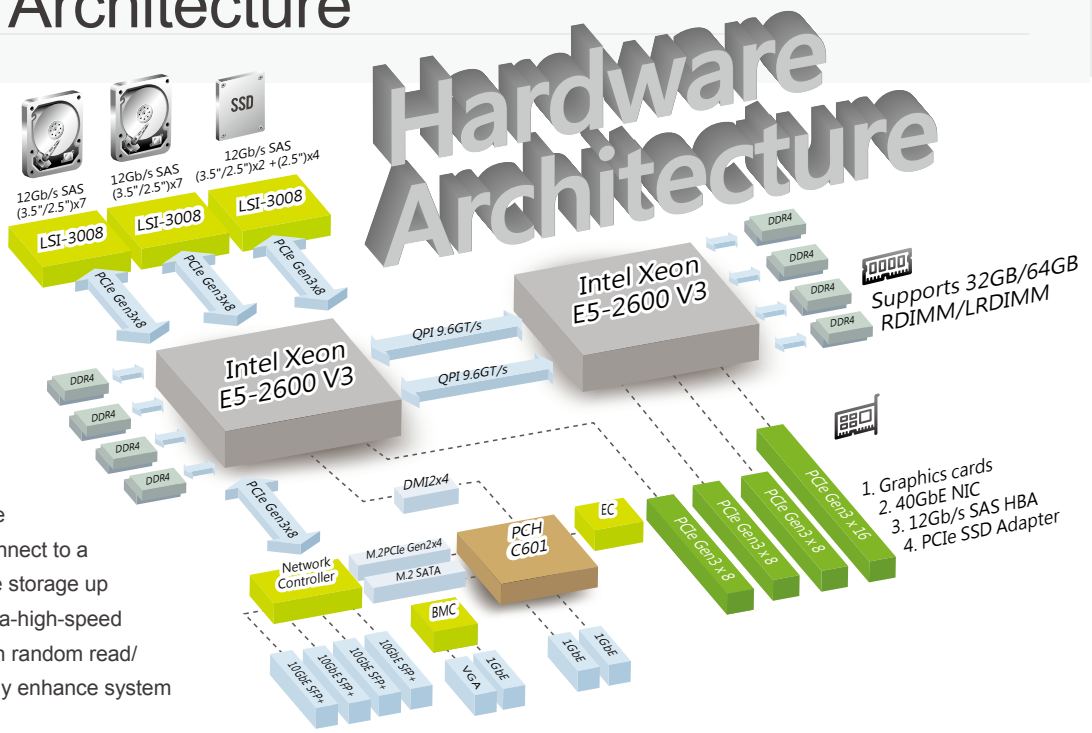
- 10GBase-T, SFP+ over copper cable, optical cable, 10GbE or 40GbE.
- Bandwidth requirements: Data from the Guest OS needs to be rapidly transferred to the storage server.
- Capacity requirements: The storage server needs to be able to handle random read/write requests from the Guest OS.

QNAP solve the challenges facing IT administrators: Hyperconverged Server (Application Server + Storage Server).

Use the QNAP TDS-16489U for your virtualization deployments. With the built-in Virtualization Station, the TDS-16489U can significantly reduce your total cost of ownership and instantly transfer data from Guest OS to its internal storage through the high-speed 12Gb/s SAS bus. Previously, this would require two physical servers and additional network equipment to achieve. The hyperconverged TDS-16489U, aggregates compute, networking, storage, and application server into a single, scalable, affordable chassis.

Hardware Architecture

The TDS-16489U comes with two cutting-edge Intel E5 2600 v3 CPUs, up to 1TB DDR4 2133MHz RDIMM/LRDIMM RAM (16 DIMM) and four PCIe expansion slots. The first PCIe slot (Gen.3 x 16) supports an AMD R7/R9 graphics card for VM GPU pass-through. The remaining three PCIe slots can be used to install 10/40GbE NICs to increase the bandwidth capacity. The 12Gb/s SAS HBA can be used to connect to a 12Gb/s JBOD/REXP-x20 to increase storage up to 1PB. PCIe SSD cards support ultra-high-speed data transmission to easily meet high random read/write speed requirements, and greatly enhance system performance.



The three dedicated SAS-3.0 (12Gb/s) controllers can provide high-speed internal bandwidth. The 4 rear 2.5" trays also boost the read/write capabilities to increase overall system performance. The four built-in 10GbE SFP+ interfaces are excellent for external communications and backup.

Superb random-access performance with NVMe PCIe SSD

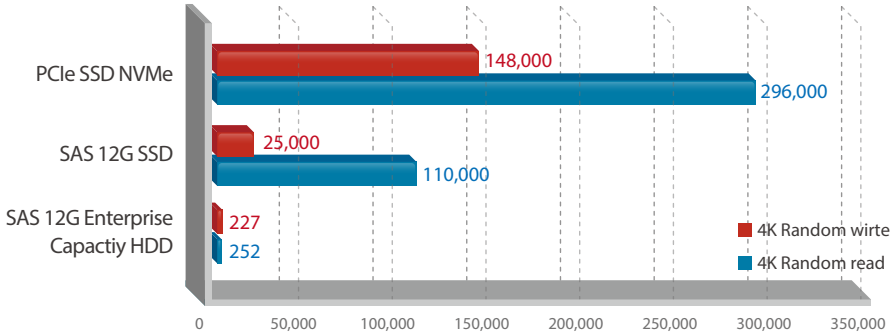
Hard drive manufacturers in the 3-6Gb/s generation used AHCI (Advanced Host Controller Interface). However, this interface no longer meets high-speed data transfer needs in the SSD era. NVMe (Non-Volatile Memory Express) is a next-generation interface technology designed specifically for flash memory. NVMe has the advantages of a much shorter command queue latency and a higher degree of parallelism over conventional SATA and SAS interfaces. The TDS-16489U supports NVMe PCIe SSD and leverages its advantages to boost its system read/write performance.

AHCI vs. NVMe

Reference: NVM Express (https://en.wikipedia.org/wiki/NVM_Express)

	AHCI	NVMe
Maximum queue depth	One command queue; 32 commands per queue	65536 queues; 65536 commands per queue
Uncacheable register accesses (2000 cycles each)	Six per non-queued command; nine per queued command	Two per command
MSI-X and interrupt steering	A single interrupt; no steering	2048 MSI-X interrupts
Parallelism and multiple threads	Requires synchronization lock to issue a command	No locking
Efficiency for 4 KB commands	Command parameters require two serialized host DRAM fetches	Gets command parameters in one 64-byte fetch

Performance comparison between SAS 12Gb/s HDD, SAS 12Gb/s SSD, PCIe SSD and IOPS



Seagate PCIe SSD Nytro XP6302 Flash Card
Seagate 1200 SSD
Seagate Enterprise Capactiy HDD ST2000NM0034
Reference:http://www.seagate.com

Intelligent Platform Management Interface Module

The Intelligent Platform Management Interface Module (IPMI) is an autonomous computer subsystem that provides management and monitoring capabilities independently of the host system's hardware and operating system. By employing an intelligent baseboard management controller (BMC) on the system, administrators can obtain parameters such as temperature, cooling fan speeds, power status, and operating system (OS) status with different types of sensors reporting to the BMC.

The IPMI provides remote access via networking. It also enables a system administrator to monitor system health and manage computer events remotely. IPMI operates independently from the QTS system and is able to control the NAS even when the NAS is powered off, i.e. remote power-on the system.

- Remote power control
- Hardware sensor Monitoring
- Hardware events logs
- Standalone administration interface
- KVM over IP

Remote Power Control

Remote Power Control allows for remote power-on, power off and system reset. While using WoL (Wake-on-LAN), it may not be possible to power on a server after a long power outage. IPMI starts automatically after power is resumed and is a more reliable way to maintain high system availability.

Hardware sensor monitoring

Hardware sensor monitoring enables remote checking of the hardware status of the QNAP NAS including temperatures, voltage and fan speed. The advanced functions enable the system to send alerts automatically if an abnormal status has been detected.

Hardware event logs

The IPMI Module is capable of logging. It enables administrators to check for abnormal readings or events such as power loss or the absence of a redundant power supply.

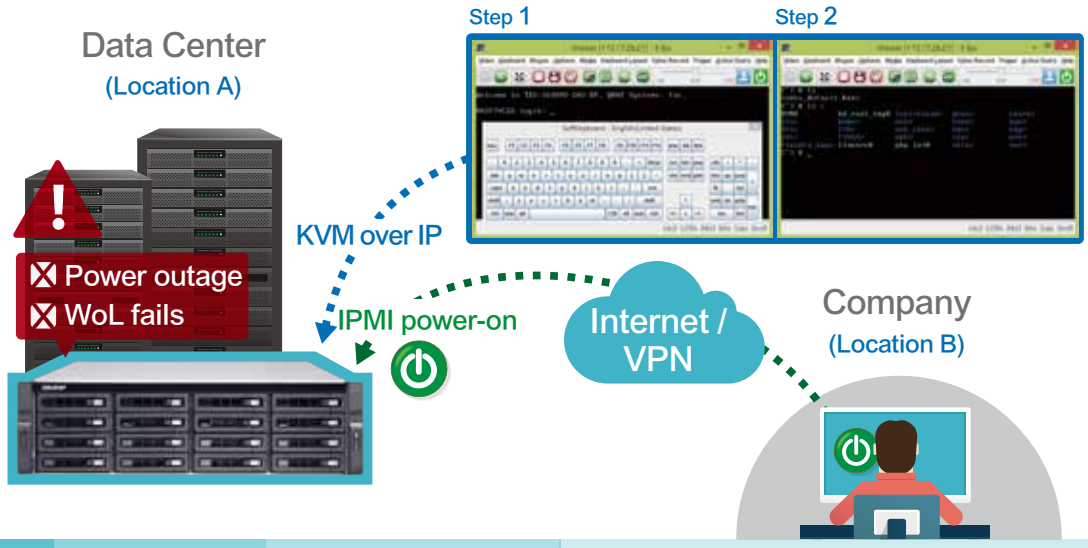
Standalone administration interface

The IPMI Module operates from its own operating system, having an independent power supply and web administration interface. It will remain functional even when the TDS-16489U is powered off. The web administration provides system monitoring and IPMI user account administration. The management port can be accessed via the Ethernet connectivity of the NAS or via the use of a dedicated channel (i.e., out-of-band management).

Remote control (Keyboard, Video & Mouse (KVM) over IP)

KVM over IP enables full remote control of the TDS-16489U using a virtual keyboard and mouse even when the system is powered-off or in the BIOS stages of booting-up.

Status	Sensor	Reading	
●	ETRG3	30° C	
●	ETRG4	31° C	
●	ETRG5	29° C	
●	ETRG6	29° C	
●	ETRG7	30° C	
●	ETRG8	31° C	
●	ETRG9	29° C	
●	ETRG10	30° C	
●	ETRG11	30° C	
●	ETRG12	29° C	
●	ETRG13	29° C	
●	ETRG14	19° C	
●	ETRG15	29° C	
●	ETRG16	29° C	
⊗	Graphic_Volt	1.807 Volts	
●	PSU1_TEMP	32° C	
●	PSU1_FUN	1056 RPM	
●	PSU2_TEMP	31° C	
⊗	PSU2_FUN	0 RPM	



What is Virtualization?

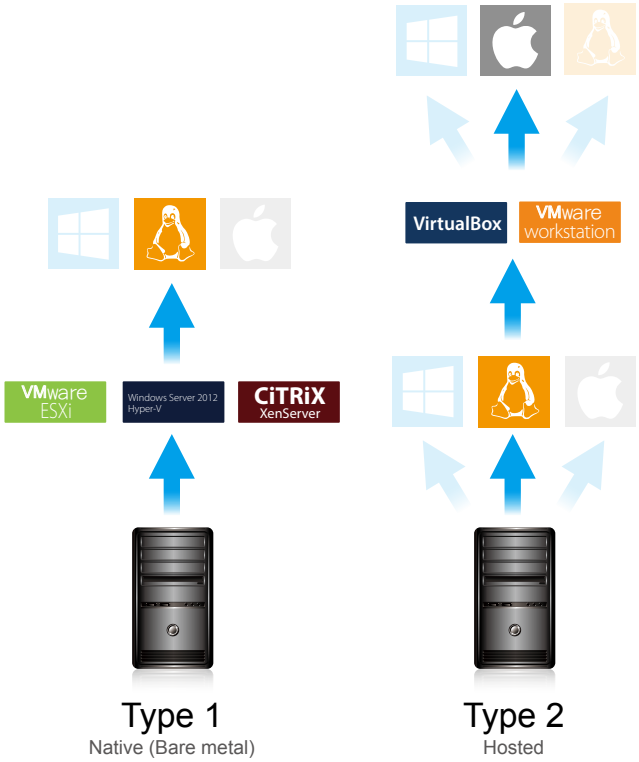
Virtualization abstracts hardware and allows multiple workloads to share a common set of hardware resources (CPU, RAM, storage, etc). Workloads on shared virtualized hardware co-exist while maintaining full isolation from each other. Virtualization helps IT administrators by reducing the amount of hardware to maintain, and also assists in project development by making it quick and easy to test different systems and environments without impacting existing infrastructure. A growing number of solutions to migrate running systems from physical servers to virtual machines are available. This has led to improved management efficiency, server utilization and consolidation, and faster deployment. A variety of server virtualization solutions with features that allow customization of platform settings have been developed and marketed by software vendors including VMware® ESXi, Microsoft® Hyper-V, Citrix® XenServer and KVM, all of which further leverage the dramatic increase in hardware capabilities and computing power.

Hypervisor

A hypervisor, also called a virtual machine manager, is a program that allows multiple operating systems to share a single hardware host. Hypervisors can be divided into two types:

1 - Bare metal, installed directly on hardware. Examples include VMware® ESXi, Microsoft® Hyper-V, and Citrix® XenServer.
2 - Hosted, installed on the existing operating system. Examples include Oracle® VM VirtualBox, and VMware® Workstation.

Enterprise-class or datacenter environments manage and operate a large number of virtual machines, requiring higher computing power (e.g. multiple CPU & high memory capacity) and hardware capabilities.
Bare metal hypervisor solutions are an appropriate fit to meet these business needs with improved native performance and a great deal more supported functionality including High Availability and Fault-tolerance. Hosted solutions are simpler to deploy scenarios with fewer problems such as driver compatibility.
Bare metal virtualized platforms unquestionably bring better performance and extended functionality; however, these solutions are considerably more expensive to implement, and the enhanced management and extended functionalities are often vendor specific requiring significant further expense. Hosted solutions present fewer issues with installation and driver compatibility though support for extended functionality is limited. The QNAP Virtualization Station solution provides the best of both bare metal and hosted solutions with none of the drawbacks. Users can quickly install Virtualization Station from the QTS App Center while taking advantages of technologies and functions offered by the QTS operating system, including Auto-tiering, SSD cache acceleration, snapshots, Public and private cloud backup, and more. Seamlessly apply 3rd party data management software such as CommVault® and Double-Take® to protect and recover virtual machines across hypervisors without being trapped by vendor lock-in.



	Type 1 (Bare-metal)	Type 2 (Hosted)	Running VMs on TDS-16489U
Typical Hardware Deployment	Typically enterprise-class servers (Multi-CPU)	Workstations or PC (single processor)	Intel® Xeon® E5 2600 v3 (dual processors)
Hardware Compatibility	Medium	High	High
Virtual Machine Performance	High	Medium	High
Support for Remote Replication of VMs (or other high-availability, fault-tolerance solutions)	Yes	None	Yes*
Expandability	High (expensive)	Low (free)	Yes*

*With 3rd party solutions or built-in QNAP apps

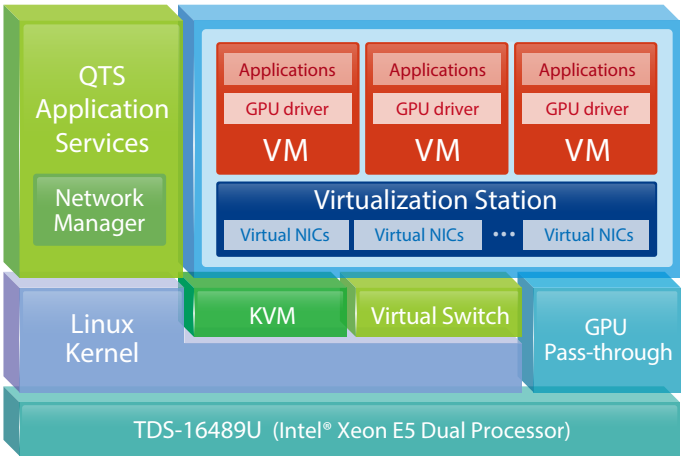
Virtualization Station 2.0

Enhanced Software Defined Network architecture for dramatic efficiency improvements

Enterprise-class server virtualization

Virtualization Station is the primary QNAP hypervisor platform based on the extremely popular and open source Kernel-based Virtual Machine (KVM) architecture. The last iteration of Virtualization Station introduced Software Defined Networking, GPU Pass-through, and VM snapshot technology, alongside various interface refinements. Virtualization Station leverages a shared Linux kernel fully capable of GPU (via an external PCIe graphics card) and USB pass-through.

As shown in the following diagram, Virtualization Station fully leverages the Linux kernel of the NAS system to run KVM, combined with a GPU pass-fthrough, and a virtual switch. These Virtualization Station features in conjunction with the wider QTS environment (SSD cache acceleration, auto-tiering, port-trunking, and iSCSI LUNs) mean the TDS-16489U is fully able to deliver complex, wholly virtualized environments with outstanding compute-intensive and high I/O performance. The TDS-16489U demonstrates a state-of-the-art hyper-converged NAS transforming NAS far beyond the simple storage server role and fully into the X-as-a-Service arena.



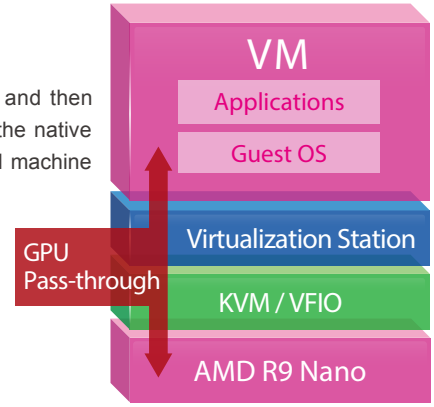
GPU Pass-through

The TDS-16489U series offers true enterprise-class processors with Intel® VT-x and VT-d in combination with massive memory capacities, and numerous PCIe slots. The built-in hardware-assisted Intel® Virtualization Technology drastically increases performance and introduces ring-based privilege security at the silicon level. In addition, improved I/O performance and availability is achieved through Intel® TV-d technology and its direct assigning of I/O devices to virtual machines.

Assign a PCIe external graphic card* directly to a virtual machine via GPU Pass-through to achieve near native capability of a GPU on a virtual machine with full support for OpenGL and DirectX.

KVM/VFIO to VM

The GPU pass-through involves establishing communication between Linux's KVM/VFIO and a GPU and then reaching the VM via Virtualization Station. Test results establish that this architecture achieves 80% of the native performance of the GPU. The DirectX performance comparison between a physical system and a virtual machine using an AMD Radeon™ R9 Nano is shown in the following diagram.

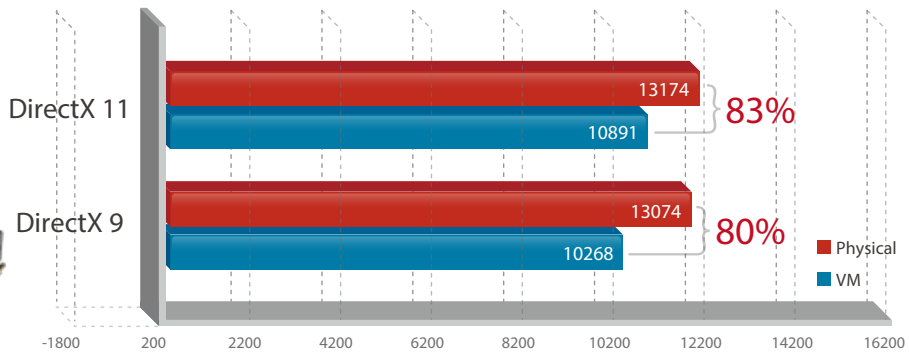


*Supports AMD Radeon™ R7 and R9 Series.

GPU Pass-through – TDS-16489U & R9 Nano

- CPU: Dual Intel® Xeon® E5-2620 (2.4 GHz)
- External graphics card: AMD Radeon™ R9 Nano (PCIe x16 Slot)
- HDDs: Seagate® 1TB HDD
- Memory: 16GB DDR4 registered

	DirectX 9	DirectX 11
Virtual Machine	10268	10891
Physical	13074	13174



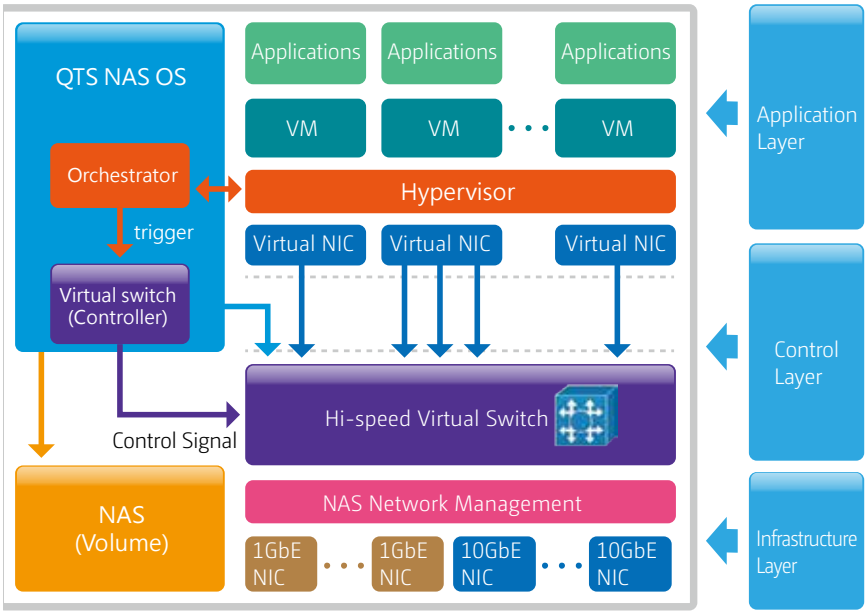
AMD R9 Nano

- API support: DirectX® 12, Mantle, OpenGL® 4.58, Vulkan™, OpenCL™ 2.0
- PCIe version: 3.0
- 4K resolution: yes
- GPU clock speed: up to 1000MHz
- External power supply: 1x8-pins
- Dimension: Full-height, compact, and dual-slot

Software-defined Switch

By adopting a Software Defined Network (SDN) approach, VMs can now share the network interface with the QNAP NAS to maintain the best data transmission speed while allowing users to define their own network mode, potentially enhancing deployment flexibility and network security.

The SDN-based architecture consists of an Application Layer, a Control Layer, and an Infrastructure Layer. At the Application layer, the VM orchestrator manages workload schedules through communication with the Hypervisor. When the VM Orchestrator receives a transmission request from the Hypervisor, the VM Orchestrator will signal the vSwitch Controller (as the NAS's network control), and then the vSwitch Controller of the control layer will dynamically adjust the Hi-speed Virtual Switch so that VMs can connect with the Physical Networks or NAS storage for data communication. By employing a high-performance virtual switch VMs are no longer confined to the limits of the transmission speed of the physical NICs when transmitting data between VMs, or between VMs and the NAS.

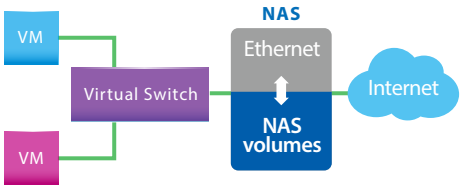


Virtual Switch

Virtual Switches are an efficient and effective network design when compared to dedicated network ports. Virtual Switches enable VMs' to share Ethernet interfaces removing the need for a dedicated VM network. Bypassing the need to transfer data through the physical network equipment also boosts the transfer rate between VMs and the NAS. The Virtual Switch is capable of 10 GbE and port-trunking, enabling you to obtain a fast and secure network environment.

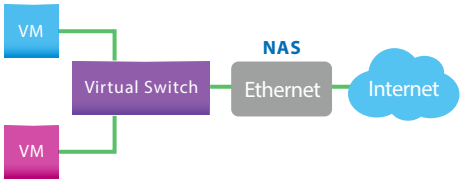
Support Networking modes of Virtual Switch

- Bridged Networking



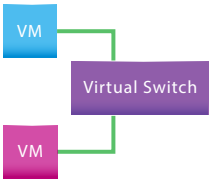
Attaching an Ethernet interface (Port-trunking available) to a Virtual Switch creates a bridged network. The NAS and the Virtual Switch can share the same Ethernet interface without occupation and supports high-speed data transfer via internal routing.

- External-only Networking



Specify an Ethernet interface for a Virtual Switch to enable dedicated routing between virtual switches and external networks. Enable DHCP to automatically assign an IP address to a Virtual Switch or choose to manually assign an IP address.

- Isolated Networking

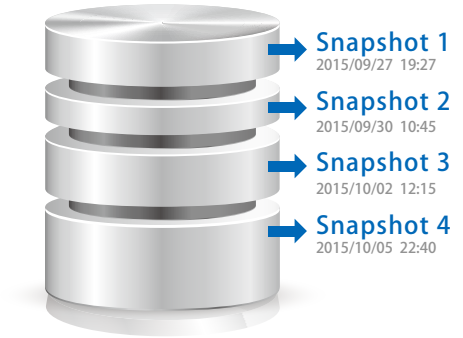


Not attaching any Ethernet interface to a Virtual Switch creates an isolated network. Manually setting IP address of VMs can enable communication between VMs connected to the same Virtual Switch.

* Available port-trunking modes: Active Backup, IEEE 802.3ad, Balance-tlb.

VM Import & Export

Support for various open formats (e.g. ovf or ova) makes it easy to import or export virtual machines across different platforms in a virtualized environment. Also, remote import/ export helps IT administrators efficiently migrate VMs among different QNAP NAS units.



How do snapshots work (basic):

The Internal Snapshot feature will capture an image of a running virtual machine and compare the capture to the original virtual machine image. The differences are recorded as the snapshot, and the original virtual machine image is marked as read-only.

The most recent virtual machine image will contain the original virtual machine image in addition to the differential images captured thereafter. Snapshots are not inter-dependent, enabling you to restore a virtual machine to any point in time when a snapshot was captured.

VM backup and restore

Virtualization Station makes managing multiple virtual machines on a QNAP NAS effortless. Virtual Machines can be backed up and restored centrally using an easy-to-use interface. Users can obtain scheduled tasks/status, and manually start or stop backup tasks. The online backup tasks run in the background without interrupting VM operations and/or powering off the system. Furthermore, you can set the schedule for backup tasks and maximum number of backup copies. When restoring, the system will automatically start up the restored VM, simplifying the whole process and reducing system downtime.

Device Management

The Device Management screen provides an overview of all VMs, keeping you informed of the storage capacity, network interface, and USB devices of the NAS as well as letting you connect or remove a new device without shutting down the VMs.

Remote connection with virtual desktop

Enjoy the convenience of operating Windows®, Linux®, UNIX®, and Android™ based VMs as remote desktops with a common browser such as Google® Chrome, Firefox®, etc. A list of buttons is provided on each individual VM display, allowing users to suspend, shutdown, force shutdown, reset, bring up key combinations: Ctrl+Alt+ Del and function keys, and take snapshots of the VMs.

The Virtualization Station supports SPICE and VNC connections. Connect to the VMs on the NAS with the SPICE (virt-viewer) or VNC client software. Windows Remote Desktop is also supported.

USB devices (USB Pass-through)

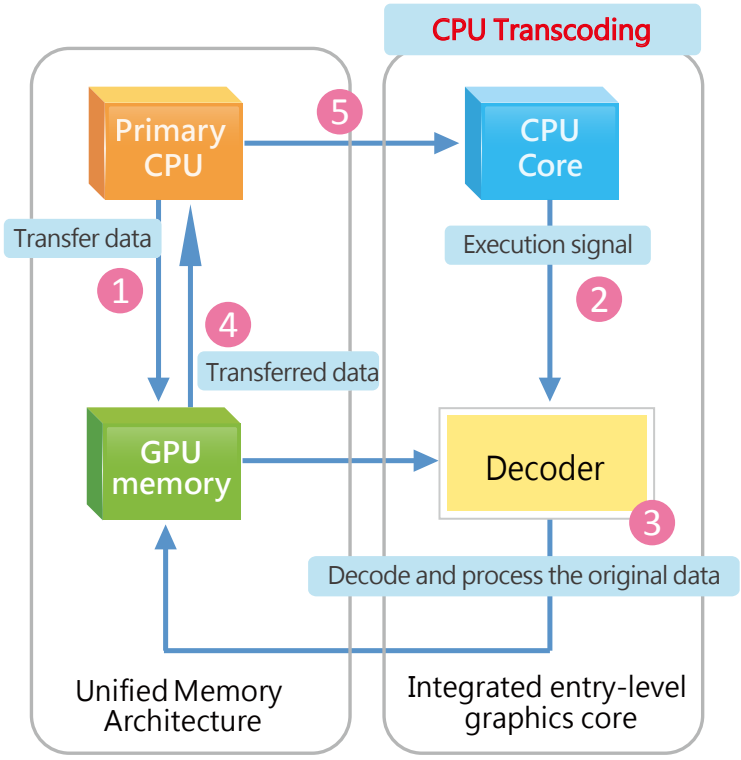
Virtualization Station supports connecting USB devices to virtual machines. Commonly used USB devices such as storage devices and card readers can be connected to virtual machines, and you can select a specific device using Virtualization Station. This can be used together with QVM Desk just like a PC. You can also connect USB card readers/scanners to a QNAP NAS via Virtualization Station and store scanned data directly to the NAS without taking up Internet bandwidth. Further, with the advent of USB 30, higher data transmission can be easily achieved.

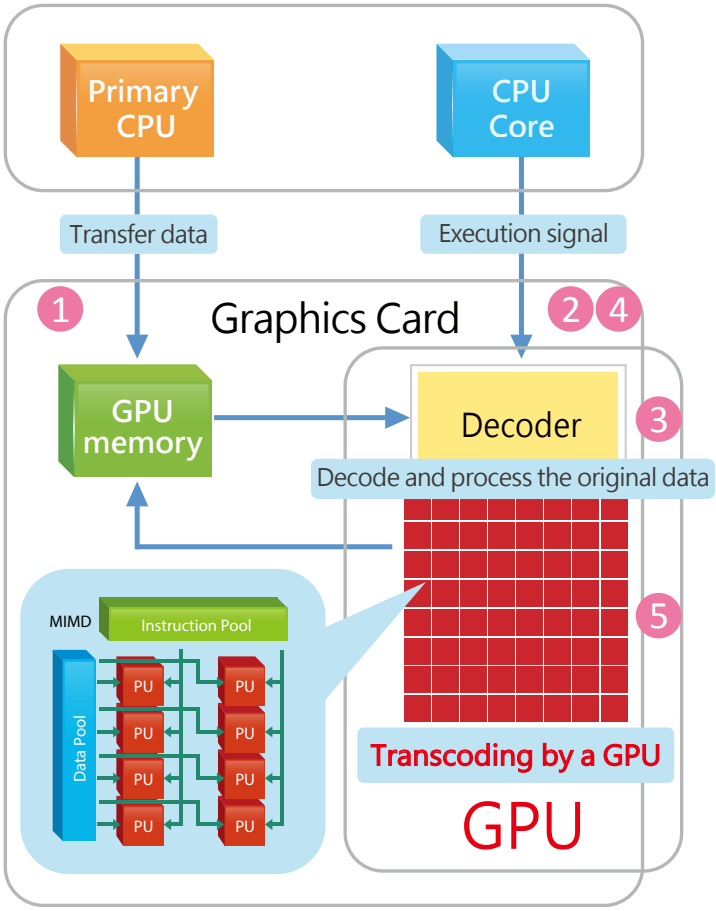
* Please note that this function is only available on Windows® 8 or later.

Application Scenario 1

GPU Pass-through for a Multitude of Applications

A Graphics Processing Unit (GPU) is a single processor with a massively parallel architecture of thousands of smaller cores making them ideal for handling multiple tasks simultaneously. GPUs are used in highly-sophisticated engineering applications, and with OpenCL (Open Computing Language) and Microsoft® DirectX 11 Compute Shader can be used in accelerating applications for general tasks such as transcoding and 3D animation & video rendering. The TDS-16489U supports installing GPU cards, and combined with its processing power and massive storage, it can offer unprecedented performance and design flexibility for compute-intensive applications.





Using video transcoding as an example, a GPU not only reduces the number of data transfers but also processes parallel workloads more efficiently than a CPU.

The use of GPU in virtualization has many challenges. There are no standardized modes of operation in virtualized platforms among GPUs. To fully leverage a GPU's application-accelerating capabilities, the TDS-16489U uses a Pass-Through mode to dedicate one GPU to a single virtual machine and other GPUs to other virtual machines. One virtual machine can be dedicated to exclusively run GPGPU computation, lifting the burden from the CPU for other jobs while significantly improving overall system performance.

TDS-16489U, TVS-ECx80U-SAS, and TS-ECx80U models support GPU pass-through with AMD Radeon™ R7 and R9 series GPUs. (Please check the external power supply requirements, and physical dimensions when selecting graphics cards to be installed on the NAS.)

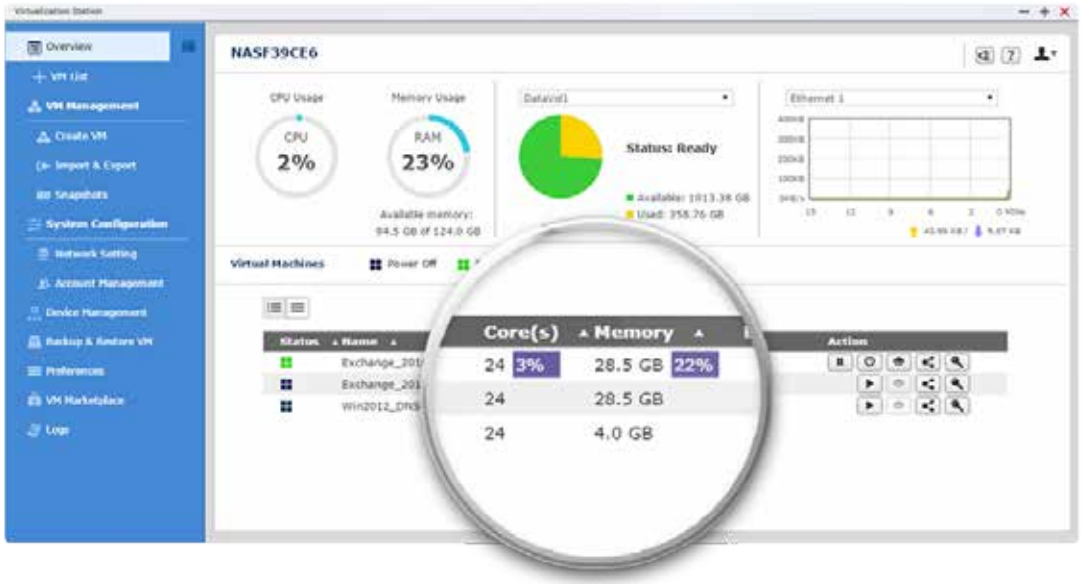
Application Scenario 2

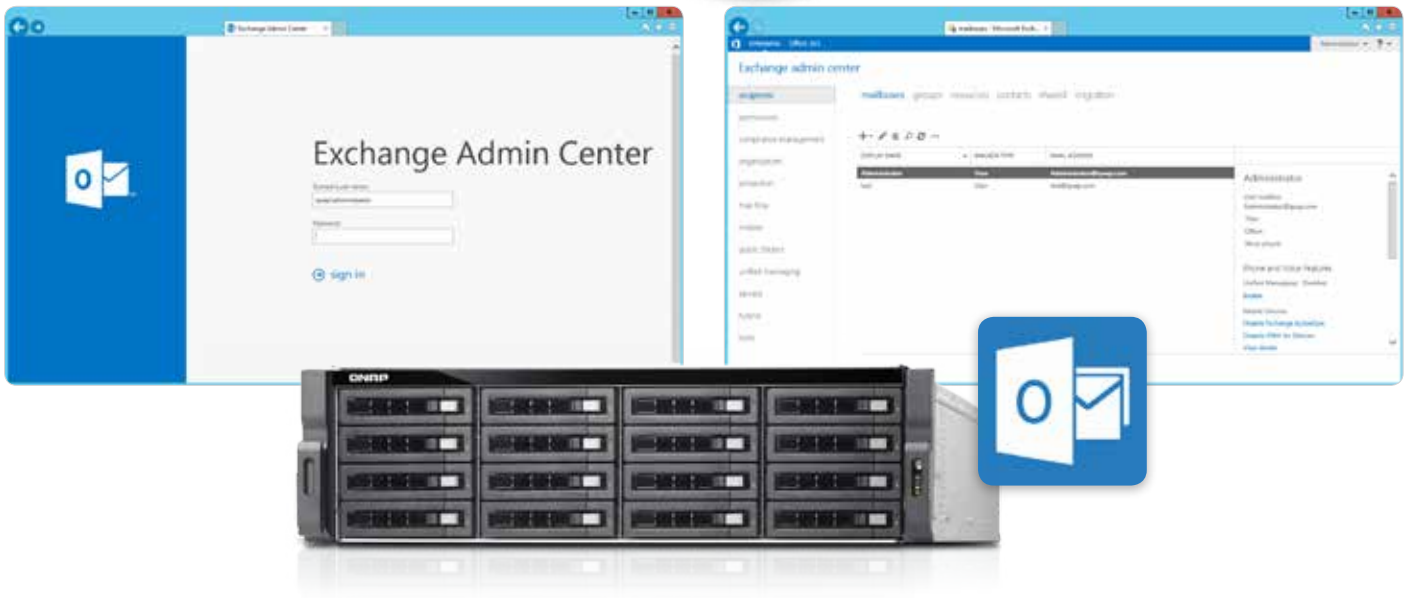
Running Microsoft Exchange, MS SQL, Active Directory, DNS, and Virtual Machines

Exchange Server 2016

Reliable messaging services help IT deliver the service levels and capabilities demanded by end users, while helping organizations reduce their TCO through areas such as server and site consolidation. Deploying Exchange servers requires additional hardware, along with the requirements for storage space and backup software, has driven up costs in the data center for procurement, deployment, and energy use. Running Exchange Server on virtual machines vastly reduces costs on all these fronts. Moreover, functions such as exporting, importing, backup and snapshot facilitate centralized management and aid in management efficiency.

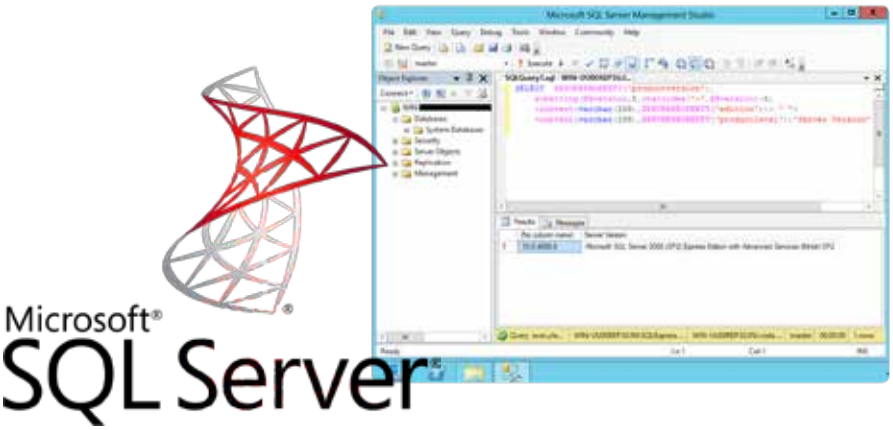
The dual Intel Xeon E5 processors and potentially large memory capacity of the TDS-16489U makes it the perfect platform to build Exchange mail servers in a virtualized environment. It offers not only the advantage of virtualization but also the combined advantage of computing and storage in one system.





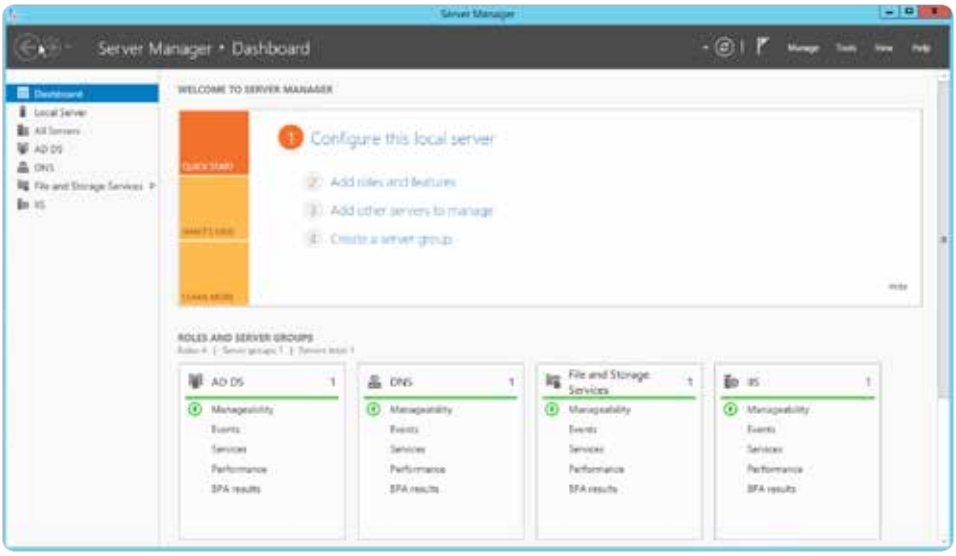
SQL Server

A database requires great scalability and flexibility in capacity planning and management. Virtual machines running on the TDS-16489U can mount iSCSI LUNs or shared folders via SAMBA to expand storage space on demand. Moreover, our scale-up or scale-out NAS solution allows dynamic capacity expansion by connecting JBOD expansion enclosures. The superior system design of QNAP NAS supports a mix of storage networking standards and storage media with server-grade computing in one system, providing you with the highest performance and the best value for money, all in one solution.



AD (Active Directory), DNS (Domain Name System)

AD and DNS use less computing resources compared with other services in enterprise IT systems, making it more practical and economical to deploy them on a virtual machine in lieu of a dedicated physical server.



Advantages:

1. By leveraging the combination of computing and storage on virtual machines, data exchange occurs inside the QNAP NAS through internal buses/interfaces, bypassing the limitation of network bandwidth between computers and storage servers.
2. The combination of computing and storage onto one system also saves money on acquiring networking devices and improves TCO with a smaller footprint.
3. Tiered storage helps classify email attachments into hot and cold data to accelerate application efficiency and to enhance the user experience.
4. Use Snapshots or VM Backup to provide contingencies for unforeseen system failures and minimize downtime to improve business continuity. In addition to data protection for virtual machines, the TDS-16489U also offers block-level data protection on system volumes with snapshot technology.

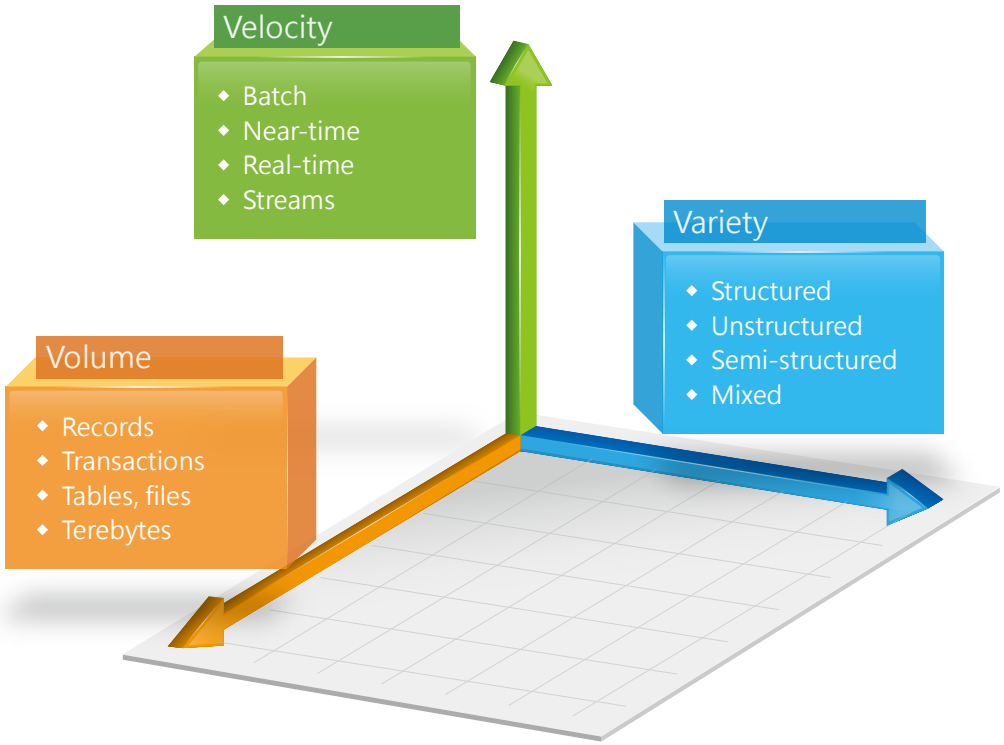
Virtualization Station offers different networking modes by employing high-performance virtual switches. The Isolated mode can be used to create a dedicated and safe network environment. The External-only mode ensures that VM network traffic can not be passed into the NAS by dedicating a network port for the VM. The Bridged mode ensures that the NAS and the Virtual Switch can share the same Ethernet interface and supports high-speed data transfer via internal routing.

Application Scenario 3

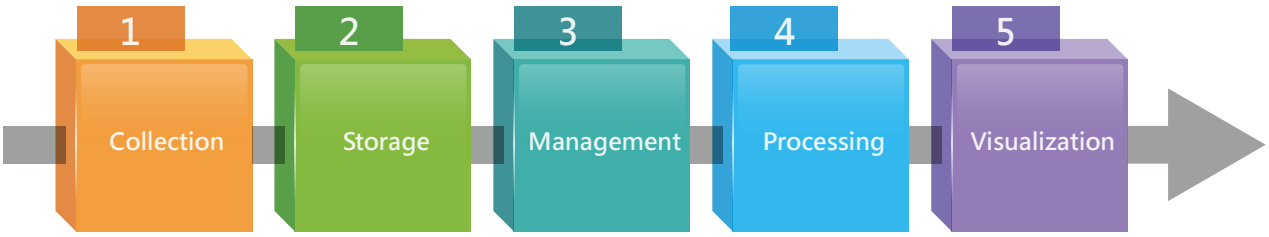
Big Data Storage and Analytics

Big Data analytics with Spark/Hadoop

The boom of the Internet of Things means that the amount of devices that connect to the internet is rising drastically. And with increasing amounts of data being generated by these devices, you need a storage infrastructure that interacts at high speed with your data. Intelligent storage infrastructure solutions offered by QNAP help boost your business applications, accelerate time to insights, and help you make data-driven decisions that will empower your business and provide you with competitive advantages.



5 Phases of Big Data analytics

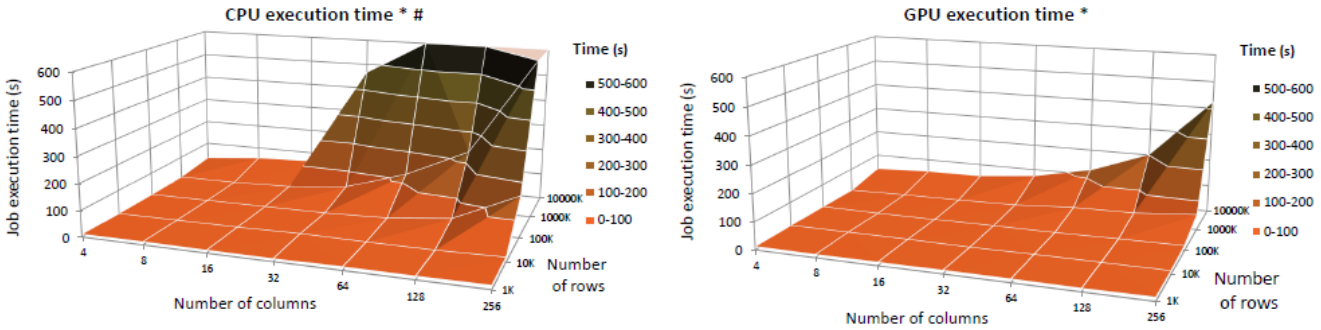


1 Data collection: Terabytes of data are collected in a short amount of time from connected devices over the Internet. The TDS-16489U fully supports virtualization and containerization, making it possible to consolidate disparate data acquisition services (which were separately running on Windows or Linux servers) all on a single physical server.

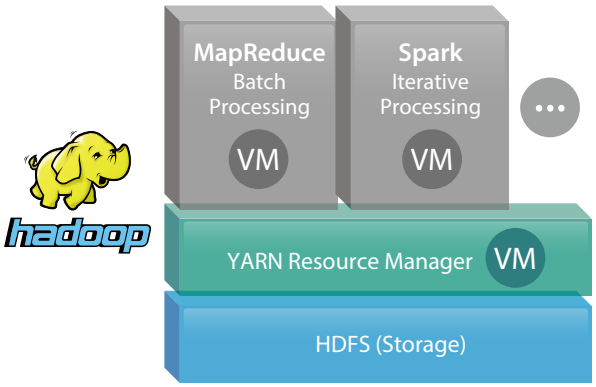
2 Data storage: The TDS-16489U provides the capacities and qualities required to support analytics workloads with the ability to efficiently reduce data storage demands e.g. deduplicating data at block-level across multiple TDS-16489U nodes. In addition, the TDS-16489U storage architecture supports fault tolerance and provides the performance necessary to accommodate ever-changing workloads.

3 Data management: Aside from traditional file systems and relational databases (RDB), newer implementations such as Hadoop, and NoSQL/ NewSQL can be easily deployed on the TDS-16489U.

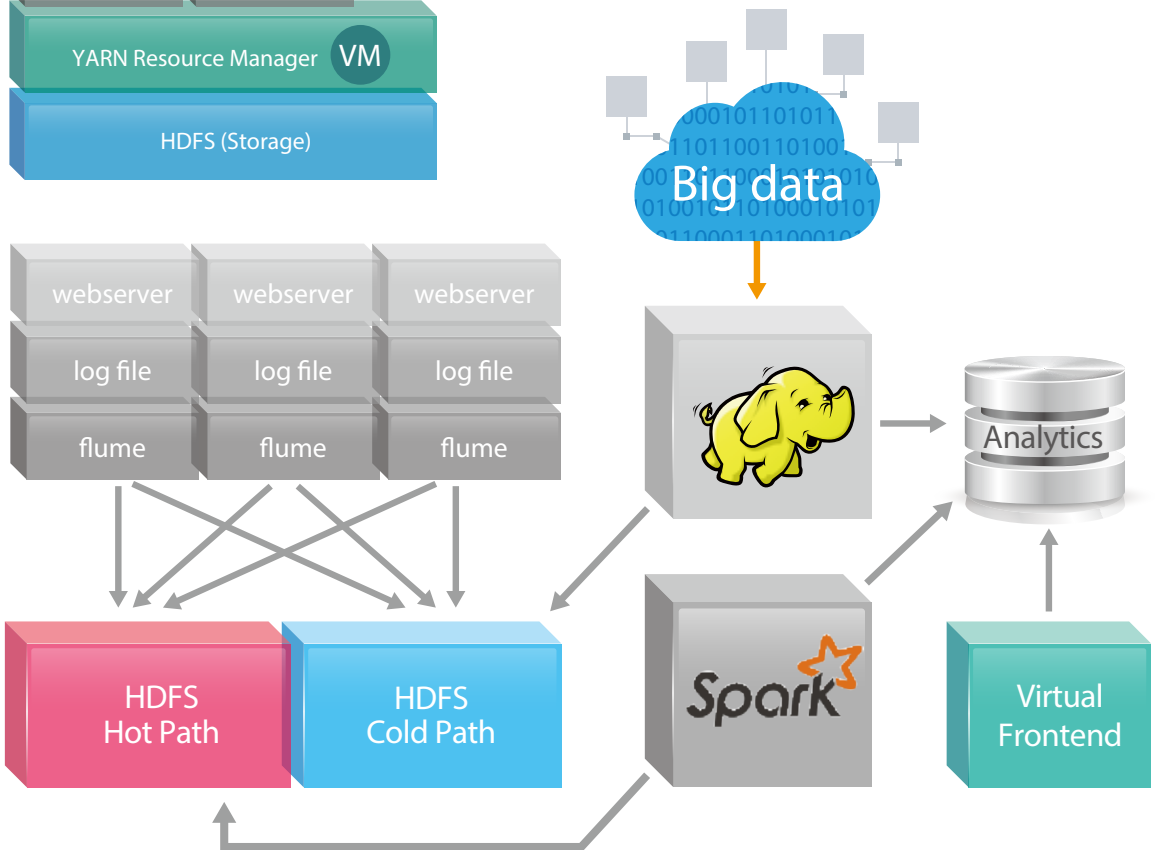
4 Data processing: The utilization of data for multi-vector analysis to support business intelligence is fundamental to Big Data analytics. Data scientists can use R or Java-based code to perform data analysis by using Hadoop/YARN, Spark, and Machine Learning libraries. The TDS-16489U can fully benefit from hardware-accelerated graphics processors on virtual machines. The use of graphics processors on Hadoop MapReduce can boost the performance of Big Data projects by 8-12 times.



5 Data presentation: The processed data should be presented in a way that helps users gain insights from data to inform decision making. Present your data efficiently by hosting websites on the TDS-16489U or via mobile apps.

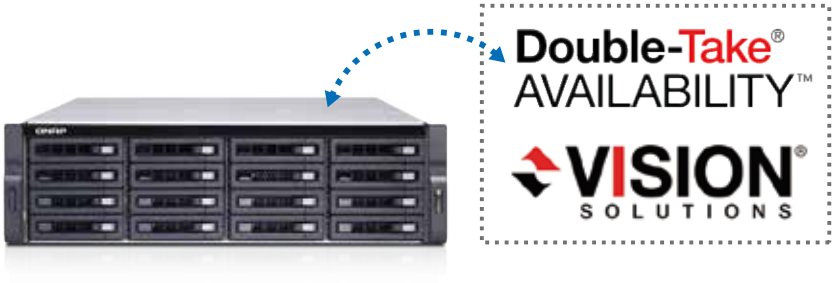


Examples would include analysis of website logs using Hadoop MapReduce or Spark's Machine Learning libraries. The built-in Qtier technology on the TDS-16489U can categorize the data into hot, warm, and cold by analyzing how frequently the data has been accessed so that data can be migrated to nVME, SSD, SAS disks, or SATA expansion enclosures accordingly.



Use Spark Streaming to perform predictive analytics by analyzing a website's workloads, click rates, and data from Global CDN. Dynamically adjusting system resources enables the highest system utilization to be achieved among multiple TDS-16489U units on the local network or across different deployment sites.

Virtualization Station + Double-Take® Availability™



Vision Solutions® is the premier provider of IT software solutions designed to protect data and minimize downtime for the modern data center. Double-Take® Availability™ provides complete data protection and enables instant recovery from any server outage. Double-Take® Availability™ also provides data replication and failover for entire operating systems and applications, including applications on Windows servers such as Exchange Server or Notes across computing platforms and sites.

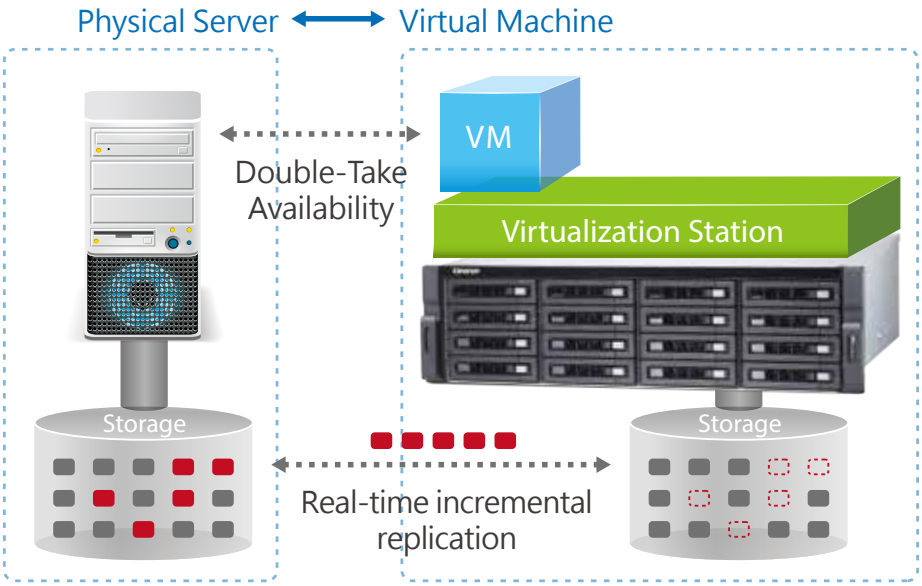
Powered by dual Intel® Xeon® E5 processors with up to 1TB memory, virtual machines on the TDS-16489U can run enterprise-grade services such as email servers, databases, and cluster computing. However, any data, system or application downtime poses a threat to operations and can have serious repercussions on a businesses' reputation affecting customer trust and potentially sales & profitability. To answer the demand for comprehensive data protection, QNAP offers not only enterprise-grade virtualization but also Double-Take® Availability's market-leading high availability and disaster recovery solutions. With Double-Take® Availability solutions, VMs on the TDS-16489U are in a consistent state and ready for recovery at any time, achieving the best possible RTO (Recovery Time Objective).

Administrators can remotely install the host-based recovery software for effortless protection and migrate across physical, virtual, or cloud-based Linux server environments using the Double-Take® console (client). Coupled with the Double-Take® Availability™, the TDS-16489U can run virtual machines to be the backup site for physical servers. Or, set up real-time replication between two virtual machines (Active and Passive) on two physical TDS-16489U systems, enabling immediate recovery from any system outage and eliminating a single point of failure. Additionally, the backup solution utilizes block-level incremental replication to minimize bandwidth usage and attain higher efficiency.

Failover

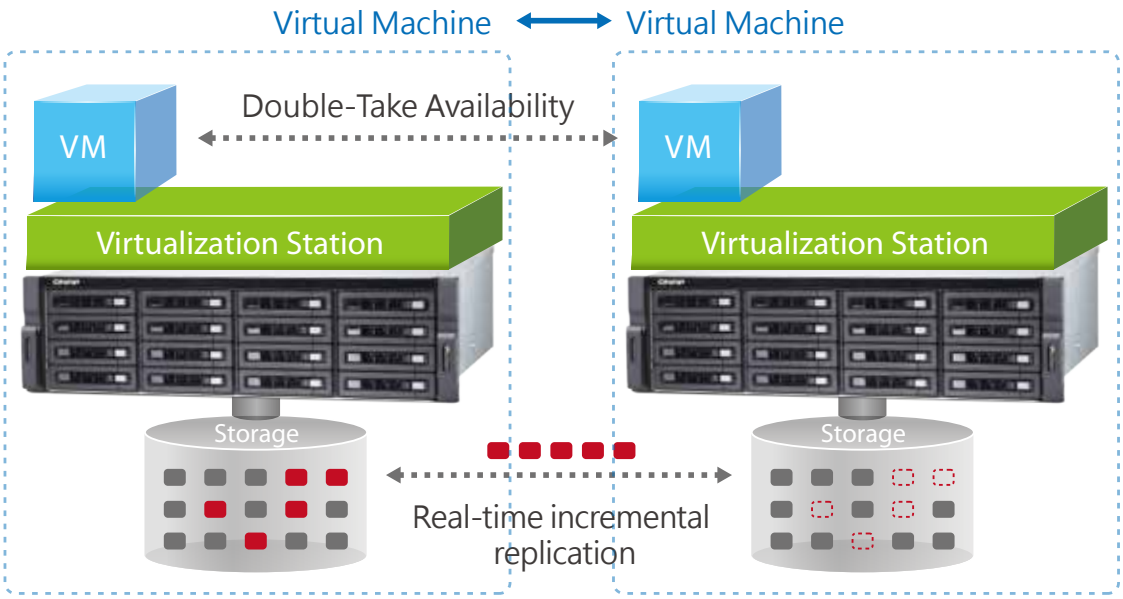
1 Implementation of Physical to Virtual machine (P2V) data protection and failover

If you already have a physical server, you can set up a virtual machine installed with the same operating system (e.g. Windows Server 2008 R2 or 2012 R2) as the physical server in Virtualization Station on the TDS-16489U. There is no need to install or configure the application on the backup server. Install Double-Take® server components on both the production and backup servers and it will run the data recovery mechanism between the source and the target system.



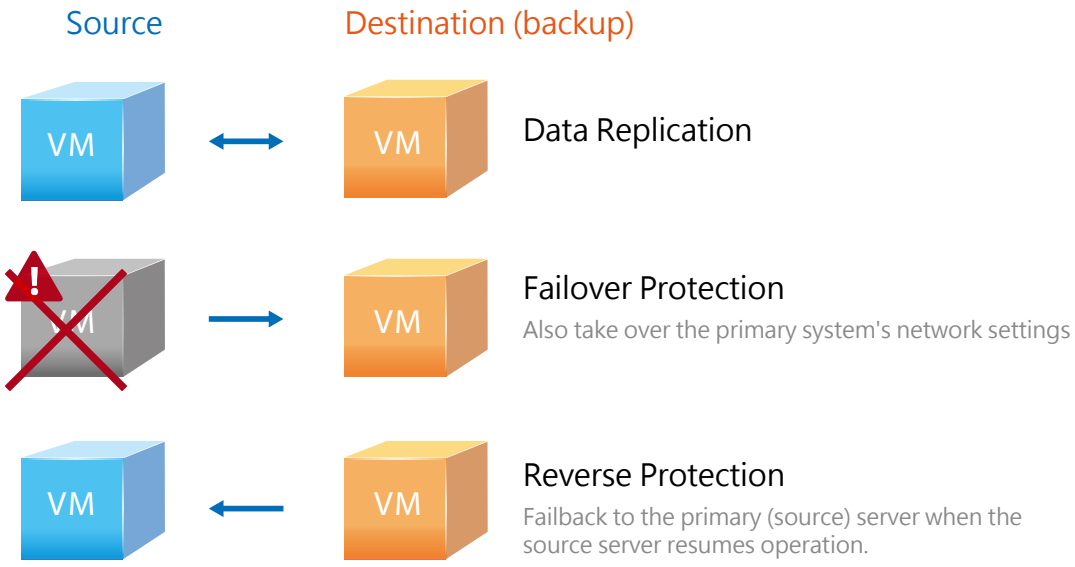
2 Implementation of Virtual to Virtual machine (V2V) data protection and failover

Besides the P2V implementation, data recovery can be established between two VMs operating on Virtualization Station, VMware®, Hyper-V®, or other platforms using Double-Take® Availability, ensuring the uninterrupted availability of critical application systems.



Failback Reverse Protection

Upon failover, Double-Take® Availability processes the system state replicated from the source and applies it to the target. However, when the primary system is back to an operating state, it is often necessary to failback to the primary server. To accomplish this, Reverse Protection should be invoked during failover to restore data from the target back to the source server. After the completion of failback, you can reestablish the data recovery mechanism between the source and target server.



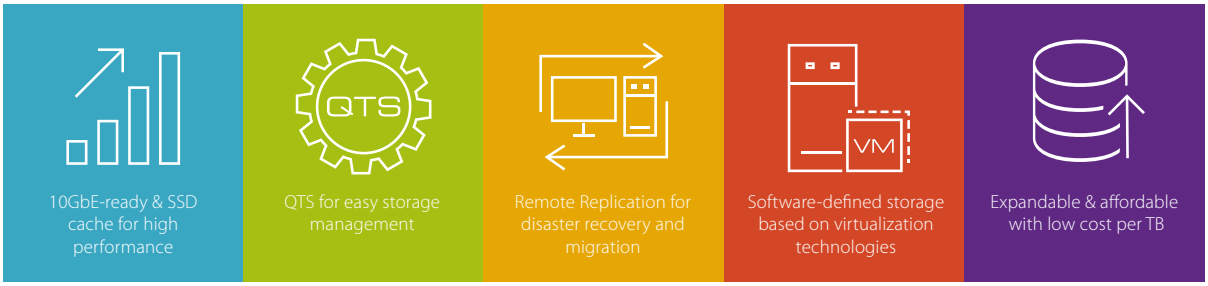
For more information on Vision® Solutions, please visit http://www.visionsolutions.com.

QNAP NAS is DataCore Ready

Being certified by the the DataCore Ready Program, QNAP NAS is compliant with DataCore SANsymphony-V software-defined storage infrastructures, and can help organizations maximize the availability and utilization of IT assets and centralize the management of data storage.

Benefits of using QNAP NAS with DataCore SANsymphony-V

Additional benefits that DataCore provide include simplified and automated provisioning, uninterrupted access using mirrored nodes, striping and cache to overcome I/O bottlenecks, automatically optimized disk access across tiers, and more.



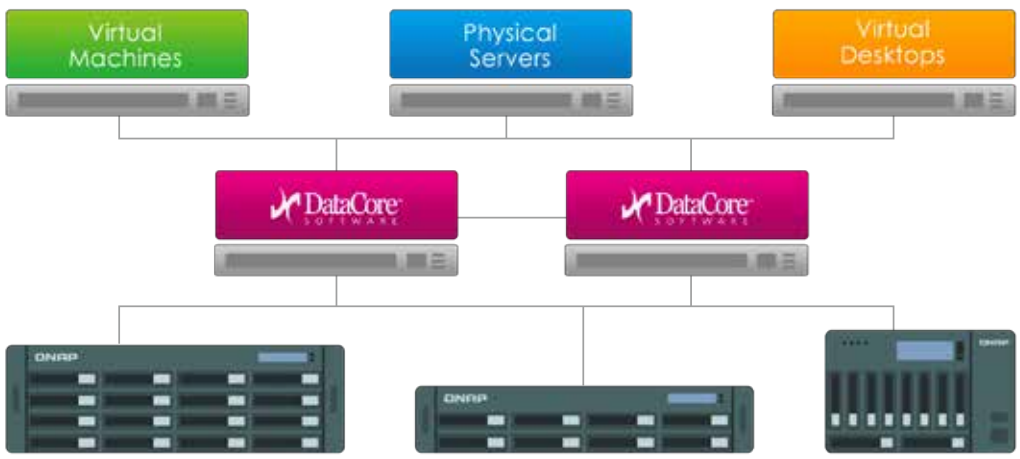
Easy deployment

QNAP NAS can be easily deployed to ensure storage availability for an organization's production servers and VDI environment.

This solution deployment scenario contains 3 main components:

- Servers requiring storage and high performance, such as virtualization servers, mail servers and/or databases;
- Raw hardware storage with RAID protection and 10GbE capability provided by QNAP;
- DataCore SANsymphony-V providing virtual storage volumes to the servers with high availability.

QNAP NAS provides the raw hardware storage to DataCore SANsymphony-V via iSCSI. Organizations can effortlessly use this joint solution to achieve desired performance levels and functions for file backup/archiving and disaster recovery.

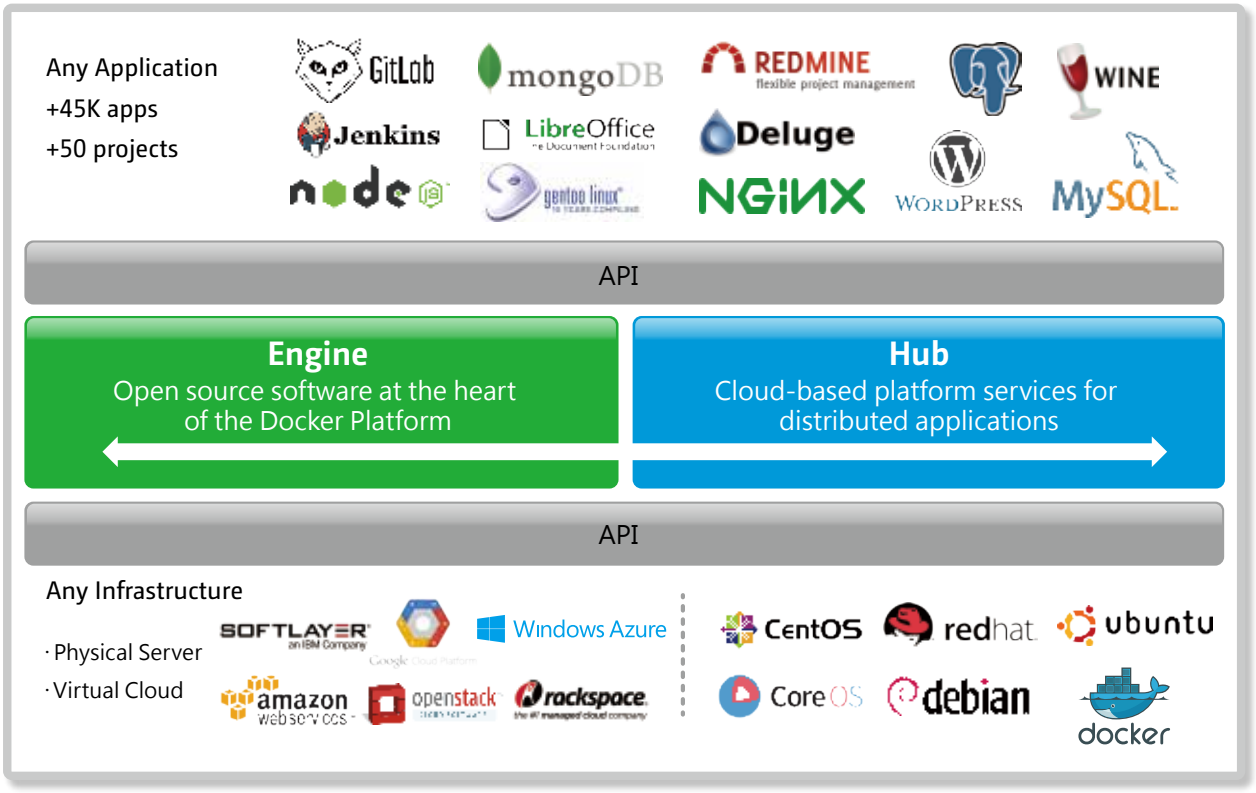


Container Station 1.0

The new era of virtualization and cloud computing

Container Station provides an agile, top-of-technology development platform bridging computers, QNAP NAS, and public cloud for developers and system administrators. QNAP introduced Container Station in 2015 following the Just enough OS/JeOS philosophy. This lightweight virtualization technology can instantly and truly create a ready to use environment on PC's, QNAP NAS, and Cloud technologies for RD developers and IT administrators.

For example, build a project in Container Station on your home computer and after the completion of each stage of development, upload the container to Docker Hub or export and save it on the NAS. Your coworkers can then download the container and continue with the next development stage. With a container-based application, on QNAP NAS, VMware, OpenStack, or on the cloud, developers can deploy and share any app on any of these platforms, quickly and reliably.

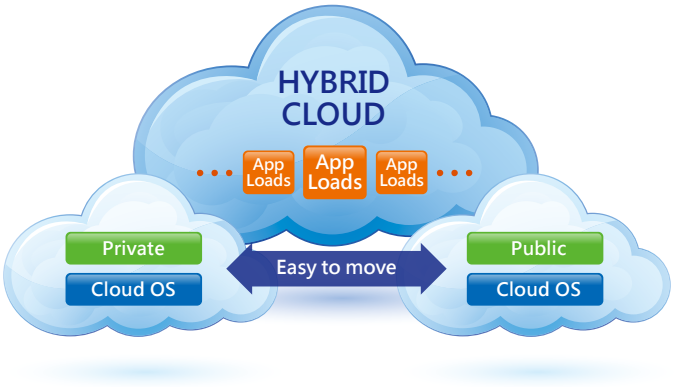


Container Station is available in the App Center.

Benefits of Container Station:

1 Embrace Docker technology to seamlessly bridge NAS and cloud applications in a hybrid cloud infrastructure.

With Docker, applications can be uploaded (pushed) from the NAS to a public cloud at anytime from anywhere, shortening development cycles and increasing testing speed.



2 Integrate LXC and Docker to bring even more value to your NAS

LXC —

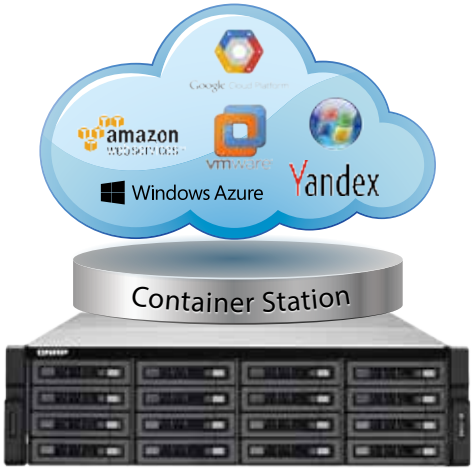
the lightweight Linux Container enables a high-performance lightweight virtualized Linux environment on your NAS. Install a lightweight version of Linux as the base for your containered application with LXC.

Docker® —

Facilitates fast and mass application deployment to build microservices.

3 A wealth of shared applications

Use the Docker Hub to search for publically shared applications, whether they are databases, web servers, programming languages, or development tools; install it as you would an app on your smartphone.



4 Easy cross-platform deployment

LXC/Docker has been widely adopted by many public cloud services. Containers run on almost any platform, including PC, servers, VMs, and public and private clouds. Container Station with Docker streamlines application deployment and migration on virtualized and cloud environments. Using Turbo NAS with Container Station enables seamless integration with major public cloud services.

5 Excellent virtualization performance

Instead of virtualizing hardware, containers rest on top of a single lightweight Linux instance. This makes it possible to quickly set up and run containers from the same host where each guest has a unique operating environment isolated from its host and with performance close to that of a physical server.

Seven exclusive and industry-leading functions

1 One-click installation

Forget complicated configuration and simply enjoy the benefits of software containers. Just click “Create” and the system will automatically download and install the applications.

2 Lightweight virtualization—LXC

LXC is now available in Container Station. It features the most common operating systems including Ubuntu, Debian, and Fedora built-in. Users can add desired applications after downloading.

3 Automated deployment

Wondering how to set up software containers? QNAP's exclusive automated deployment function makes using software containers very easy, enabling rapid installation and deployment.

4 Virtualization on NAS for home and small offices

Entry-level NAS models, e.g., TS-231+, TS-431+ can enable Linux virtualization on QTS 4.2. Just download the default Linux version from Container Station and you can have the only virtualization-ready ARM-based NAS.

5 Operate software containers via URL or terminal

The Container Station automatically provides links to web-based applications to streamline software development throughout the entire process. In addition, the console provides a familiar development environment for Linux experts.

6 Export/import software containers

You can export software containers along with data contained in it to a given shared folder. You can also import software containers from PC or shared folders. Employs this function to back up as well as transfer your containers at ease.

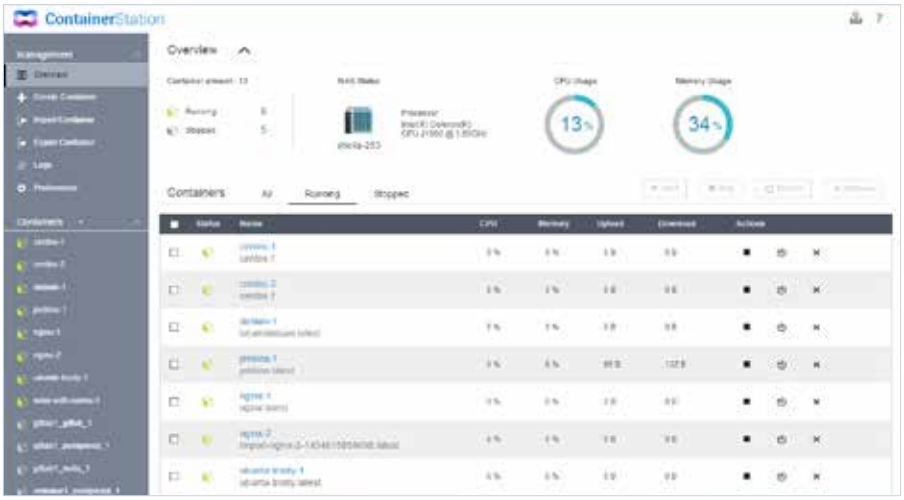
7 Auto start up

Your software container starts automatically after your Turbo NAS powers on or after Container Station reboots. This eases system administrators' workload while improving the system availability.

Other functions

Resource management

Specify host CPU/memory resources allocated to a software container and monitor the host in addition to each container's performance from a single screen. The visualized presentation with graphics provides a quick overview of resource consumption and aids in resource management.

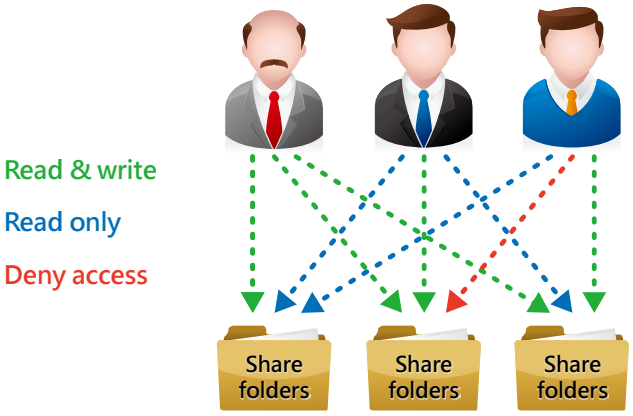


Access shared folders

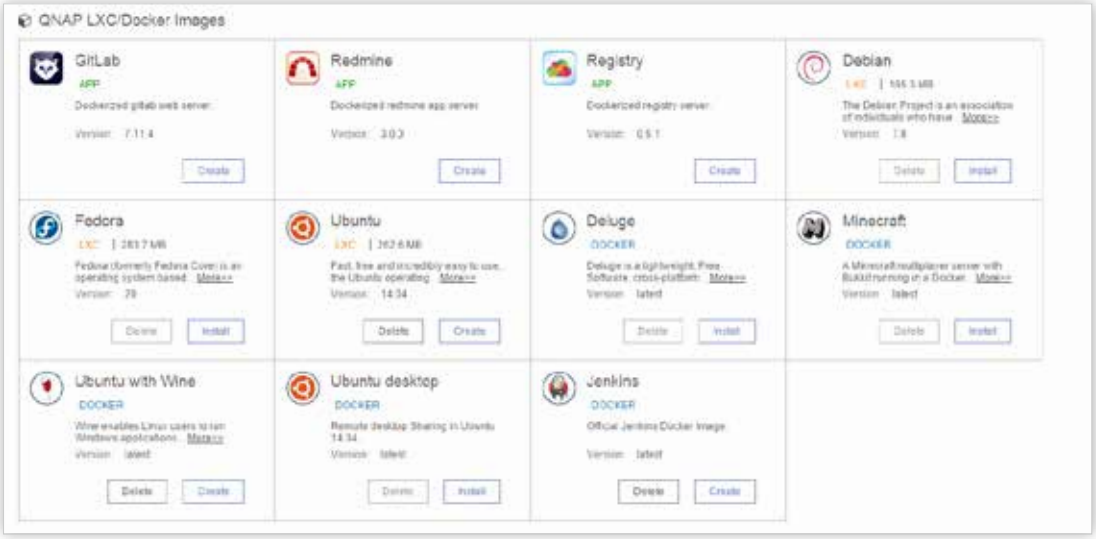
Shared folders mounted in a container (or from other containers) save data to the NAS at comparable access speeds to that of bare metal environment.

Permission control

Access shared folders on the NAS or other containers as well as connect to other host servers with granular permission control.



QNAP customized LXC/Docker images



Virtualization Applications

VMware® / Citrix® and Hyper-V®

The Turbo NAS supports iSCSI and NFS protocols, and is virtualization ready - VMware® Ready™, Citrix®Ready™, and Microsoft® Hyper-V™ compatible, to provide businesses with powerful and flexible storage solutions for virtualization applications

Virtualization ready

The Turbo NAS supports VMware Ready™ vSphere 5, VAAI;Citrix® Ready XenServer™ 6.0, and is compatible for Microsoft® Hyper-V, supporting ODX and Windows Server 2012.

Secure and flexible storage utilization

The Turbo NAS offers flexible management through creating and allocating iSCSI LUNs (Logical Unit Numbers), mapping and unmapping LUNs to and from iSCSI targets, and thin provisioning functionality. The support of CHAP authentication and LUN masking reinforces secured deployment in virtualization applications.

NAS/iSCSI SAN unified storage

QTS supports NFS and iSCSI SAN storage solutions as network shared storage for virtualized environments for efficient cost-saving, energy-saving utilization of storage capacity.

VAAI for iSCSI, VAAI for NAS

QNAP NAS, VAAI iSCSI and VAAI NAS are VMware certified. Businesses can select either iSCSI or NFS as a centralized storage to boost performance. VAAI for iSCSI supports Full Copy (hardware-assisted copy), Block Zeroing (hardware-assisted zeroing), Hardware-assisted Locking, and Thin Provisioning with space reclamation. VAAI for NAS supports Full File Clone, Extended Statistics, and Reserve Space. The QNAP NAS uniquely supports VAAI iSCSI and VAAI NAS to enhance storage performance in a virtualized environment.

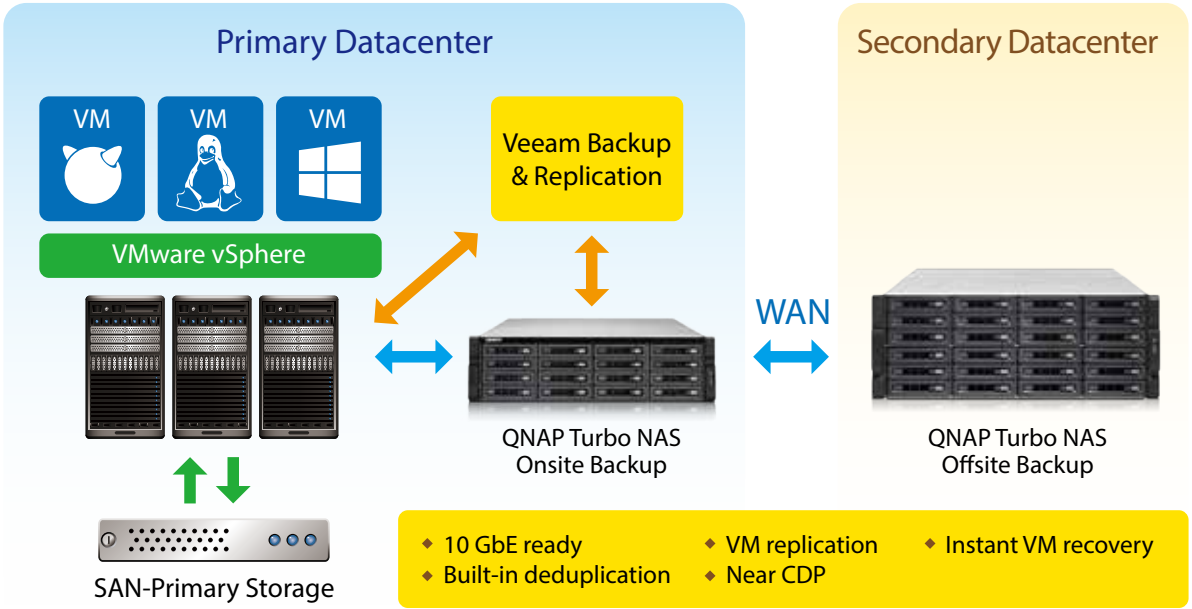
Storage for Microsoft Hyper-V

With ODX support, the QNAP Turbo NAS becomes a high performance iSCSI storage solution under Windows Server 2012, including Hyper-V virtualized environment. QNAP storage enables full copies of virtual machines within the NAS without requiring the Windows hosts to read and write the data. This greatly reduces the load on Windows hosts and improves the performance of copy and move operations for Windows 2012 hosts using QNAP iSCSI storage. When providing QNAP storage to a Windows 2012 file server, the end user using a Windows 8 client workstation will also benefit from the offloaded copying process for large file transfers.

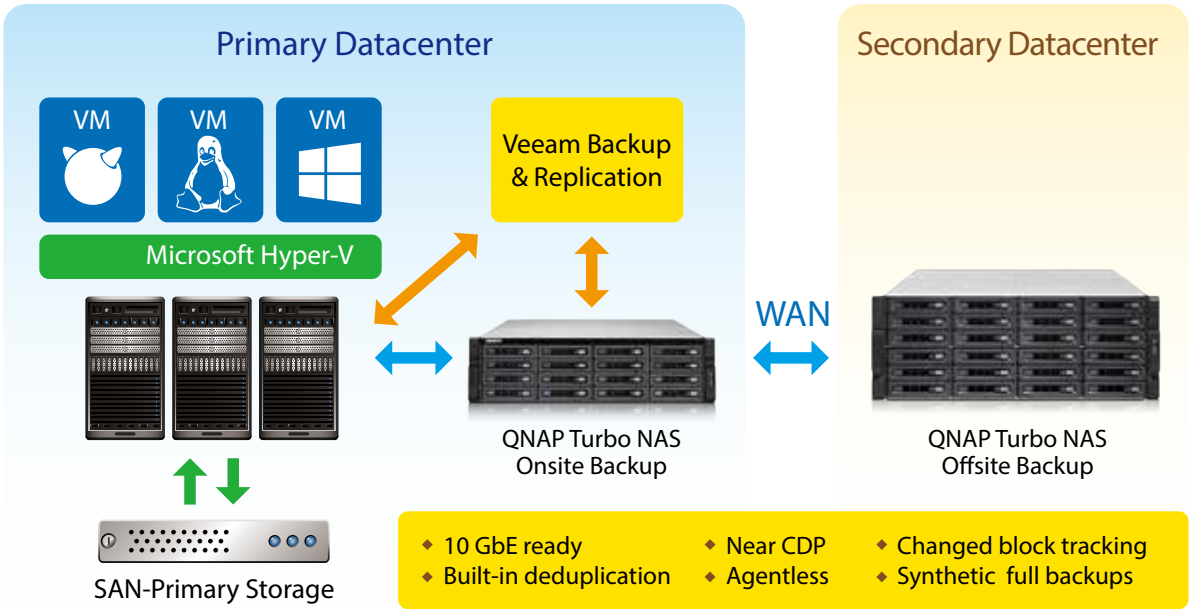
VM Backup Solution with QNAP and Veeam

Veeam Backup & Replication software combined with QNAP NAS provides a cost-effective disk-based backup solution for VMware and Hyper-V that maximize data reduction and scales to meet the needs of demanding enterprise environments. This affordable and complete backup solution enables setting up one or multiple QNAP NAS units as the backup storage, replicating VMs and backing them up to a remote site for an efficient disaster recovery solution.

Solution for VMware



Solution for Hyper-V



The joint solution of QNAP NAS and Veeam Backup & Replication provides complete storage and virtualization protection.

The advantages of using QNAP NAS with Veeam Backup & Recovery include:

High Performance and Efficiency

- 10 Gigabit ready: QNAP TS-x80 series support 10 Gigabit interface for a fast transfer rate allowing rapid backup and recovery.
- VMware®and Windows™ Server 2012 Hyper-V support: QNAP NAS support both virtualization platforms concurrently. It can be used as the production or backup storage in either virtual environment.
- Large storage capacity: QNAP NAS supports up to 128TB of storage capacity (16-bay models). The storage capacity of the server can be expanded by online RAID capacity expansion.
- Built-in deduplication: Save storage capacity with Veeam's built-in compression and deduplication while providing several recovery points for VMs. The QNAP NAS efficiency can be increased, by reducing the required storage space and limiting the data sent over the network.

High Flexibility

- Granular restore: Recover complete VMs, or restore individual files and folders from inside VMs using Instant File-Level Recovery (IFLR)
- Veeam Explorer™ for Microsoft Exchange provides instant visibility into Exchange backups, advanced search capabilities, and quick recovery of individual Exchange items (emails, contacts, notes, etc.).
- Instant VM Recovery: Run a Hyper-V or vSphere VM instance directly from a compressed and deduplicated backup file on the QNAP backup storage, without modifying the backup file. This eliminates the need to extract the backup and copy it to the production storage, reducing the downtime to minutes or less.
- Image-based backups: Speed-up the backup process with agentless VM protection and improved block tracking for fast incremental backups in Hyper-V and vSphere environments. With increased backup performance, you can protect VMs more frequently

Reliable Data Protection

- RAID data protection: QNAP NAS provide RAID protection to safeguard backup data from possible hard disk failures.
- Encryption: QNAP NAS provide AES-256 volume-based encryption that prevents sensitive data from unauthorized access and data-breach even if the hard drives or the device is stolen.
- Remote Replication: QNAP NAS provides both real-time or scheduled data replication between a local and a remote QNAP NAS, an FTP server, or an external drive.

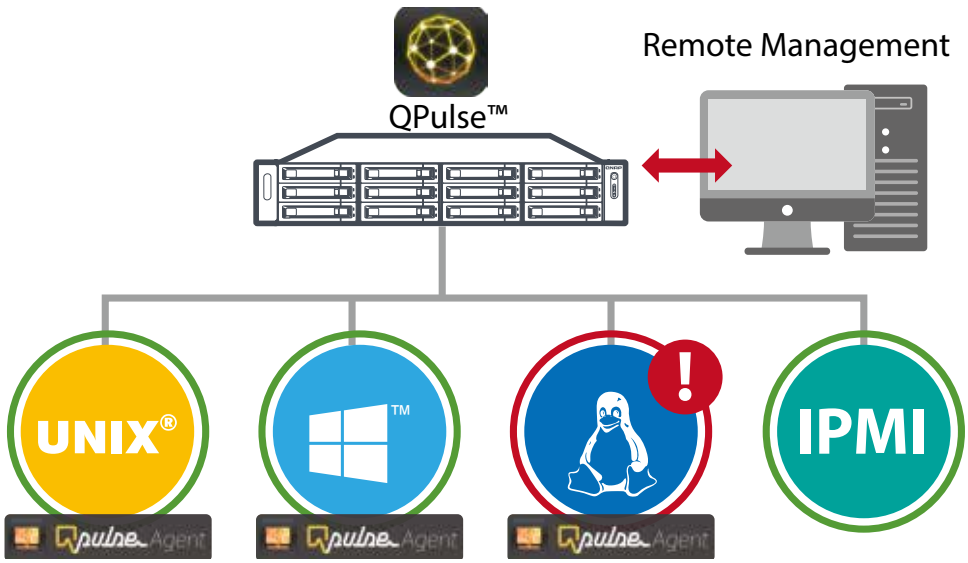
Good Manageability

- Easy to deploy and maintain: QNAP NAS can be easily set up and maintained without professional IT knowledge. QNAP NAS can be joined to Active Directory to enable Veeam Backup & Replication to use the QNAP NAS as a backup destination.
- Notifications via SMS and emails can be set up on the QNAP NAS for instant error or alert notifications.
- Affordable: QNAP NAS are an affordable converged network storage solution with enterprise-class server features and performance.
- Eco-friendly design: QNAP NAS feature low power consumption and extremely quiet operation.

QPulse™

Unified Remote Server Management Solution

QPulse™ is a Centralized Remote Server Management solution from QNAP designed for IT Teams. QPulse™ Monitors and controls the pulse/health of all the mission critical servers in your network. QPulse™ provides single point solution to Discover, Map, Monitor, and Manage all the critical computing devices (Servers/PCs/Thin Clients, etc.) in your network. Manage your servers from multiple clients with-in the same network or remotely.



Key Benefits

Server Monitoring Made Easy

- Increase IT's visibility across the health of mission critical servers.
- Discover, Map, Monitor, and control your networked resources from a single platform.
- Keeps track of all important device parameters and provides state of art alert/event management.
- Generates Reports to help you analyze performance of your networked resources.
- Supports multiple platforms like Windows and Linux through QNAP's QPulseAgent- A lightweight Remote Management Agent
- Supports IPMI 1.5 and 2.0 (IEI iRis-2400, iRis-1010 compatible).
- Spend less time in troubleshooting.

Customizable Dashboards

Server Monitoring Made Easy

Visualize and Monitor all the devices and respective paramaters via QRMS Dashboards. Customize the Dashboard as per your preferences.

Multiple graphic and informative widgets provide a simplified monitoring system for your network.

Device Discovery and Topology

Discover and Map the assets in your network

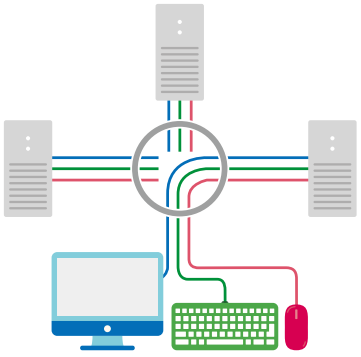
QPulse™ identifies all the devices on your network including routers, switches, printers, servers, workstations, and mobile devices. Discover all the devices on your network using an IP Range scan. QPulse™ maps discovered devices into a topographic network map. Network maps are a powerful first response tool that assist you in visualizing your networks and quickly isolating the root cause of a problem.

Web Based Application

Server management made easy

QPulse™ is a centralized, web-based solution accessible to your IT administrators from any web browser. QPulse™ supports many active monitors including CPU, Memory and Disk Utilization in addition to CPU Temperature, CPU Fan speed, and many more. This gives complete visibility to administrators across all mission critical computing devices. State-of-the-art alert mechanisms help IT staff to define and receive alerts across numerous parameters providing deep insight for full preparedness, prevention, response, and recovery.

Remote KVM Solution for IPMI



Remote KVM over IP in Browser

Multichannel/Centralized Remote KVM solution

With QNAP's Proprietary KVM Proxy solution for IPMI compatible servers, you can remotely control the server even if server is turned off or is in BIOS mode. QPulse™ KVM solution supports multichannel access so that more than one client can connect to the remote server using KVM at the same time.

QPulse™ supports Remote desktop for non-IPMI devices based on noVNC technology.

Remote KVM over IP in Browser

Track all the actions using KVM Recording and Playback

Enable KVM recording and all the KVM data will be recorded in video format to the NAS. This way you can playback the recording based on Date and Time and track the events. This provides unique way to administrators to log each action taken on server and improve the security.

KVM Recording and Playback

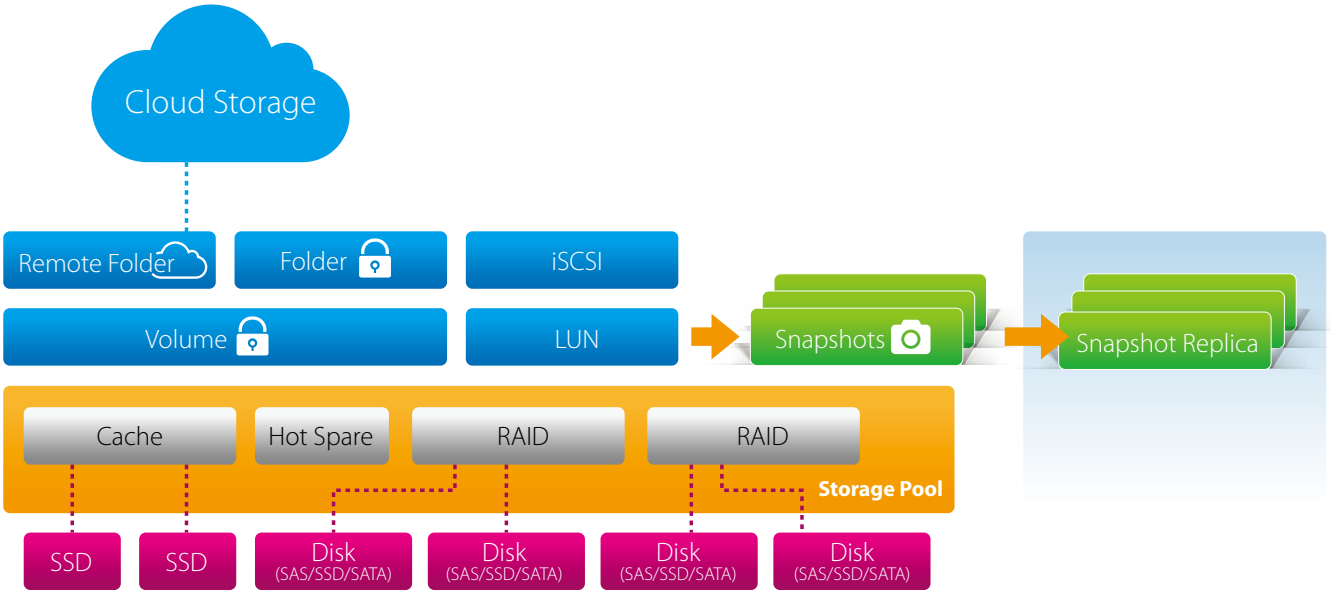
Unified Storage management and data protection

A converged management platform combining cloud and tiered storage technology

In addition to existing storage management and backup functions, the new Snapshot and Backup Versioning help you improve data security while lowering storage expenses. By integrating public cloud storage and backup services, your QNAP NAS is a converged storage management platform offering on-premise, private, offsite, and cloud services.

Intelligent Storage Manager - Unified storage management

The QTS Storage Manager neatly presents tools and options for managing system storage with an intuitive graphical interface. From reviewing the system storage allocation in the Dashboard, to managing volumes, Storage Pools, disks and iSCSI storage, or even the new Snapshot function, the Storage Manager provides a centralized place to simplify hard drive management and to maximize storage usage.



Smart Dashboard

The Storage Manager dashboard provides an overview for IT administrators to easily monitor and manage storage allocations. QTS 4.2 provides a secure and flexible way to store and manage data stored on your NAS. This next generation volume management offers powerful features such as storage pooling with multiple RAID groups, thin provisioned volumes with space reclamation, and online capacity expansion.

In addition to Storage Manager, IT administrators can also check volume status of shared folders with File Station.

Storage management

IT administrators can monitor HDD allocation status for RAID groups in addition to individual HDD information. This ensures that there are no idle HDDs and maximizies utilization of storage resources. IT administrators are able to aggregate multiple RAID groups into a single storage pool to flexibly utilize the storage capacity as a whole and to protect them using redundancy, allowing for better protection against multiple disk failures in large-capacity environments. Multiple volumes can also be created on the Storage Pool to provide further deployment flexibility.

Volume management

QTS 4.2 supports the creation of multiple volumes within a Storage Pool. View all available storage pools, volumes, and iSCSI LUNs on the same screen including comprised RAID groups. This enables the expansion or removal of current pools and volumes, set threshold values for capacity consumption alerts, and RAID group management. Data volumes and LUNs can be extended without interrupting services.

Thin provisioning

Over-allocation enables a server to view more storage capacity than has been allocated in a storage pool. Further, the physical storage capacity is used only when files are written by the application, improving utilization rates.

Efficiently use storage spaces with incremental allocation.

Thick provisioning

Physical storage capacity is dedicated during the initial allocation of the storage volume.

Allocate all spaces specified and they cannot be used by other volumes or LUNs.

iSCSI (Block based LUN)

QTS 4.2 supports two types of LUNs for efficient storage utilization: block-level and file-level iSCSI LUNs. QNAP NAS also supports multiple types of configurations for server connections:

- single LUN or multiple LUNs per iSCSI target.
- multiple iSCSI targets for a single LUN, only used for clustered environments

Block-Level iSCSI LUN

Deploy block-level iSCSI LUN as volumes to reduce overhead and improve overall read/write performance.

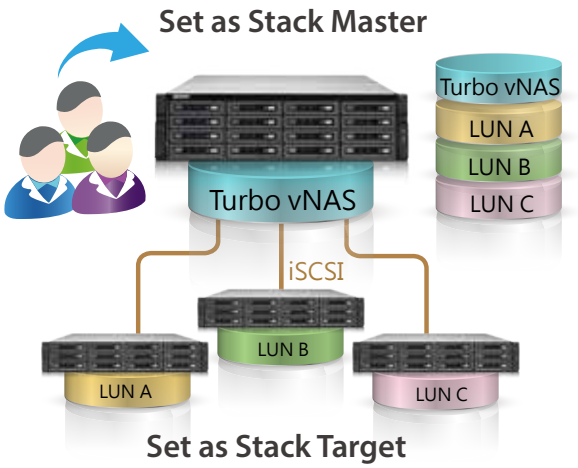
File-Level iSCSI LUN

File-level iSCSI LUNs can be used to create a disk image for an iSCSI LUN where storage space is a premium.

Both block-level and file-level iSCSI LUNs support thin provisioning, space reclamation, and online capacity expansion. We recommend using block-level iSCSI LUNs unless there is a limitation on space usage.

Virtual Disk Drives increase storage expansion flexibility

Virtual disks provide a flexible way for IT administrators to expand storage. By using the built-in iSCSI initiator to connect an iSCSI target of the Turbo NAS, you can create a virtual disk on the local server. The Turbo NAS can act as a stack master to connect up to 8 virtual disks or stack targets, aggregating storage space from multiple NAS systems. NAS users then only need to connect to a single target to access the space from all of the network storage devices.



CIFS (SAMBA)

Server Message Block (SMB), a version of which is known as Command Internet File System (CIFS), is the default file-sharing service on QNAP NAS. It is mainly used for sharing files among systems using this protocol, such as Windows and Unix-like systems and can also be used as a primary domain controller (PDC).

NFS

QTS 4.2 supports Network File System (NFS), which allows a server to share directories and files with clients over a network. With NFS, client computers can mount file systems over a network. Users can access shared files on these file systems as though they are mounted locally.

QNAP high-performance unified and tiered storage solutions

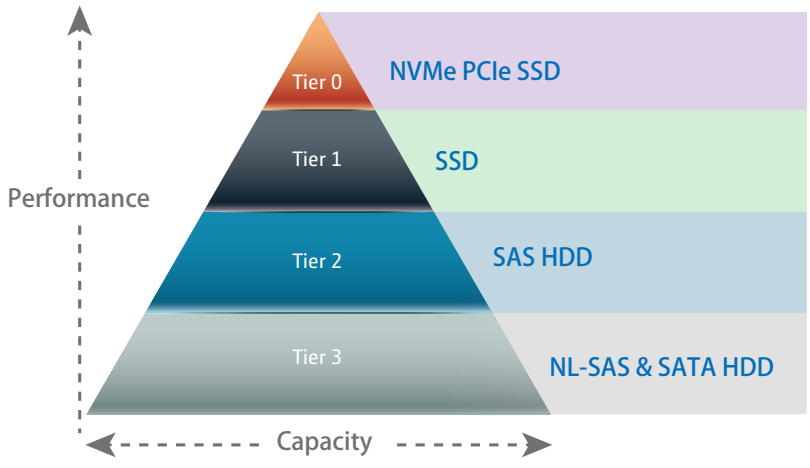
Data used by enterprises continues to grow exponentially with a greater diversity in both importance and type of data. It is imperative to offer a secure and efficient storage solution that can process this enormous amount of data while minimizing the total cost of ownership. Establishing a tired storage system based on efficiency and capacity can aid in improving overall processing efficiency. Enterprises can classify data accordingly by sharing folders with a file-based storage system and processing files that require more demanding data throughput with a block-based storage system to accommodate different usage models. QNAP NAS business series flexibly configure different tiers to hard drives on a single unit according to different data usage needs, delivering the best in unified and tiered storage solutions.

Tiered storage architecture optimizes storage efficiency

Modern business needs for data storage keep increasing. It is crucial that businesses can utilize cost-efficient storage solutions featuring tiered architecture to tackle Hot Data (frequently-used data) and Cold Data (less-used data) applications with the flexible configuration of storage devices to boost storage efficiency.

In order to achieve the goal of tiered storage, organizations typically opt for SAS controller based storage systems such as QNAP's enterprise-class SAS-enabled QNAP NAS models.

In a diverse and crowded market, businesses have to thoroughly asses storage requirements in terms of performance and capacity to achieve the maximum cost efficiency and future growth potential. The following illustration shows a typical tiered storage architecture strategy.



Storage tiers

	Tier 0 Storage	Tier 1 Storage	Tier 2 Storage	Tier 3 Storage
Device Used	PCI-E SSD or High-performance SSD	SSD	SAS HDD	NL-SAS and SATA HDD
Needs	Low latency and high performance but with lower capacity	Performance, capacities and availability	Lower performance and cost, larger capacity	Lowest cost and maximum capacity; suitable for inactive or static data
Usage Scenarios	Online transaction processing (OLTP) database, online analytical processing (OLAP)	Online database server, ERP database	Mail server, snapshot, online archive, large amount of data	Offline archive, backup copy, disaster recovery, long-term data retention.
Data Usage Examples	Records and logs, paging file metadata or index file, replication of VM and VDI connections, merging of I/O and performance	Operating files, emails, networks, database tables, audio, video, VM and VDI, hosts	Main directory, data acquisition, disk-to-disk (D2D) backup/restore	Applications with low-cost or high energy-saving
Data Status	Operating data	Mainly operating data	Mixed with operating and idle data	Mainly idle or inactive data
Measurement Standard	Focuses on high IOPS and low latency, low capacity needs; high cost.	Focuses on IOPS, bandwidth, reliability and low capacity needs.	Focuses on space capacity and reliability; cost is relatively low for high-density capacities.	Focuses on space capacities and cost; lower cost per terabyte.

Comparison of storage devices

Hard Drive	SAS Solid State Drive (SSD)	SAS Hard Drive	Nearline SAS Hard Drive	SATA Hard Drive
Features	Low power consumption, no noise, anti-vibration, low heat, fast speed	Lower latency, high reliability, best performance in traditional hard drives	Good reliability, large capacity	Large capacity, lower reliability and performance
Price	Highest	High	Moderate	Moderate
Capacity	Up to 2TB	Up to 1.8TB	Up to 8TB	Up to 10TB
Interface	SAS (Dual Port) / SATA (Single Port) 12 Gb/s, 6 Gb/s	SAS (Dual Port) 12 Gb/s, 6 Gb/s	SAS (Dual Port) 6 Gb/s	SATA (Single Port) 6 Gb/s
Performance	Very high	High	Moderate	Moderate-low
RPM	N/A	10,000-RPM 15,000-RPM	7200-RPM	5,900-RPM 7,200-RPM
External Continuous Transfer Performance	800 MB/sec	200 MB/sec	170 MB/sec	170 MB/sec
Average Response Time (Milliseconds)	Less than 0.1 ms	4 ms	R:9.5/W:8.5 ms	R:9.5/W:8.5 ms
Input/Output Operations Per Second (IOPS)	120,000/40,000 (IOPS)	> 200 (IOPS)	200~150 (IOPS)	< 100 (IOPS)
Unrecoverable bit read error	1 LBA per 10E16	1 LBA per 10E16	1 LBA per 10E15	1 LBA per 10E14
Mean Time Between Failures (MTBF, hours)	N/A	2 million	1.4 million	0.8 million
Reliability	N/A	Very high	High	Moderate

SAS full duplex high-performance interfaces

The chief advantage of SAS interfaces is dual full-duplex ports. SAS interfaces can carry out two simultaneous I/O operations, transmitting the data at the full speed of the link in both directions. Further, SAS features excellent scalability; each SAS port is theoretically capable of corresponding to as many as 16,384 hard drives.

TDS-16489U block diagram

Enterprise-class solid-state drives (SSD)

The key components of an SSD are the controller and the type of memory to store the data. SSD's do not suffer the limitations associated with mechanical hard drives such aeral density, heat dissipation, and rotational performance. SSDs achieve better IOPS by orders of magnitude over traditional hard drives, and decreases heat and power consumption and therefore lower operating costs. However, current SSD storage density is limited, resulting in an increased unit storage space making SSDs more suitable for very demanding IOPS applications rather than for general storage purposes.

Mainstream SSDs are divided into two types: SLC and MLC.

SLC SSDs: High access times (approximately 100K access times), high cost.

MLC SSDs: Low access times (approximately 10K access times), low cost.

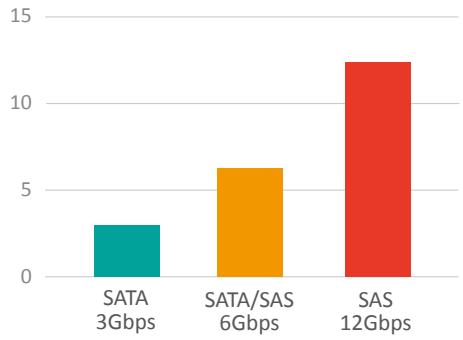
SLC SSDs are more suitable for write-intensive applications and MLC SSD is more suitable for read-intensive applications.

Enterprise 15,000 RPM SAS hard drives

Mission-critical enterprise-grade SAS hard drives are 10,000 RPM or 15,000 RPM and generally used for Tier1 storage. 15K RPM enterprise SAS hard drives use the higher RPM to provide superior performance when compared to consumer-grade hard drives and can feature higher security, higher mean time to failure, lower read errors, longer support warranties, amongst other vendor specific based benefits. 15K RPM enterprise SAS hard drives are well established and have a proven track-record of high reliability and high performance. However, high costs and lower storage space mean it is usually deployed for specific applications.

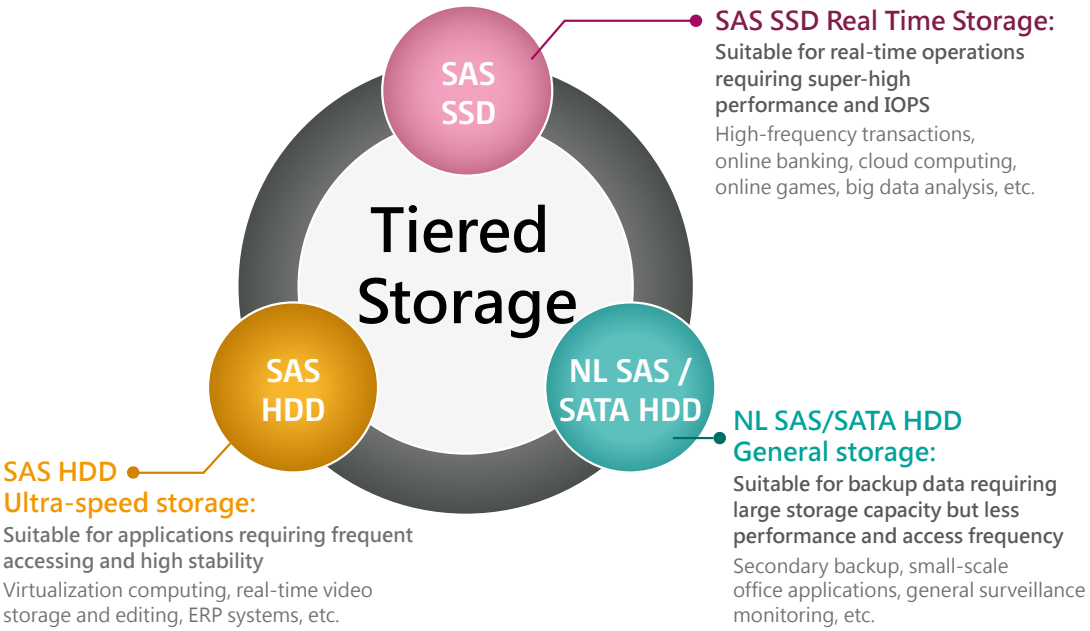
Large capacity SAS hard drives

For Cold Data storage (data with low usage frequency), large capacity and low-cost Near-Line SAS hard drives are the ideal choice for businesses. Near-Line SAS hard drives feature large capacity, high availability and high support, fulfilling businesses' growing data needs at a lower cost while only sacrificing very minor decreases in performance.



SATA hard drives

Generally SATA hard drives have slower performance and lower reliability, but, SATA is perfect for general applications and massive data storage due to its larger capacity and lower cost.

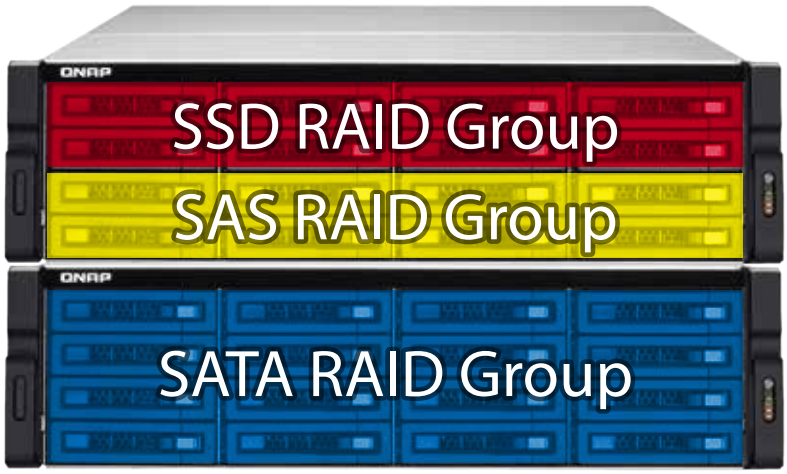


Qtier™ Technology

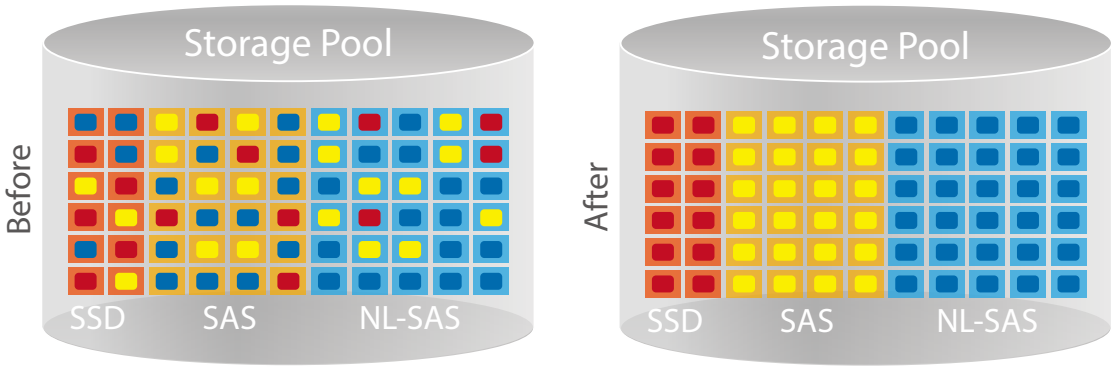
Exceptional performance in balancing hot & cold data in large storage environments

An intelligent auto-tiering solution that provides high flexibility in large storage environments by recognizing hot and cold data while also providing the lowest TCO per gigabyte cost, superior system performance and management efficiency.

QNAP's auto-tiering technology, Qtier™, is a multi-tier storage management system. Qtier™ automatically moves the most active data to high performance drives while less active data is migrated to high-capacity drives. This alleviates the burden on administrators by supporting tasks of performance pre-estimation, layout design, and relocation of data according to performance and budgets.

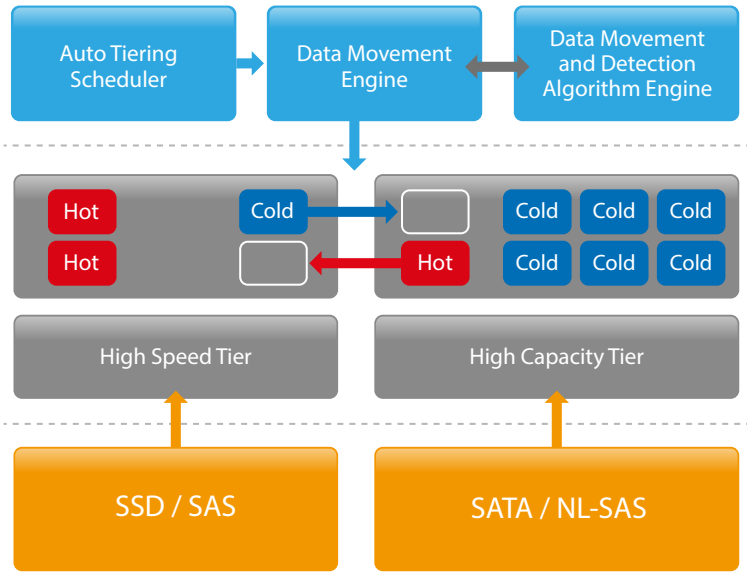


Please enable Auto-tiering when creating a Storage Pool.



QNAP Auto-tiering architecture

Data migration based on Transaction-based B-tree Update



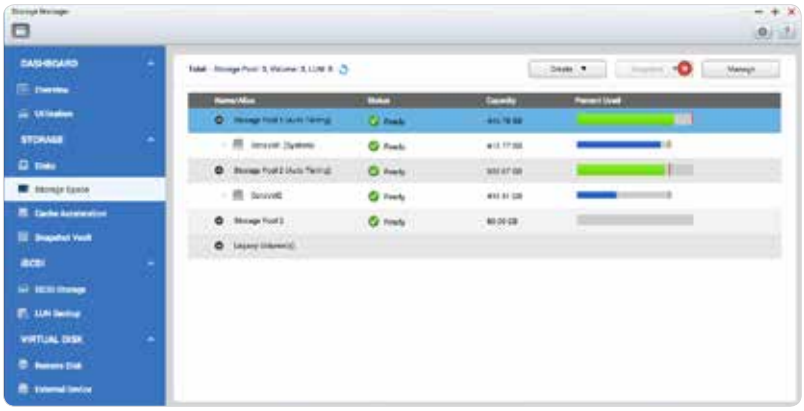
Based on the results of B-tree calculation, the NAS will automatically move data blocks with higher weights to higher tier (e.g. moving data blocks from HDD RAID Group to SSD RAID Group). Here data migration and metadata update will not interfere with normal IO; therefore, transaction-based B-tree update will avoid problems with data integrity.

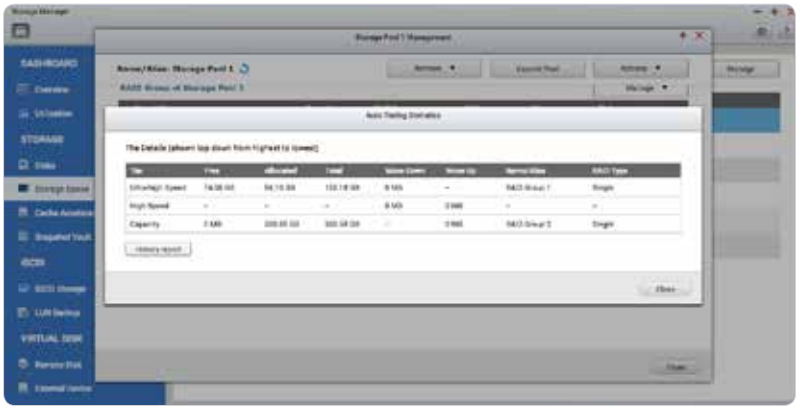
You can get the statistics of all data waiting to be processed as well as finishing processed in this phase. If the administrators need to do administrative tasks or there are bandwidth requirements for external connections, they can stop data migration in this phase. Furthermore, assigning weights can help adjust bandwidth allocation or alleviate congestion between external IO and internal data migration.

The goal of the auto-tiering function on the QNAP NAS is to optimize the use of the storage infrastructure by simultaneously improving storage utilization and performance:

- Move frequently used data onto fast disks for high-availability or high I/O cache throughput
- Move less frequently used data onto low-cost, high-capacity disks for better cost efficiency

To achieve the required level of performance and cost benefits, data is categorized based on access frequency. Service levels such as response times or runtime must be measured and evaluated in advance to decide which data must be stored at a given time in a certain tier.





3 levels of tiered storage

Qtier™ offers a 3-tier configuration, namely, ultrahigh speed (SSD), high speed (SAS) and high capacity (SATA/NL-SAS) for a combination of different disk drives:

- Tier 1 (Ultra-high Speed): SSD drives
- Tier 2 (High Speed): SAS drives
- Tier 3 (Capacity): SATA or NL-SAS

Detailed and visualized statistics for performance analysis

Historical data assists users in performance tuning and storage provisioning, enabling accurate adjustment of auto-tiering policies.

User-defined policies for better auto-tiering efficiency

Policy defined auto-tiering enables dynamic reallocation of data corresponding to the performance requirements of the data or applications in addition to scheduling and prioritization of data migration.

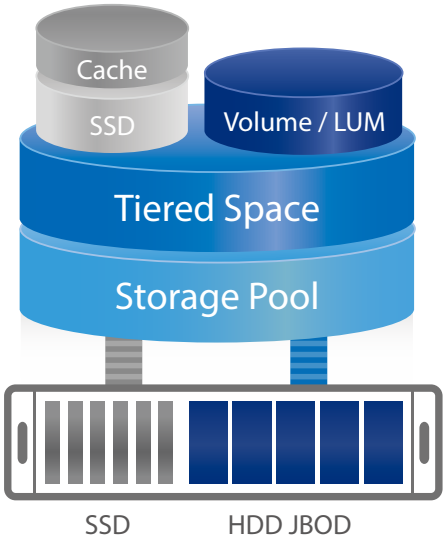
The following is a comprehensive comparison of storage technologies:

	Qtier™	Full SSD	SSD Cache
Costs	$	$$	$
Storage space	Big	Small	Big
Available SSD space	Extends as needed	Extends as needed	Limited by available memory
Data migration method	Scheduled	No	Automatic
Data migration mechanism	Moves data according to access frequency	All data is in SSD storage	Replicates frequently accessed data to SSD storage
Application scenarios	Typically used for predictable I/O workloads such as file/web/e-mail servers and application virtualization or video editing	Typically used for applications requiring fast/intensive I/O such as databases or virtualized environments	Typically used in a highly frequent data access environment such as virtualized applications or high-resolution video or audio processing

Qtier™ with SSD Cache for around-the-clock acceleration

Qtier™ fully supports concurrent tiering and SSD caching. In this mode, Qtier™ constantly monitors I/O activity and keeps active data that requires small, mostly random, read and write operations in SSD Read-only or Read-write cache and other data in the tiered storage automatically moving data between the appropriate tiers. QNAP unified and tiered storage is an intelligent, automated storage system for managing data placement to help optimize performance and cost requirements in multi-tier configurations.

Qtier™ Technology is a convenient, economical and insightful way to store and balance your active (hot) and archived (cold) data. The intelligent Auto-tiering feature allows you to have your frequently-accessed data on high-speed SSD in the NAS for quick access and high performance. At the same time, you still have access to your archived and seldom-used data on the NAS's SAS and SATA drives. This provides the versatility of extreme performance, a large storage capacity and a lower cost per gigabyte to store and balance your data.



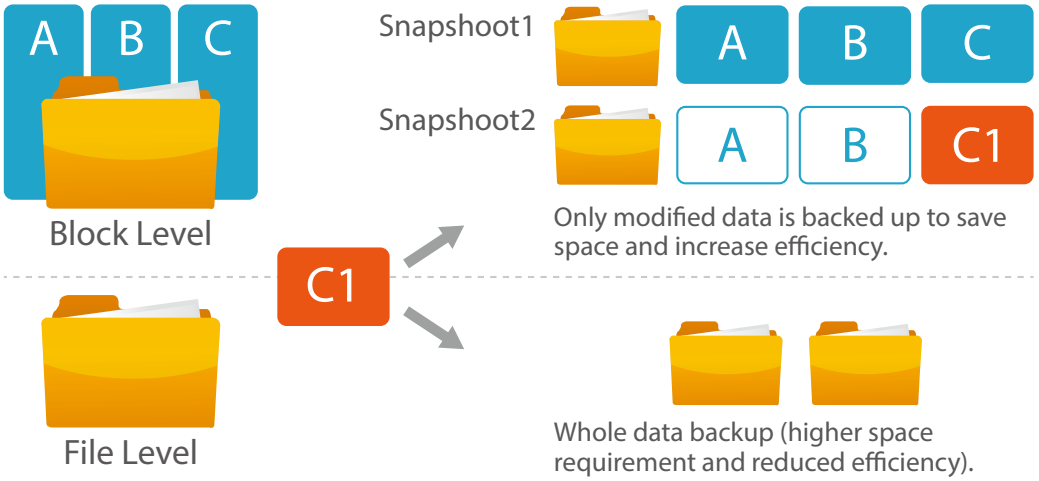
Snapshot

Block – Level Local Snapshot and Snapshot Replica —An Efficient and economical way to protect files

QNAP' s Whole Volume/LUN Snapshot Agent records the status of files using the Copy on Write mechanism. This helps in recovering files to a previously saved state in case of accidental deletion or modification and meeting enterprise requirements of improving Recovery Point Objective (RPO) and Recovery Time Objective (RTO).

Benefits of QNAP Snapshot Technology

The block-based QNAP Snapshot Technology supports up to 256 snapshots for each volume or LUN, up to 1024 snapshots. You can schedule snapshots hourly, daily, weekly, monthly, or yearly to meet enterprise requirements of improving Recovery Point Objective (RPO) and Recovery Time Objective (RTO). Further, the smart snapshot function can assist in saving space and reserve snapshots for future use. Additionally, Snapshot Agent ensures data integrity on locked or open files while taking snapshots.



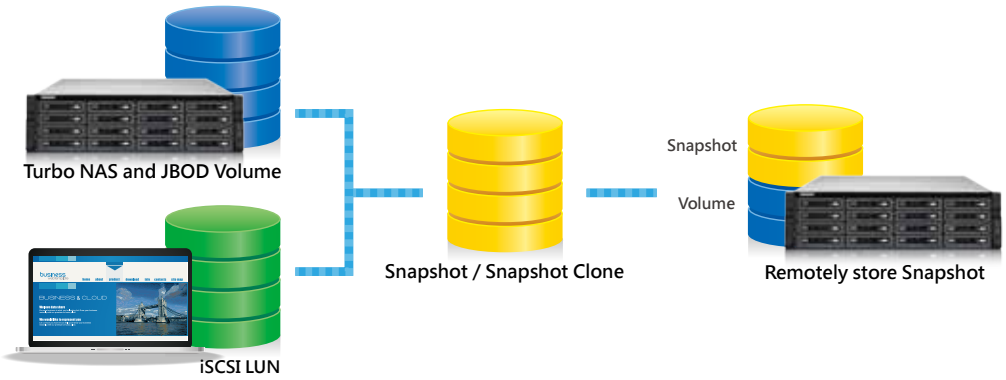
Only modified data is backed up to save space and increase efficiency. Whole data backup (higher space requirement and reduced efficiency).

	Snapshot Replica	RTRR	Rsync	NAS to NAS
Data Format	Volume / LUN	Shared Folder	Shared Folder	Shared Folder
Backup Format	Block-based	File-level file-based	File level block-based	File-Level block-based
Modified File Handling	Only back up modified file	Re back up whole file	Compare source and destination files and transmit only changed data blocks	
Time	Scheduled	Real time/ Scheduled	Scheduled	Scheduled
Encryption	Supported	Supported	Supported	Supported
Compression	Supported	Supported	Supported	Supported
Memory Requirement	4GB RAM Required	No Requirement	No Requirement	No Requirement
Remote System	QNAP NAS	QNAP NAS	Rsync Server	QNAP NAS
Using Scenario	• Lot of small data • Large file that need continues modification (VM image or backup image)	• Real time replication or synchronization • Fast transmit within local LAN	• Large file that need continues modification • Transmit in long distance	

Local Snapshot to provide continuous data protection

File-level recovery

The low-impact, small-sized, and user recoverable snapshots offer more benefits of storage administration compared to traditional file copies, which are often stored as a single large data file. For instance, you can choose to recover a file in a folder or the entire folder instantly with a few clicks.

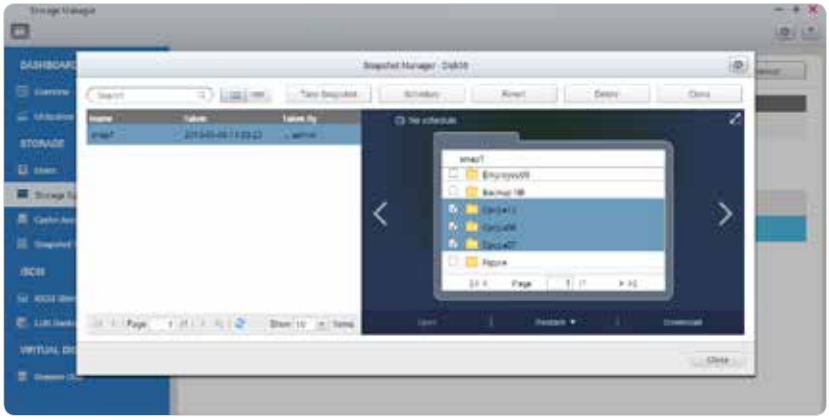


High Flexibility

Snapshots can be used with iSCSI LUNs and Volumes in QNAP NAS and Expansion Units to achieve full protection. On the other hand, Snapshot Replica allows you to transfer your snapshot to a remote QNAP NAS for backup.

Data visibility

The QNAP Snapshot provides tools in Storage Manager to help you find specific files to recover. You can easily view files and folders in a snapshot and browse through different snapshots displayed in chronological order. In addition, file recovery just takes a few clicks, increasing operational efficiency.



The files in a snapshot clone can be freely edited by users

Clone a snapshot as a volume or LUN for quick file access, eliminating long restore times and reserving sizeable space for storing backups. The files in a snapshot clone can be freely edited by users.

Rsync/RTRR integration

The Rsync/RTRR functions in Backup Station automatically detect whether the system supports Snapshots. The RTRR/Rsync functions take snapshots of the volume before starting replication and then back up snapshots to a remote server. This greatly enhances data integrity.

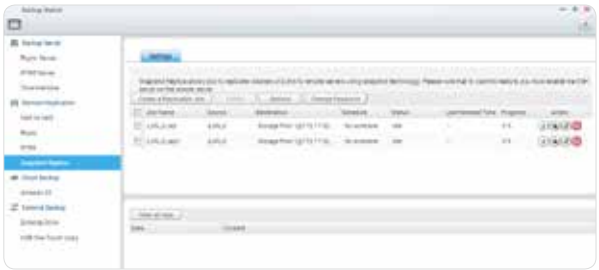
VMware/Microsoft VSS integration

QNAP Snapshot also supports virtual machine snapshots on VMware or deployment with Microsoft Volume Shadow Copy Service (VSS). Before taking snapshots, the Snapshot Agent notifies VMware or Microsoft VSS to stop accessing iSCSI LUNs to ensure data integrity and to reduce system overhead.

Remote Snapshot Replica prevents data loss

Snapshot Replica

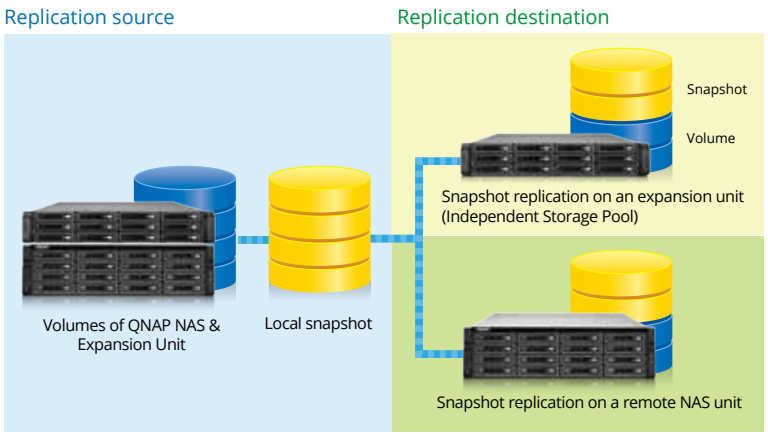
The Remote Snapshot Replica enables you to replicate volume/LUNs between different remote servers using snapshot technology, which helps to reduce storage consumption and bandwidth. Either take the snapshot immediately or set up a snapshot schedule. It is considered one of the most comprehensive strategies for data backup.



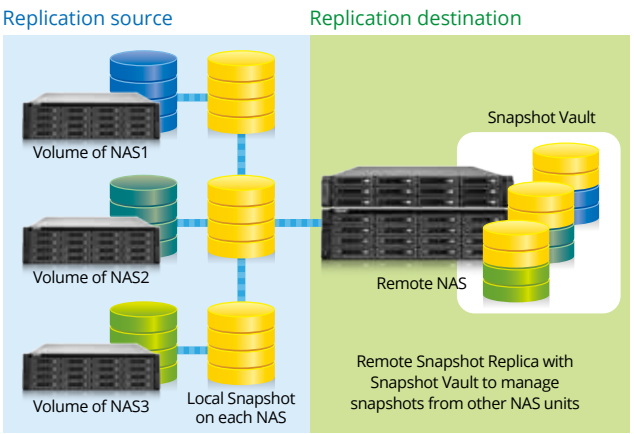
Snapshot Vault

Snapshot Vault is an essential component of a comprehensive data backup strategy for organizations with a global footprint aiming to achieve a boundary-less datacenter. Snapshot Vault is your backup center for storing and managing every snapshot created remotely from another QNAP NAS. Snapshot Vault fully supports cloning a snapshot.

NAS- to-NAS Snapshot Replica



One-to-Many & Many-to-One Snapshot Replication



Managing snapshots remotely from another NAS

Use the Clone function to clone (or mount) a snapshot from the Snapshot Vault as a volume or iSCSI LUN on a QNAP NAS. Directly access these files through File Station or Backup Station. Use an iSCSI initiator to connect to a cloned iSCSI LUN from another computer.

Replication Settings

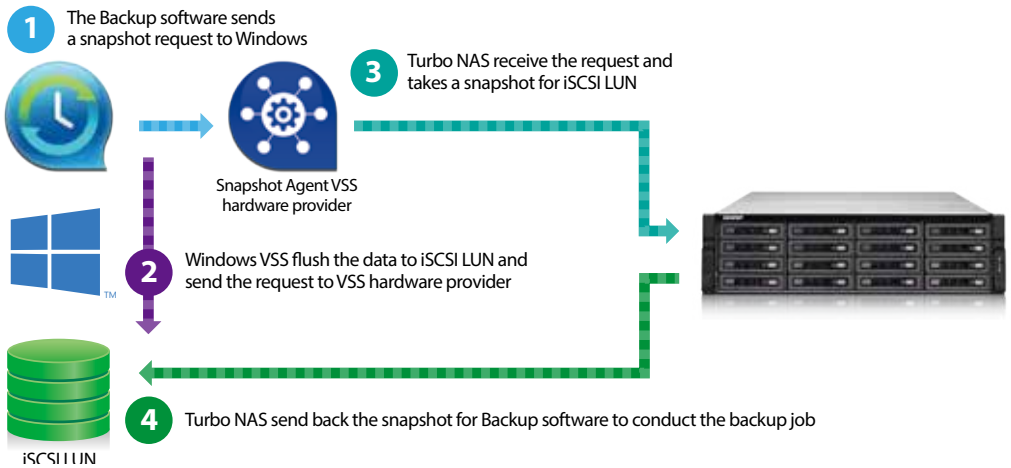
To minimize the risk of data breach, the Snapshot Replica provides the option of file encryption. It also provides file compression and transfer rate adjustment to lower bandwidth consumption.

Application Consistent Snapshots with Snapshot Agent

Snapshot Agent, used for iSCSI LUN, allows connecting the Turbo NAS with the remote servers (VMware vCenter or Windows Server) to ensure consistent snapshots. On those remote servers, the running applications (VMware virtual machines, Hyper-V virtual machines, SQL server, Windows file server...) will write/flush the data from the memory to the iSCSI LUN prior the snapshot is taken. The application will then be consistent and include all necessary data. In case of snapshot restoration, no data will be missing.

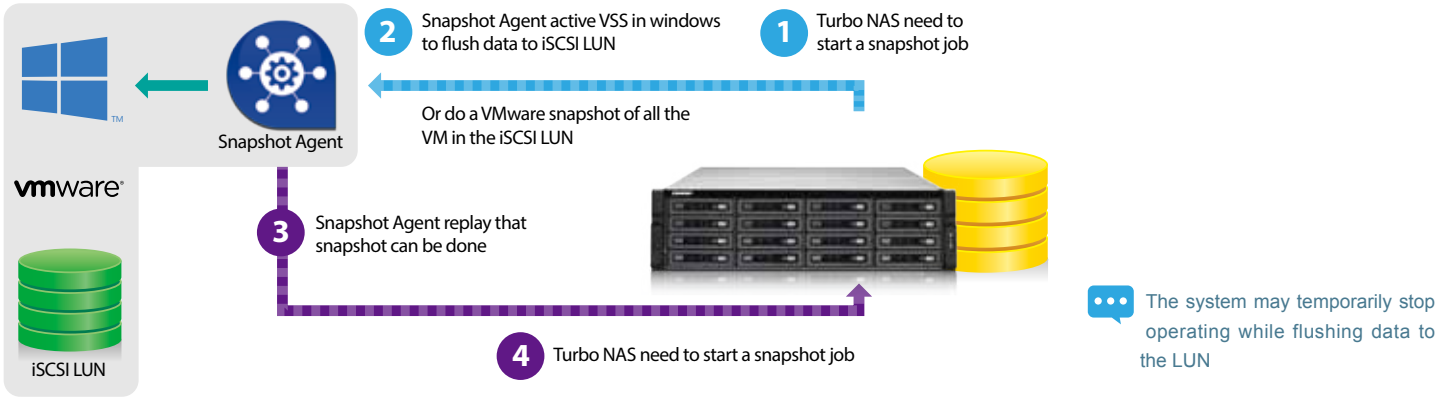
Snapshot Agent also includes VSS Hardware Provider for Windows to allow taking snapshot on the NAS from the backup software use on Windows server. The Snapshot process can be offloaded to the NAS and reduce the loading on the server.

VSS Hardware Provider Work Flow



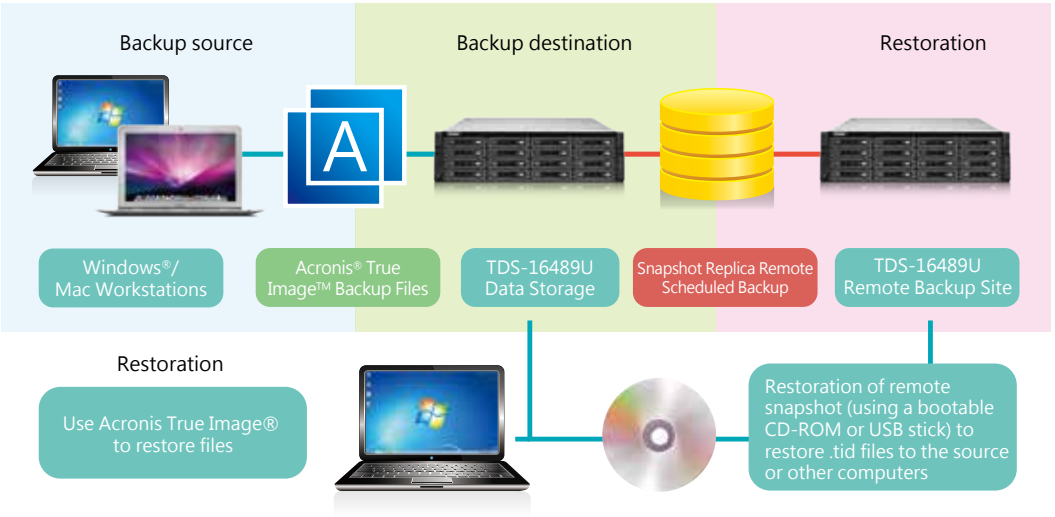
The system may temporarily stop operating while flushing data to the LUN

Snapshot Agent Work Flow



QNAP & Acronis® True Image™ Backup Solution

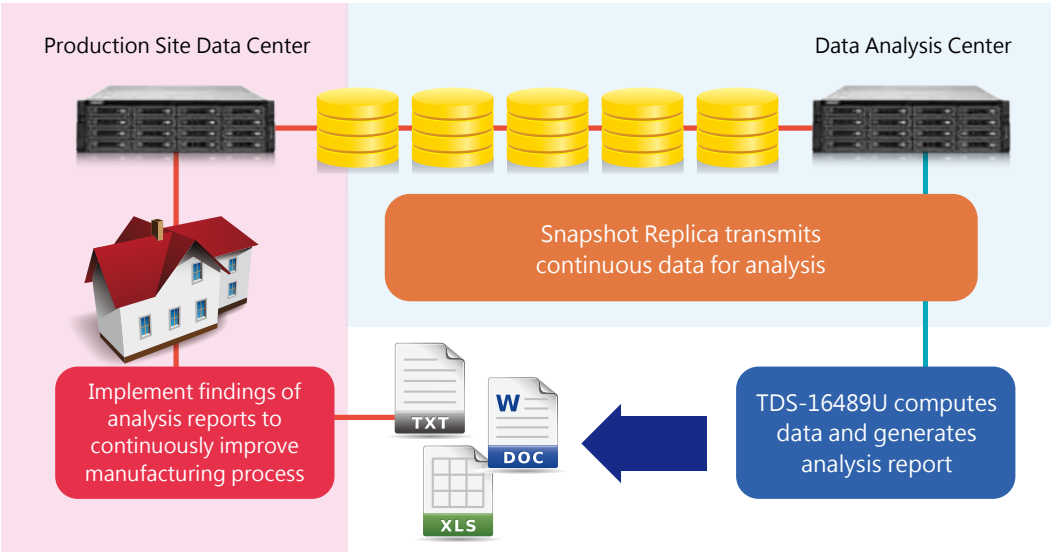
QTS is compatible with various renowned backup software including Acronis® True ImageTM, Symantec® Backup Exec, and many others. Backup entire disk drives, documents, pictures, music, videos, fonts, emails, and more – to one or multiple NAS units. With a very simple setup process, you can set up real-time backups and fully automated scheduled backups. Mac users can also use Time Machine® to back up files from Mac workstations.



The Acronis True Image® Logo and related material are belong Acronis International GmbH, for more information please check http://www.acronis.com/en-us/personal/computer-backup/

QNAP & Snapshot Replica - Industry 4.0 Usage Scenario

Manufacturing and production sites increasingly look to the concept of "Industry 4.0" where smart manufacturing processes are highly automated and more intelligent. These sites use real-time data analysis to assist in the process of continuous improvement to maximize their achievable performance benefits. Deploy a TDS-16489U with Snapshot Replica to use as a Warm Data Base for analysis allowing near real-time data analysis while reducing the load on the production site data center.



File Station 4.2

Manage all files from a single management window

With the new remote connection function, the File Station now enables management of files on local, remote, and cloud storage across geographical boundaries and platforms from a single window anywhere.

In the past, you needed to log into different devices individually for data migration or copying.

Now, File Station 4.2 supports remote connection.

- **Supports connection to several cloud services:**

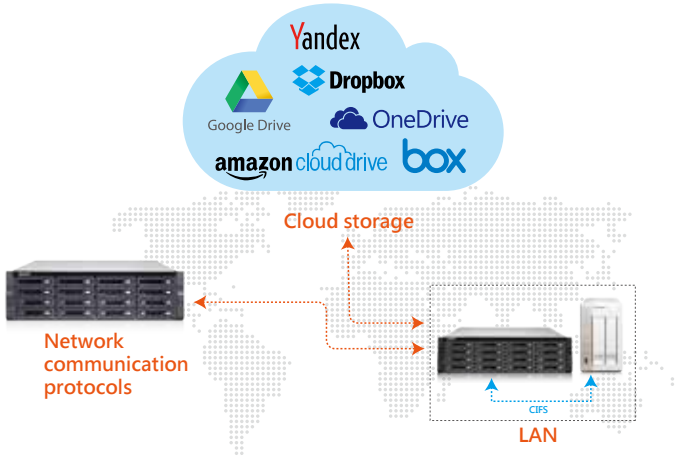
  Google Drive, Dropbox, Microsoft OneDrive, Box, Amazon Cloud Drive, and Yandex Disk.

- **Three remote device network protocols:**

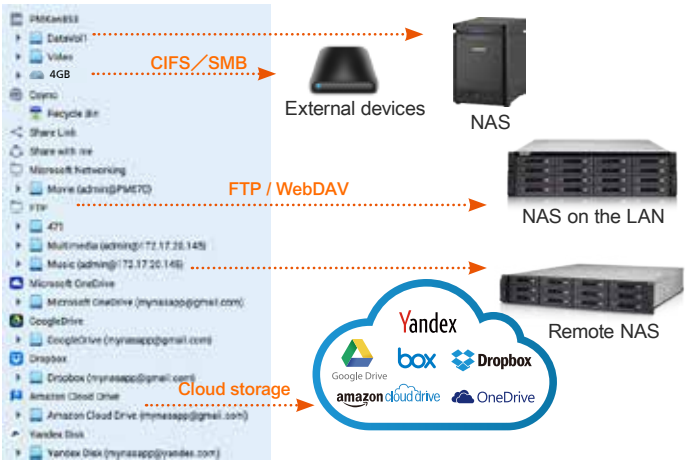
  1. CIFS: Supports online streaming and thumbnail display when Microsoft Networking (SMB/ CIFs) is selected. Allows a single folder to be mounted on your local network
  2. FTP: Allows every folder to be mounted when using the FTP service for easy access to remote data.
  3. WebDAV: Allows a single folder to be mounted on local network or over the Internet. WebDAV uses the HTTP protocol over the standard HTTP port, making accessing files via WebDAV similar to downloading files from a webpage.

- **Also supports searching for devices on the same network via FTP or CIFS.**

Note 1: Please install Connect to Cloud Drive from the App Center before connecting to cloud services.



Manage all files from a single management program



File Station interface

Three browsing modes are available:

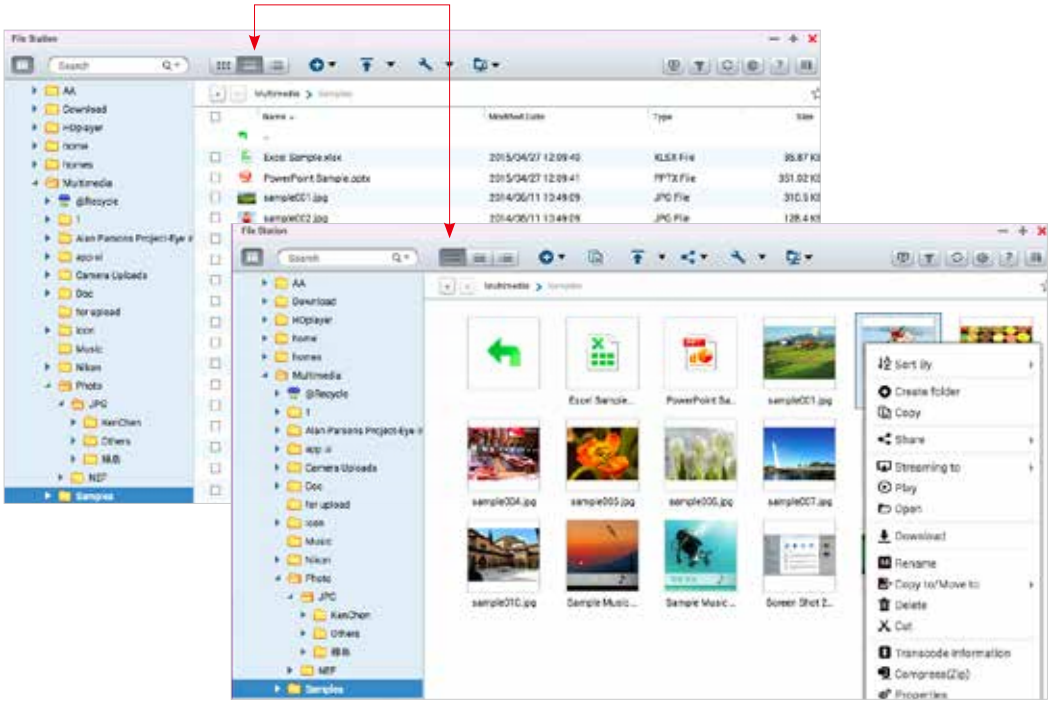
Icon, list, and detailed list.

Folders in tree structure:

Presents the locations of data in an easy-to-read format.

Remote connection:

View remote connections here



Features many functions for easier file management.

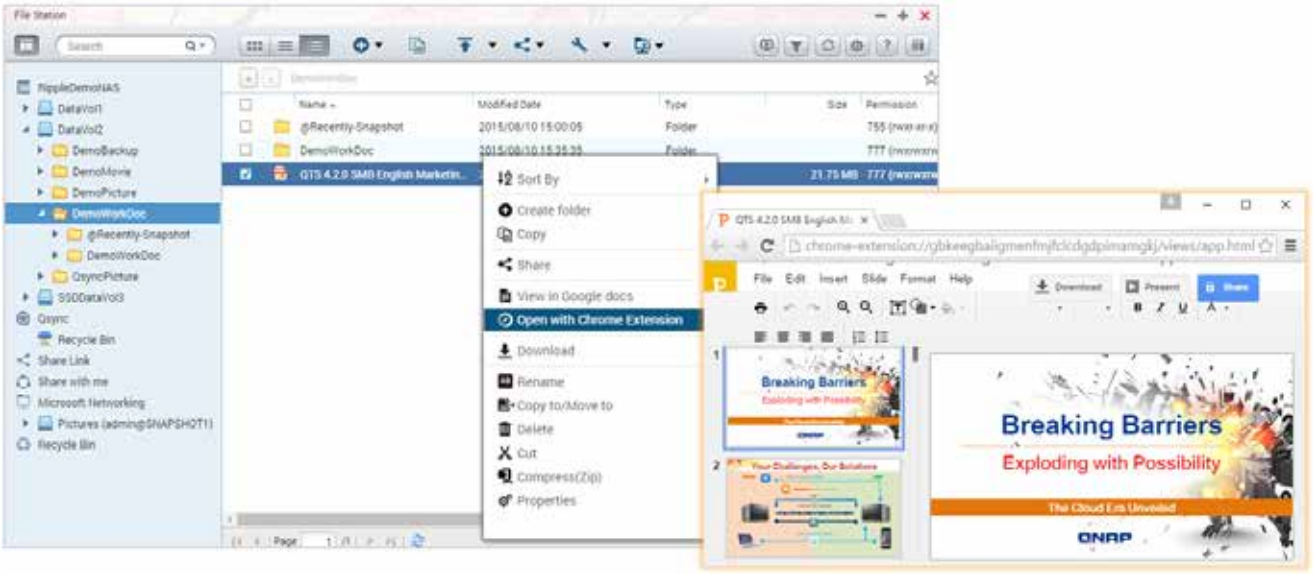
Preview for Microsoft Office files:

- Preview Microsoft Office files offline with a Chrome browser extension in the File Station.

  Support for file types: .doc, .docx, .xls, .xlsx, .ppt, and .pptx.

  Chrome™ browser only and with the "Office Editing for Docs, Sheets & Slides" Chrome extension installed from Chrome Web Store

- Also supports the online preview of Microsoft Office files with Office Online and Google Docs in the File Station.



Multimedia streaming

Video:

- On-the-fly transcoding enables you to watch a video while it is being converted in real time. (Please note that on-the-fly transcoding is only available on certain models.)
- Background transcoding enables you to convert video into different resolutions and formats suitable for multiple devices and multiple networks.
- In addition, playback with VLC player for online video streaming is now supported.

* Please note that on-the-fly transcoding is only available on certain models.

Photo:

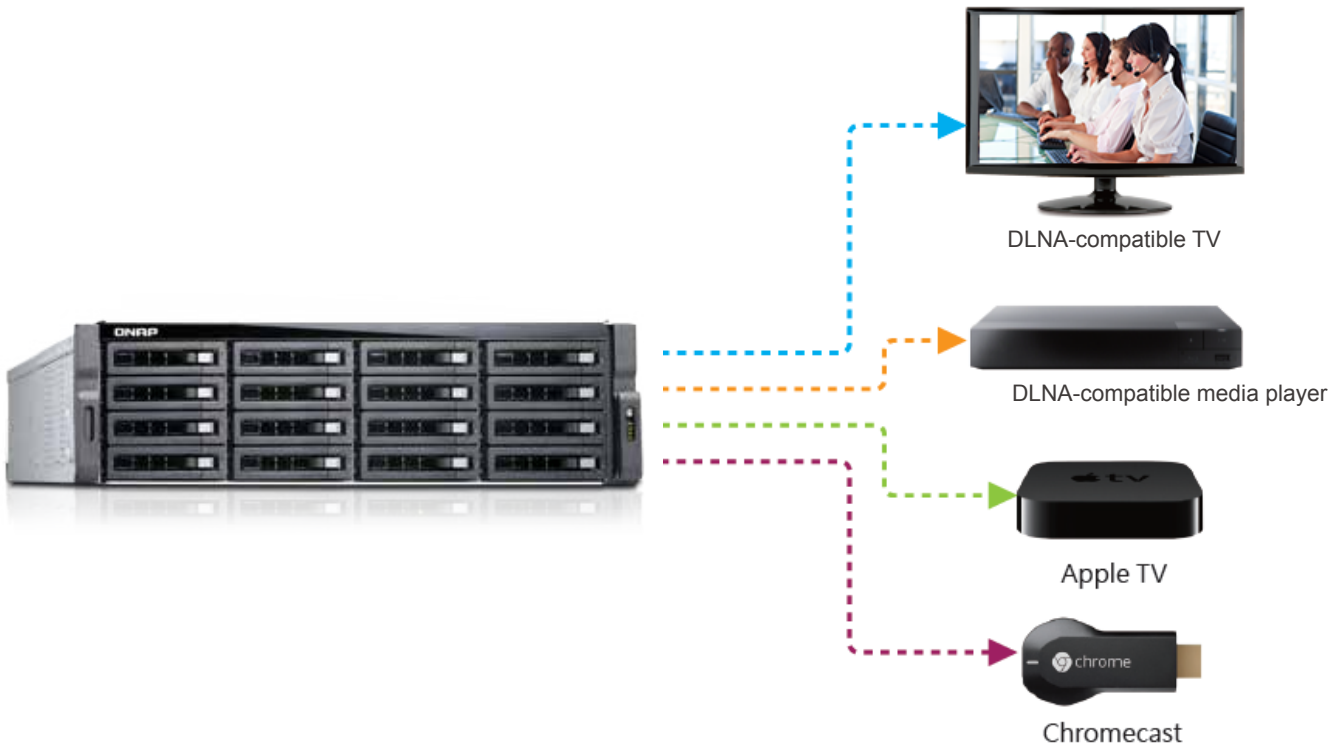
- All new interface with added support for viewing a wider range of picture formats.
- Playback photos as a slideshow, or set a photo as the QTS wallpaper directly from the picture viewer.
- Additionally, photo rotation is now supported.

Music:

- Added support for direct playback of even more music formats.

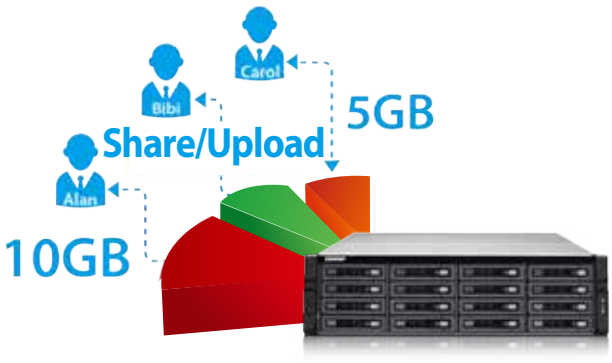
Smart zonal streaming

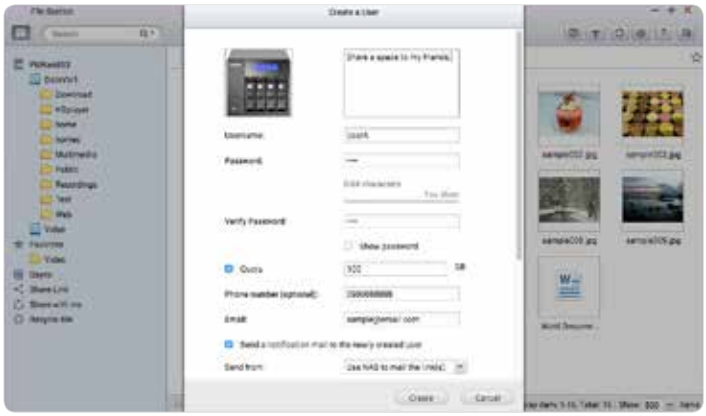
Stream multimedia files to different devices via Apple TV, DLNA, or Chromecast from the File Station.



Upgraded sharing functions

· Share space with a user: System administrators can allocate space to NAS users, and specify a storage quota in File Station.





Send users a notification of the access link via email when sharing space with a user to streamline the process.

· Directly share with other NAS users: Share files directly to selected NAS users rather than setting shared folder permissions.

· CloudLink enables file sharing from anywhere especially when your network environment does not support port forwarding. Just log in to myQNAPcloud from your NAS, create a share link with CloudLink, and then share the link with others.

· Share download links via email:

- Users can share links from their own email account.
- Supports multiple email accounts.

· **Share with social networks:** You can paste the Share Links on social networks of your choice.

· **Create share links only:** Create a share link for files or folders and copy & paste it into forums, websites, and instant messengers for others to access it.

· **Mutual file sharing:** You can easily share several files in a shared folder with friends via a Share Link. By enabling the “Allow file upload to this folder” option, your friends will be able to upload files to your File Station without a user account. Set an expiration time for shared files.

File or folder operations and management

With File Station, you can easily carry out common tasks like uploading, downloading, and managing files.

· Streamlined file operations such as rename, copy, move and delete.

· Compress/Extract multiple files: Choose multiple files in File Station and select “More Actions” > “Compress (Zip)” to compress the files to a Zip file. Alternatively, you can extract content from a Zip file.

· Instant photo preview: File Station displays thumbnails of photos, album covers, and videos to aid in categorizing and organizing multimedia files.

· File/Folder Property inspection: You can quickly inspect a file or folder's detailed properties from its Properties window.

· Auto transcoding: Set a folder as an auto-transcoding folder with its Properties window on the right pane. The Turbo NAS will automatically convert the videos in this folder to the resolution you have set.

· Media Folders: Similarly, you can designate a folder as a media folder and specify the type of files (photos, videos, music, etc.) that the media scanner should index from the Properties window.

· File upload: Move files from a local PC/Mac to File Station by drag-and-drop to upload the files to the Turbo NAS easily.

Hybrid Backup Solutions

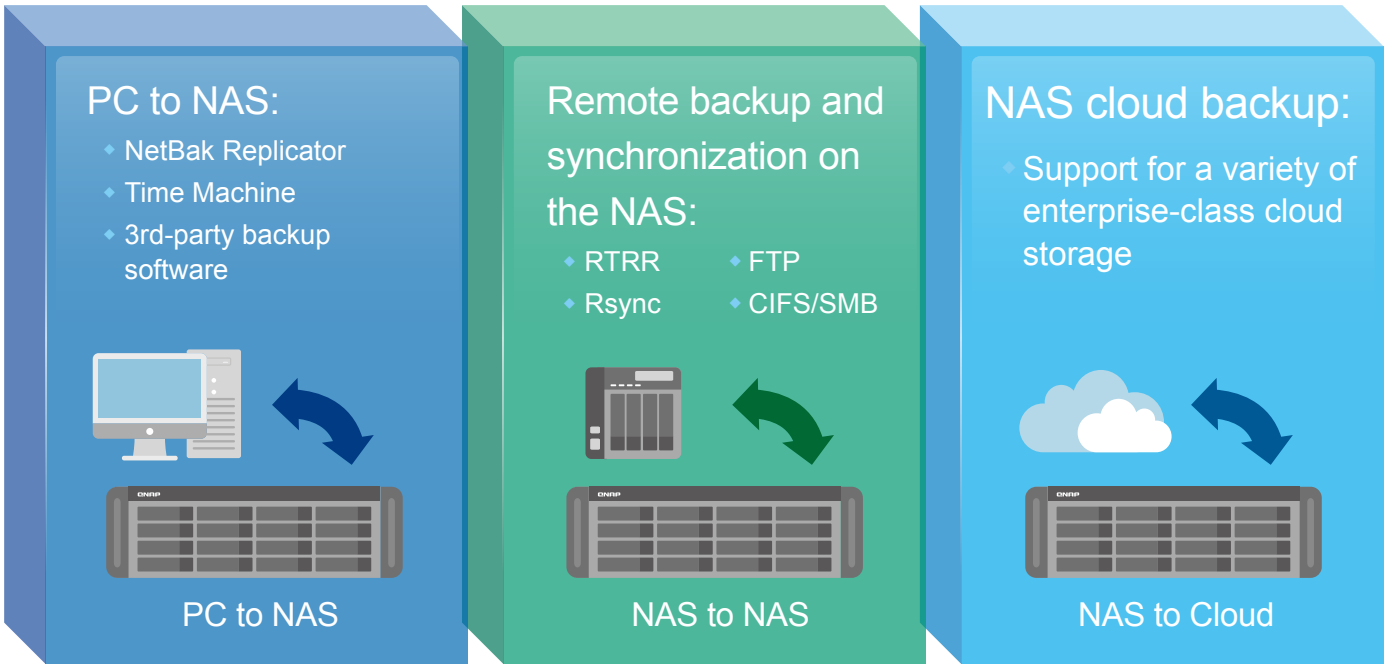
Hybrid cloud for a consolidated backup solution

The QTS allows data on PCs, servers, virtual machines, and external drives to be backed up to the Turbo NAS; and provides disaster recovery solutions to back up data on the Turbo NAS to external devices or remote servers.

Backup from computer to NAS

Windows users can install the free QNAP NetBak Replicator utility to back up files from Windows PC - entire disk drives, documents, pictures, music, videos, fonts, emails, and more – to one or multiple QNAP units. With simple clicks, you can set up real-time backup, scheduled backup and autobackup.

Mac users can use Time Machine to back up files in Mac.



3rd party backup software

QTS is compatible with various renowned backup software such as Acronis® True Image and Symantec® Backup Exec. Users that have adopted such backup software can immediately back up data from other sources to the QNAP NAS.

Virtualization backup server

The Turbo NAS is compatible with VMware® ESX server, Citrix® XenServer, and Microsoft® Hyper-V, enabling your QNAP NAS to be seamlessly integrated to a virtualized environment as extended storage for data backup.

* Please refer to the chapter: "Virtualization Applications".

QJBOD Express

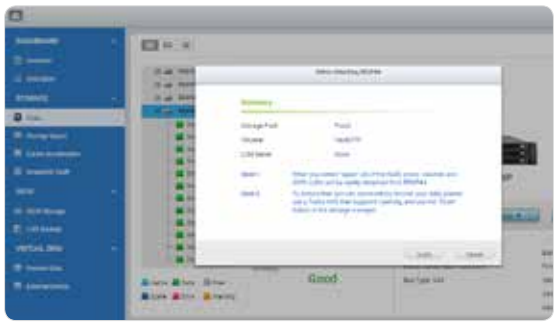
The new QJBOD Express enables quick back up or migration of large amounts of data to local or to remote sites without using any network bandwidth.

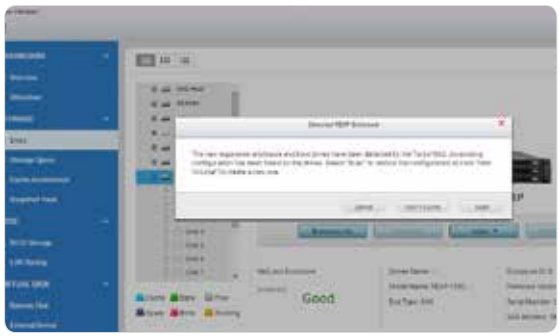
San Francisco to Los Angeles: Initial transfer costs for 50TB data		
Method	Time cost	Bandwidth cost
100Mbps network	About 45 days	50TB
QJBOD Express	In two days	0

Back up 50TB data to remote site

1 Back up data to the JBOD

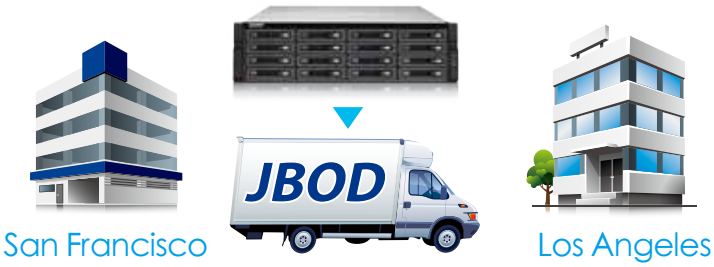
Connect the JBOD and create an encrypted volume for backup. “Safely Detach” the JBOD after the backup job is completed.





2 Transportation

Transport the JBOD to a remote site.



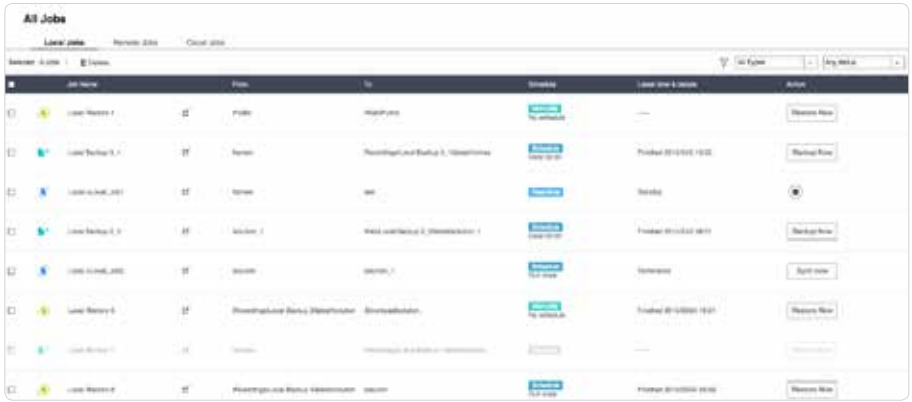
3 Finish backup job

Connect and scan the JBOD. Create the final incremental backup job.

The remote NAS must support JBOD expansion to use this feature.

A comprehensive backup strategy from anywhere, anytime, on any device

The explosive growth of data brings challenges of data protection and management. Unless an organization has the necessary knowledge and a disaster recovery strategy to protect and recover data, data integrity and data security will continue to present a problem. Hybrid Backup Sync assists you in managing and planning backup strategies (including local, remote-site, and cloud backups) with its centralized management capability even in the most complex data environments.



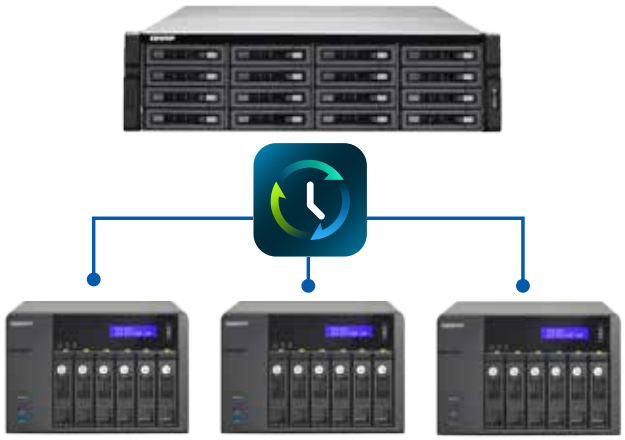
Hybrid Backup Sync beta is available for download from App Center by December, 2015.

Local Backup

Use the One Touch Copy button on the front panel of the NAS to quickly backup data to or from external USB devices or disks.

Remote-site backup

Using the Real-Time Remote Replication (RTRR) service on your QNAP NAS to back up data to your NAS is a simple and easy process. Your computer or your NAS can be the source, destination, or relay server during the backup process. It also gives you the option of (CIFS/SMB) or FTP service when setting up RTRR remote replication.



RTRR with version control

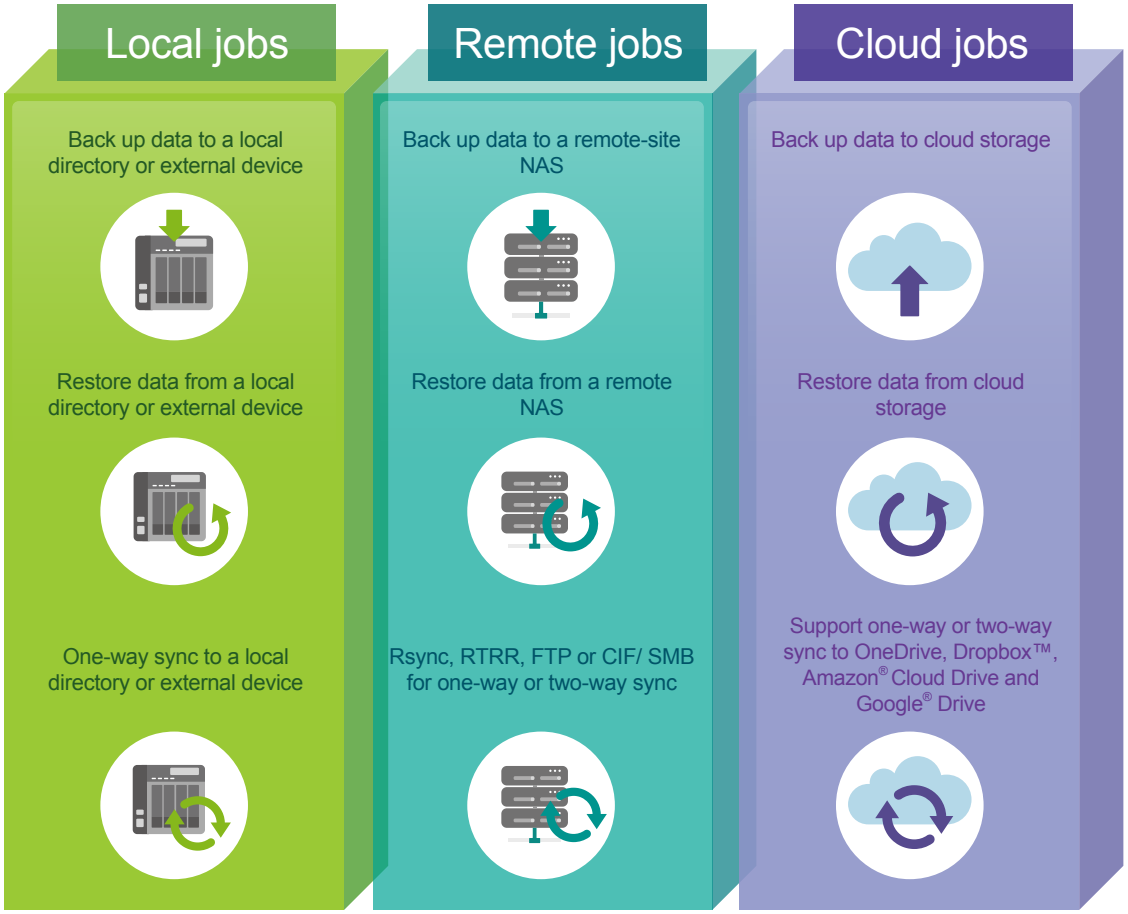
RTRR enables saving backup files to time based versions. In case of an incident, files can be restored to earlier backed-up versions specified by time and date. Smart versioning enables you to create backup versions hourly, daily, weekly, or monthly. Alternatively, simple versioning keeps a fixed number of versions for a given period and automatically rotates stored versions.

Remote backup monitoring

System administrators can now monitor backup jobs from remote servers with QTS 4.2 Backup Station. The Incoming List displays the status of backup jobs from other NAS servers that use the current NAS as a target destination for their backup.

Two-way shared folder synchronization

Use the RTRR service to set up real-time or scheduled synchronization of shared folders between two NAS units. With two-way synchronization, file backup consistency is improved and is especially helpful in synchronization and collaboration across departments and branch offices.



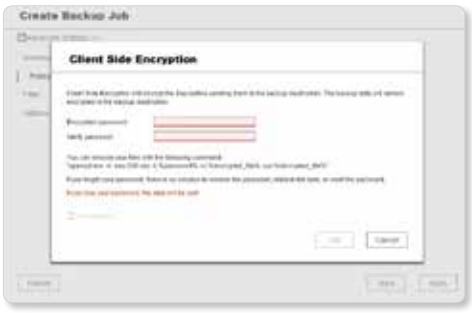
Cloud sync solutions

The Hybrid Backup Sync supports four leading cloud storage services and synchronization with designated folders. It supports Amazon® Cloud Drive, Google™ Drive, Dropbox™, and Microsoft® OneDrive® for continuous synchronization between your NAS and cloud storage.

Cloud backup made simple

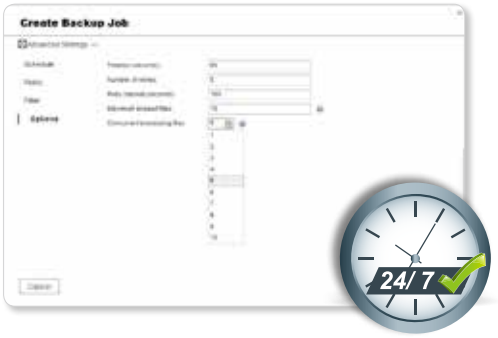
1 Compress

The CloudBackup Station supports compressed backup files, scheduled file deletion according to users' specifications and sparse file detection to avoid backing up unnecessary files. You can screen files by type, size, and date to ensure only the required files are saved on the cloud for greater storage and cost efficiencies.



2 Select folder and encrypt

The CloudBackup Station features an SSL-secured connection and military-grade AES 256-bit data encryption to protect your data in transmission and at rest on the cloud.



3 Multi-thread transmission

HCloudBackup Station supports multi-task processing and multithreaded data transfer*. The latter improves file transmission speed and enhances work efficiency by segmenting large files into smaller ones before uploading. You can preview files in the cloud and download individual files instead of the entire folder.

WebDAV app does not support multi-threaded data transfer.

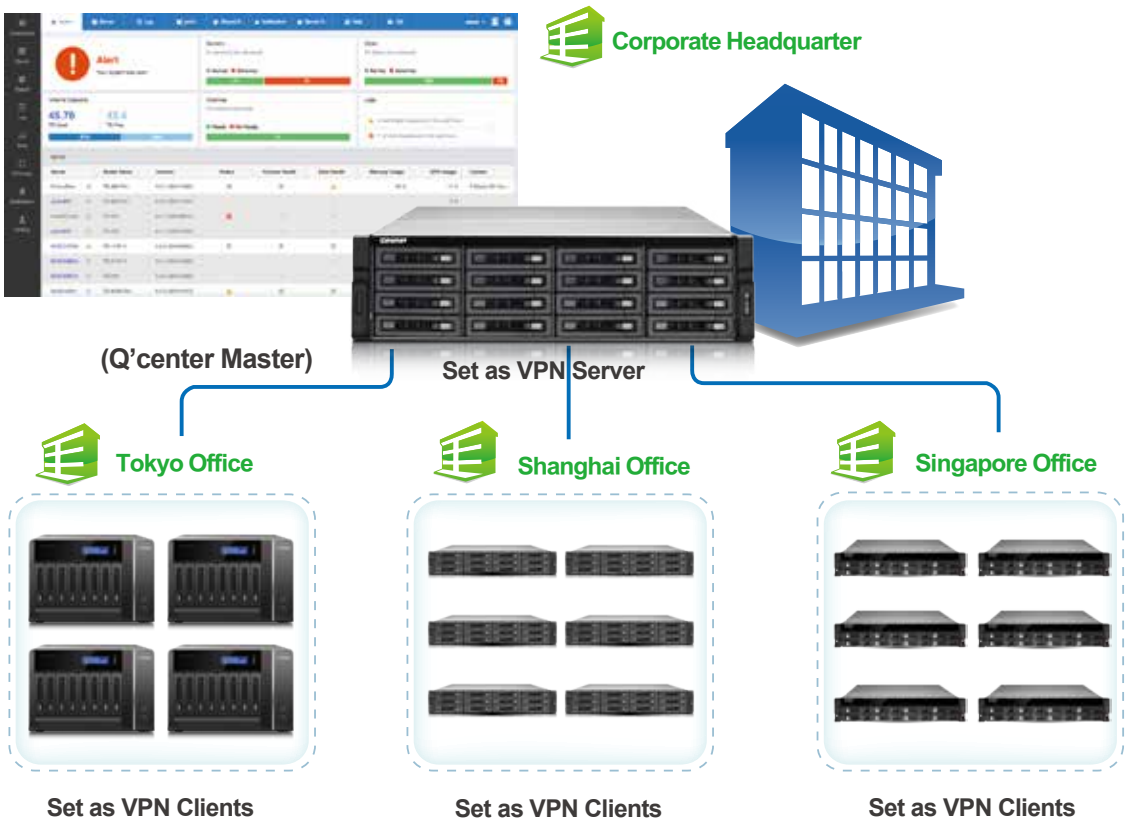
Cloud Backup

Protecting against potentially disastrous data loss is of paramount importance for all businesses regardless of size. A QNAP Turbo NAS is a comprehensive backup and recovery solution to back up not only files for all devices on the LAN, but also for remote-site NAS units and servers. Furthermore, QNAP Turbo NAS fully supports backup from the Turbo NAS to online cloud storage services (e.g. Amazon® S3, Amazon® Glacier, ElephantDrive®, Microsoft® Azure, Google® Cloud Storage). The QTS powerful and comprehensive backup Station makes backup and recovery simpler for all business's disaster recovery plan.

Q'center CMS (Central Management System)

Visual management platform for multi-NAS management

Previously, IT administrators needed to log in to QNAP NAS units individually to check their status. The QNAP Q'center CMS (Central Management System) offers a platform to centrally manage multiple NAS units. The simple setup, cost effective, convenient and flexible approach that Q'center delivers greatly improves management efficiency for IT administrators.

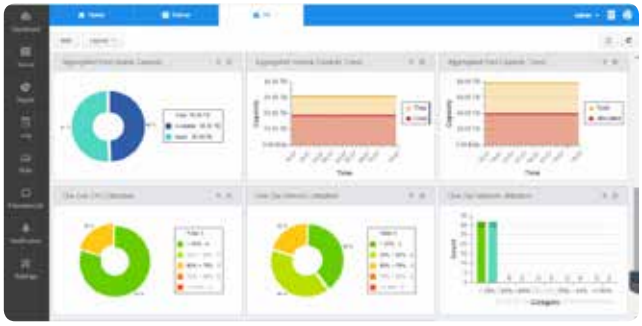


The Best Utility for IT Administrators

Q'center is a powerful QNAP NAS management tool. You can view the status and system information of multiple NAS units at the same time from the Q'center Server. You only need to install Q'center on the master NAS and set all other QNAP NAS units as managed stations, and all their relevant system information can be easily checked on the Q'center Server. Q'center can greatly assist IT administrators and QNAP NAS users in system resource allocation and future capacity planning.

Central Management Platform

The "Dashboard" screen provides you with tools to conveniently inspect and monitor system status for all connected NAS units and allows you to efficiently review system logs of selected NAS units. You can customize dashboards to get a quick overview of specific system information or statuses and alerts.



Visualized Statistics

The visualized statistics and messages allow you to rapidly gain a clear picture on the system statuses of all QNAP NAS units, including disk usage, shared folder space usage, HDD IOPS, HDD delays and CPU usages and use them as the basis of your system utilization trend analysis.

Centralized platform

You can use Q'center as a centralized platform to enable network services and other settings on a group of NAS units at once or a specific NAS unit. Q'center can also act as a firmware storage center and be used to store historical firmware versions or schedule firmware updates for all NAS units or a specific NAS unit to improve efficiency for IT operations.

Designed for all IT environments

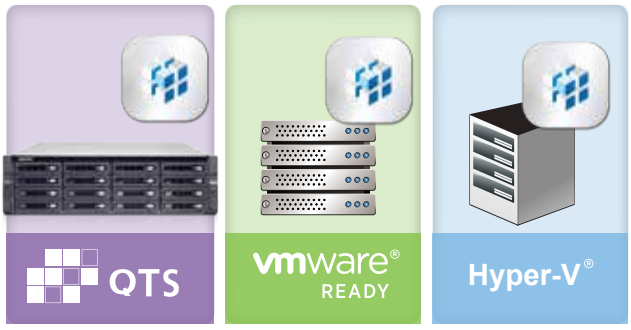
You can use Q'center as a centralized platform to enable network services and other settings on a group of NAS units at once or a specific NAS unit. Q'center can also act as a firmware storage center and be used to store historical firmware versions or schedule firmware updates for all NAS units or a specific NAS unit to improve efficiency for IT operations.

Manage QNAP NAS behind firewalls

The exclusive firewall penetration technology from QNAP enables Q'center to connect different QNAP NAS units in different geographic locations and subnets. Using Q'center Agent, you can quickly establish connections between NAS clients and the Q'center server, saving you the trouble of complicated router and VPN settings.

Q'center for VM

QNAP also offers the Q'center version to run on VMware and Windows Hyper-V. You can install it in VM without a QNAP NAS, adding flexibility to your setup choices.



Productivity tools

Maximizing the values of your QNAP NAS

QNAP NAS is a versatile device that provides a wide range of features and allows you to share, back up and store multimedia files; manage them using a browser; and stream/play them on HDMI, DLNA, AirPlay and Chromecast devices. You can also download multimedia files to enrich your personal collections.

Centralized management

myQNAPcloud 2.0: myQNAPcloud Offers an easy-to-use management interface, enabling you to check online information of multiple QNAP NAS. Operating through the browser, you can download, move, copy and share files via QNAP NAS.

Qsync Central Station 2.0: Qsync provides you with the unlimited ability to synchronize and share files across multiple devices, free of charge.

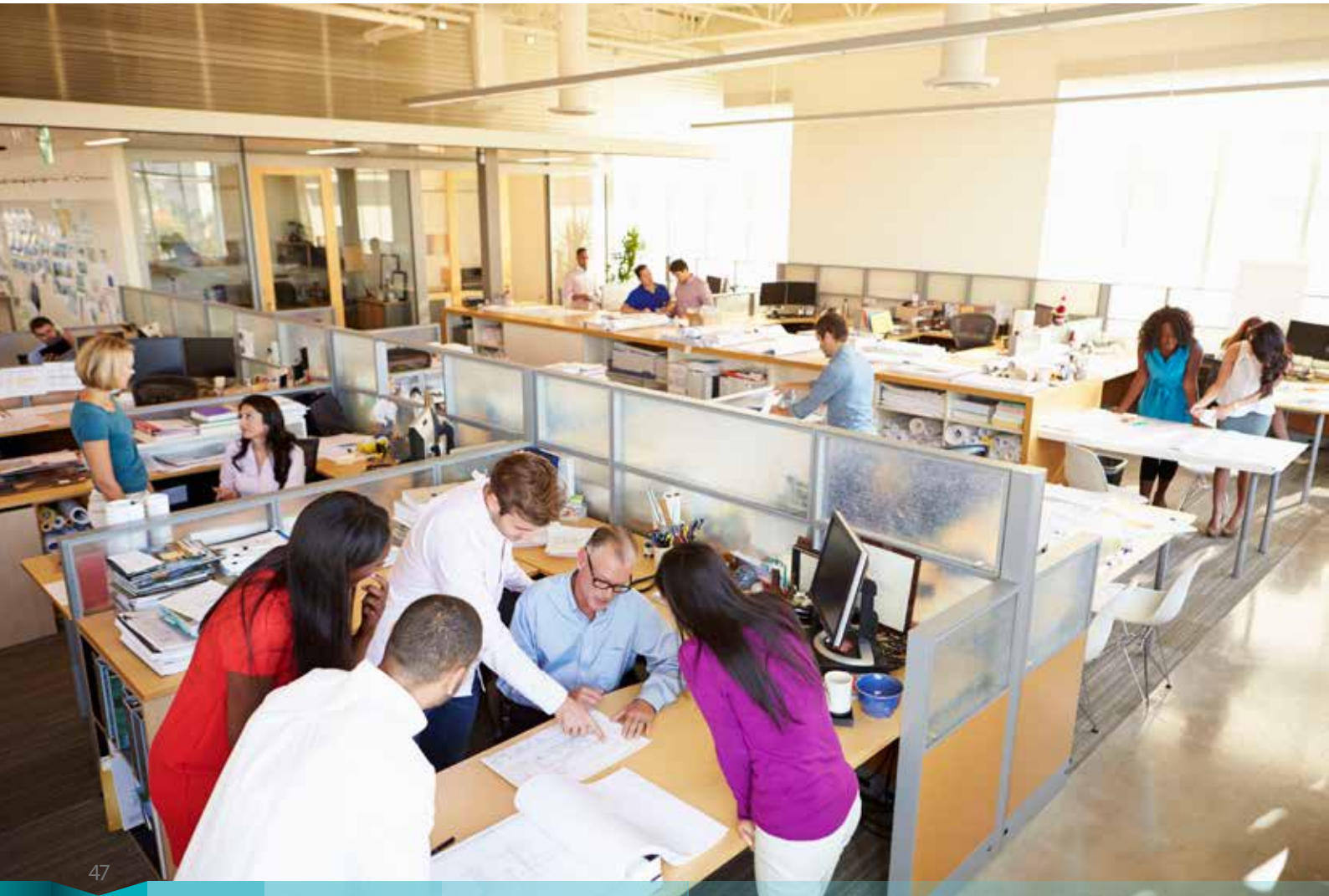
Q'center 1.1: Using the summary charts and other visual reporting tools on the Q'center server, you can easily manage the disk capacity, system health status and more settings on multiple QNAP NAS.

Rapid and simple content production

Notes Station 2.0: Quickly compile meeting minutes and marketing reports to share with other users.

Signage Station 1.5: Easily create and deploy attractive and engaging multimedia signs and ads.

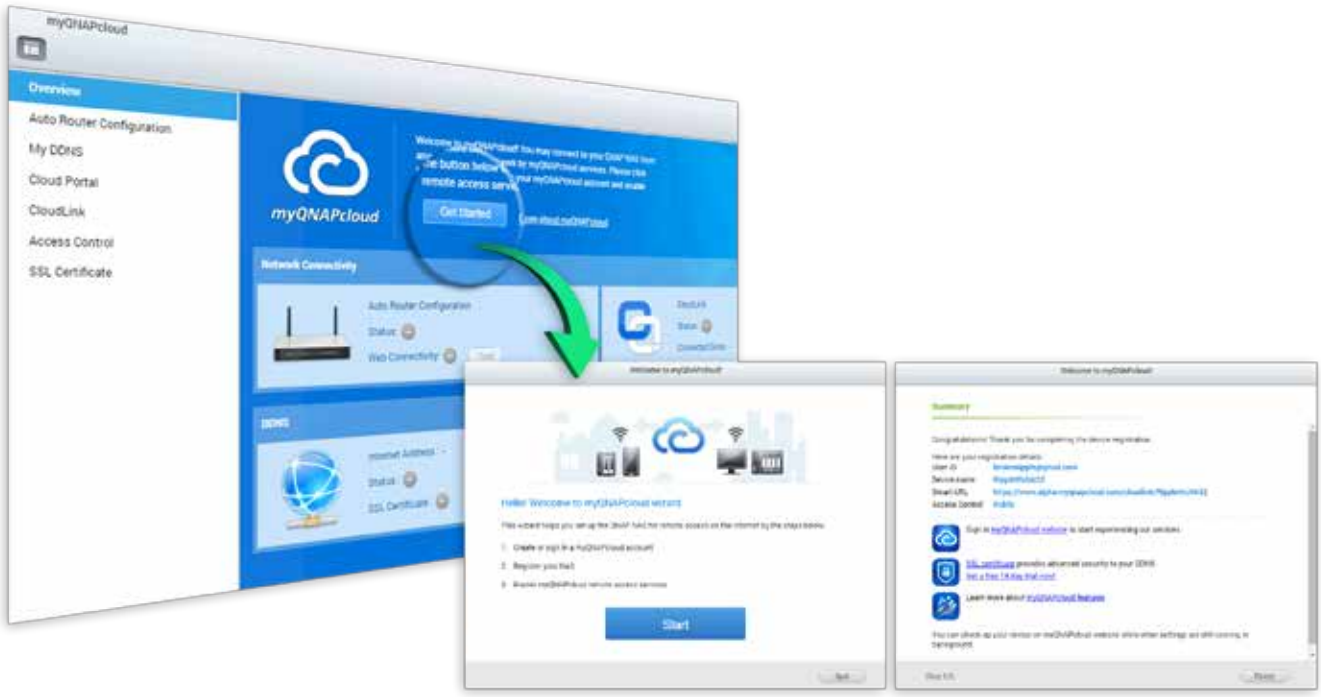
Qsirch 2.0: A powerful search tool to help you find everything on your NAS.



myQNAPcloud 2.0 cloud access service

Create your own cloud with QNAP NAS

Cloud access is greatly simplified in QTS 4.2. Following the setup wizard you can effortlessly create your personal or private cloud. With myQNAPcloud 2.0, you can always enjoy the services of your QNAP NAS safely and conveniently.



Just follow the wizard's instructions to set up the cloud access.

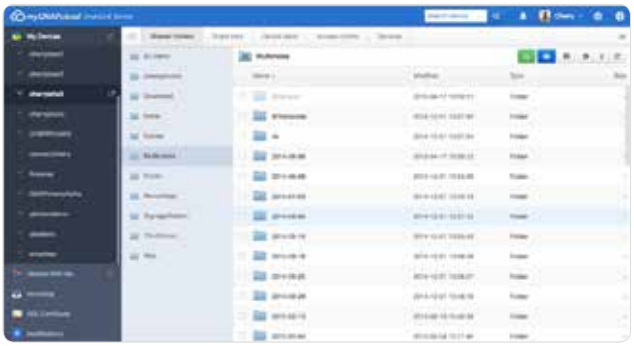
myQNAPcloud ID (QID)

Access your QNAP NAS by signing into your myQNAPcloud portal (www.myqnapcloud.com), mobile Apps, or the PC utility Qsync with “QID”, a unique ID for you to access your NAS and securely share your private data and files. When you start the myQNAPcloud App in QTS 4.2 for the first time, the myQNAPcloud wizard will help you register a QID.

To use the services described in the following page, please first activate the cloud services using the myQNAPcloud wizard.

Manage multiple NAS devices and your data from your web browser

The myQNAPcloud web portal (www.myqnapcloud.com) is a user-friendly interface that allows you to check available and connected NAS servers. You can download, move, copy and share files stored on your NAS servers with your web browser and enjoy the convenience of accessing multiple NAS servers from a central Internet portal.



CloudLink

CloudLink is the best remote access service provided by myQNAPcloud and allows you to connect to your device via the Internet using the myQNAPcloud website (www.myqnapcloud.com). No complicated port forwarding settings on the router are required: just sign in using your myQNAPcloud ID (QID). Then, you can access files from the myQNAPcloud website. CloudLink will automatically select the best connection for you according to your network environment. In addition to the web-based connection, CloudLink also allows you to connect to your QNAP device with the QNAP mobile apps Qfile and Qmanager as well as the PC utility Qsync. CloudLink greatly simplifies remote connectivity.

QID access control

To enhance remote access flexibility, you can set access privileges of published services in myQNAPcloud in QTS 4.2 or the myQNAPcloud website:

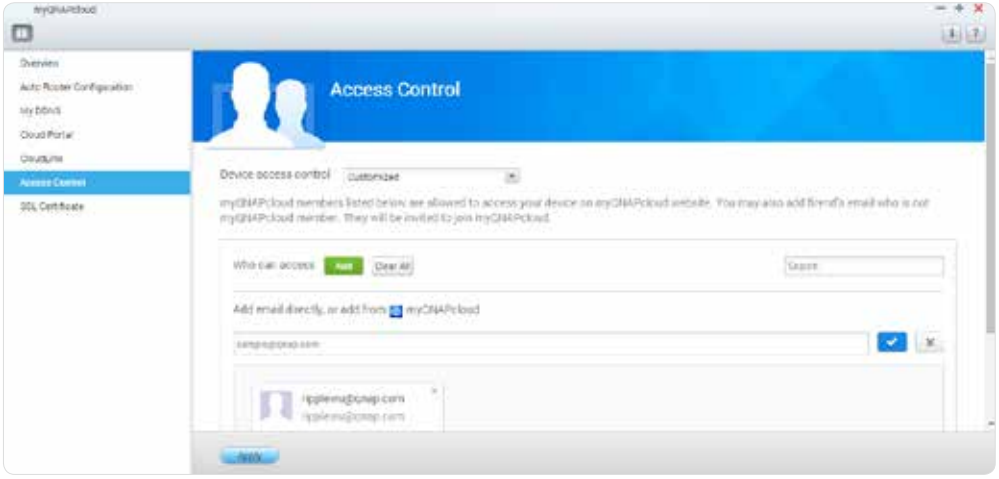
Public: Everyone can search for your device on myQNAPcloud website and access your public services.

Private: Only you can access your QNAP NAS remotely on myQNAPcloud website or with mobile apps via CloudLink service.

Customized: You can specify who is allowed to access your device on myQNAPcloud website or with mobile apps by entering their registered accounts here. Or you can add the email addresses of your friends who are not currently members of myQNAPcloud to send them an automated invitation message.

Secured data storage and access

myQNAPcloud supports SSL 2048-bit online encryption to strengthen data security during transmission, ensuring your peace of mind.



Supports myQNAPcloud SSL authentication

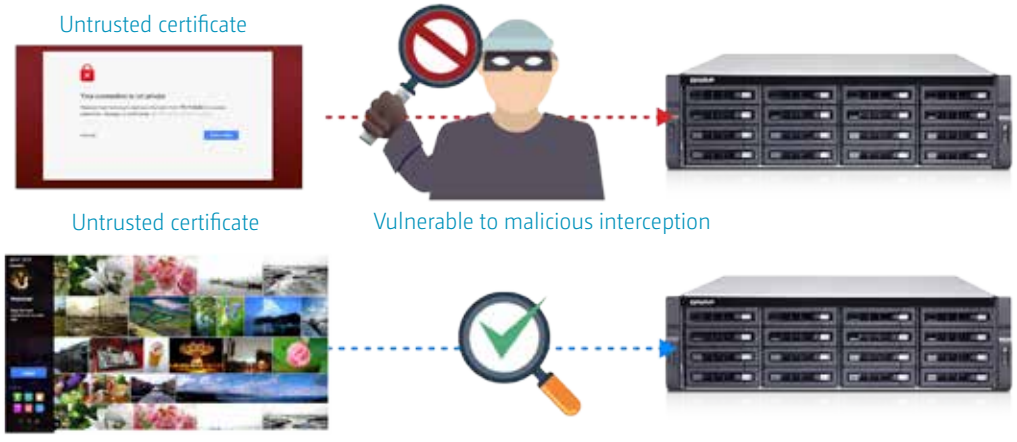
myQNAPcloud SSL certificates are used to provide a secured connection between the QNAP NAS and web browsers, providing authorization as well as encrypting the connection to secure data and transactions.

Why do I need myQNAPcloud SSL authentication

Using myQNAPcloud without SSL authentication over HTTPS to connect to a QNAP NAS (i.e. https://xxxx.myqnapcloud.com) will result in the browser will displaying a security alert. You are not able to ensure that the NAS you are trying to connect to is genuine, and risks potentially having the data that you are transmitting being intercepted.

Upon purchasing and installing a myQNAPcloud SSL certificate, you will be able to ensure that the web page you are connecting to is genuine when using DDNS to access a QNAP NAS.

Please go to the myQNAPcloud website and log in using myQNAPcloud ID to purchase an SSL certificate. Instructions for installing SSL certificate in QTS are provided on the myQNAPcloud site.
myQNAPcloud SSL authentication is only available when used with QTS 4.2 or newer version.



Qsync Central Station 2.0

A private cloud solution combining centralized management and shared folder synchronization

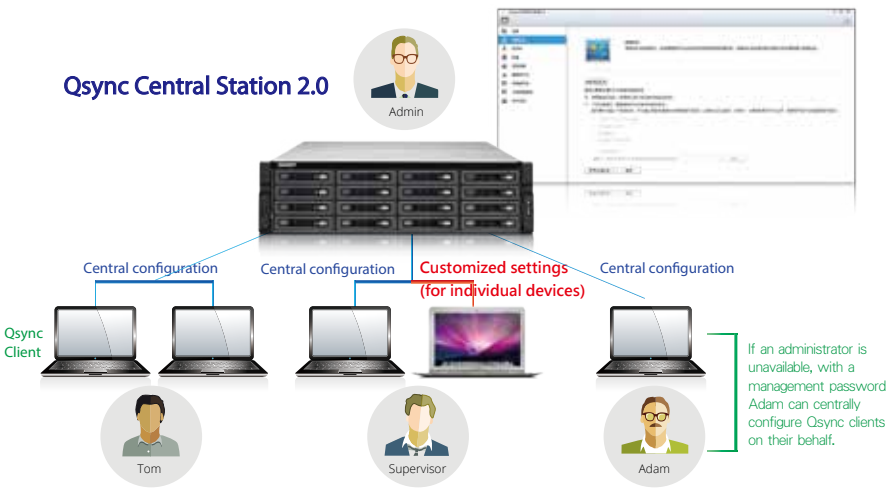
Large volumes of data are transmitted and used by businesses and between departments on a daily basis. While public cloud services like Dropbox can fulfill easy sync and sharing needs, their low data allowances and potential security and ownership issues can leave a lot to be desired. With Qsync, QNAP provides a complete file sync solution that allows businesses and organizations to ensure that team members always have the most up-to-date files for greater working efficiency.

Synchronization as a better file management and collaboration approach

Qsync Central Station 2.0 supports file synchronization between multiple devices, and you can utilize a smart phone, tablet, computer or webpage to browse through synchronized files. When your computer is offline, you can edit the files offline or view the files on the local Qsync folder, and as soon as the network resumes, online, it will continue to synchronize the data. You can also choose to keep the files stored on your QNAP NAS undeleted to save the storage space of your local device.

Enhance management efficiency by monitoring equipment settings

The administrator can create default settings on Qsync Central Station 2.0 and also apply them to Qsync clients, which helps to not only save time and effort setting up individual clients, but also allows administrators to monitor user settings, thereby strengthening enterprise-wide IT management and file filtering control and avoiding the risk of deleting files on a QNAP NAS by mistake due to synchronization. Also, by using permission settings, administrators can flexibly adjust individual user's equipment settings, where it not only retains the above advantages, but further enhances the flexibility and convenience of the centralized management approach.



Supports shared folder synchronization and seamless file sharing for each other

In addition to the Qsync folder, you can synchronize shared folders on a QNAP NAS to the Qsync client on your computer, enabling synchronization among multiple shared folders on the NAS and elevating the level of file sync and sharing efficiency to a higher level.

Share team folders to improve collaborative and teamwork efficiency

Qsync Central Station 2.0 supports sharing team folders to improve efficiency at work, making teamwork simpler and easier. Deploying a private cloud synchronization solution on an intranet can help to ensure security of data storage, while the Version Control feature of the shared folder can effectively solve file conflicts or accidental deletion.

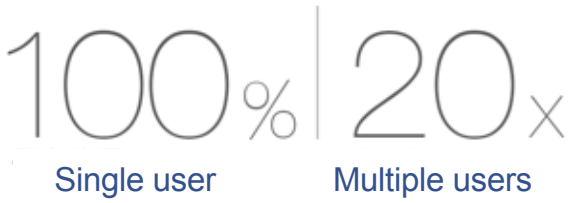
Remotely delete shared folders to prevent data leaks

In the event where a computer/device is stolen or lost, the Qsync folder can be remotely erased* to ensure that sensitive or confidential data is not accessed by unauthorized users or leaked. Once the computer/device is recovered, Qsync can easily restore the data that was deleted, ensuring the perfect balance between security and convenience.

* The data will still be retained on the QNAP NAS.

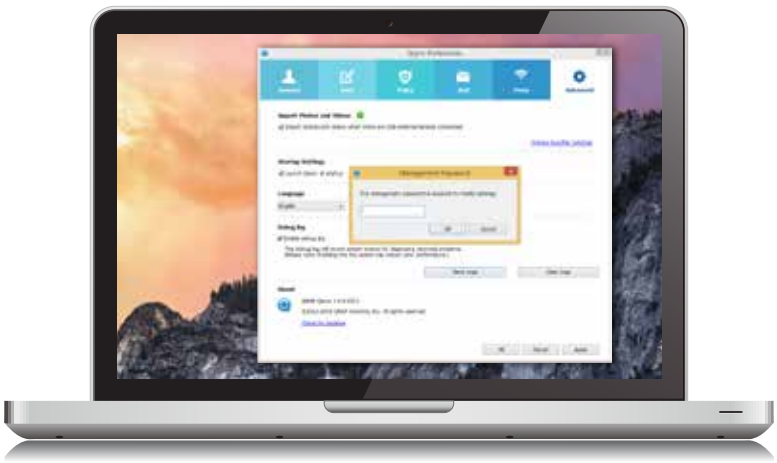
Advanced system database and algorithms for enhancing system performance

On QTS 4.2.0, a brand-new database system and refined algorithms are incorporated into Qsync Central Station 2.0 to greatly improve the overall system performance and reduce the burden on the NAS and computers/devices using it. When accessed by a single user, Qsync Central Station 2.0's upload efficiency nearly doubles. With 20 users, the upload efficiency further increases by nearly 20 times. All the improvement can maximize collaborative efficiency while minimizing the wait time for the team.



An array of user settings to choose from

Qsync Client's easy-to-use interface is very user-friendly and comes with a number of handy and practical features (i.e. sharing files through the computer's mail server, connection test, help center.) With Qsync Client, synchronization tasks are a piece of cake.



Notes Station 2.1

A handy notepad on your private cloud

QNAP has leveraged its private cloud functionalities to introduce Notes Station 2.1. It provides the convenience of notetaking on cloud-based services but with the privacy and security of QNAP NAS. Users do not have to worry about risks from public storage, and are able to enjoy easier data access at all times.

Single workspace for all notetaking activity

With its 3-level structure (Notebooks, Sections, and Notes), Notes Station 2.1 allows you to manage all your notes systematically and flexibly whether it is a note you write to yourself or for work. You can jot your valuable ideas in Notes Station 2.1 and keep them safely accessible through your own devices wherever you are.

Powerful editing

Notes Station 2.1 is capable of advanced editing. You can style the text by changing the size, font, or color. You can also edit inserted images with the built-in photo editor to enrich your content.

Diverse backup styles

Notes Station 2.1 offers several backup options. Users can choose to back up files to their PC or NAS. Additionally, system administrators can use the backup features of the NAS to periodically and remotely replicate everyone's notes.

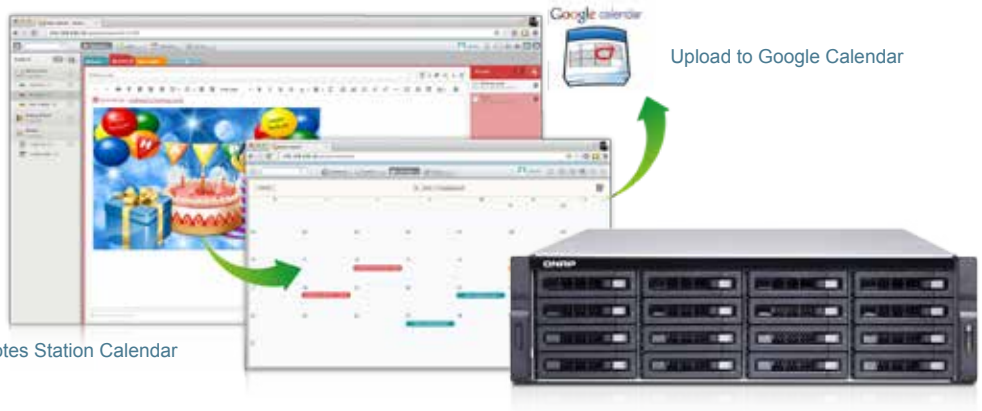
	Notes Station 1.0	Notes Station 2.1
Snapshots for version control		v
Notebook backup	v	v
Full backup		v
NAS to NAS backup		v

Notebook backup: A user can choose to back up his or her notebook.

* Full backup: This feature is for administrators only. Administrators can back up notebooks for all users of the NAS.
* NAS to NAS backup: Administrators can back up notebooks to a different NAS for all users.

Google Calendar Support

Events in the Notes Station Calendar are linked to the note you create it from. Update the calendar from Notes Station 2.1 to your Google Calendar with a single click, so you will be reminded for every event.



The events on your Notes Station Calendar

Protect your notes with military-grade encryption

Notes Station 2.1 can secure your notes using the highly-efficient AES 256-bit encryption specification. By encrypting your notes, you can rest easy knowing that only authorized users can access confidential and sensitive information.

Import & export PDF and epub files

Notes Station allows you to directly import contents (such as comic books, eBooks and scholarly articles) from PDF or epub files to assist in putting information together before editing, commenting and marking. Existing notes on the Notes Station can also be exported as PDF or epub files for backup and sharing.

Some imported files may not be displayed as their original layout.

Preview attached files

You can directly preview inserted documents (including PDF, Word, and PowerPoint files) on Google Docs and Office Online, and even play inserted multimedia files with the built-in media player without needing to download any files.

Subscribe to RSS live feeds

Notes Station 2.1 includes RSS support that helps gather subscribed online content from websites and blogs. All of the latest RSS contents are effortlessly centralized on the Notes Station for easy note-taking.

Restore notes to a previous version

Notes Station 2.1 features snapshots for version control, which can be used to retain different versions of notes at different time points. You can easily restore a note to a previous version whenever needed without worrying about frequent changes to notes.

Share notes for teamwork

Notes Station 2.1 is helpful for communication and teamwork in work and life. You can create sharing links to share your notes via social networks and messenger apps on mobile devices, or invite other users to read and edit notes for productive communication and teamwork.

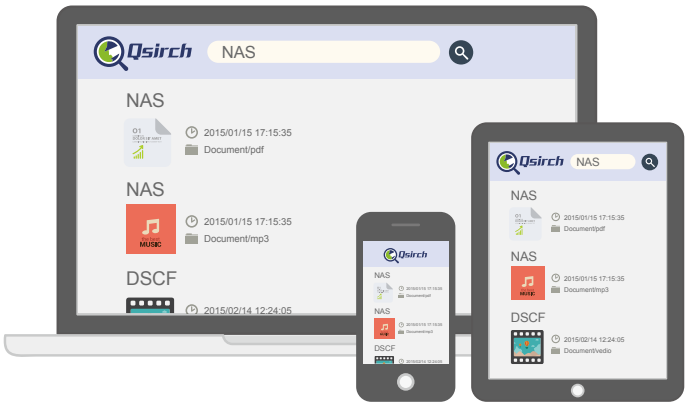
Back up content from Evernote

Notes Station 2.1 supports backing up your notes from Evernote, allowing you to directly import them from Evernote's public cloud to the secure private cloud provided by your QNAP NAS. You can further edit these imported notes with Notes Station's powerful editing tools and easily share with others.

Qsirch 2.1

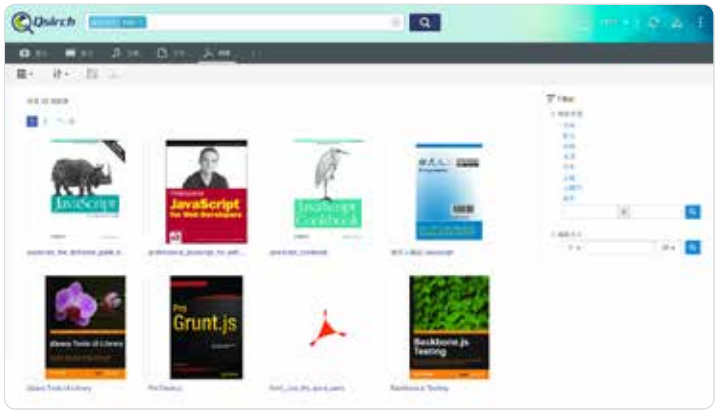
Search for everything on your QNAP NAS

A QNAP NAS is a converged storage solution required to store huge volumes of data and provide users with the tools and utilities to make use of that data. The first utility users need is the ability to find their data. Qsirch is designed to simplify and accelerate searching for files on a QNAP NAS. Finding your files couldn't be easier.



QNAP exclusive, smarter search engine

Qsirch uses fine-grained indexing conditions in combination with its full-text search capabilities to support searching over 6,000 file types. Powered by TF-IDF algorithm and a near real-time search engine, the Qsirch enables users to search while typing and sort through files faster and more precisely



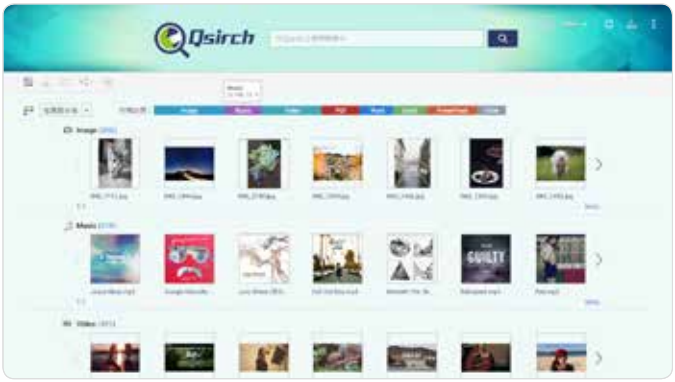
Qsirch browser add-on for Google Chrome

Install the Qsirch add-on to enable Qsirch from your web browser. Simply click on the Qsirch icon on the right of the address bar to search Google and your QNAP NAS simultaneously. Your Qsirch and Google search results will appear side-by-side for space-saving, time-saving convenient comparison.

• Simultaneous search on Google®

Presentation by file types

Search results can be filtered and presented by types including photos, music, videos, and documents. This visualization enables you to locate your desired results faster. In addition to sorting by file type, results can be organized based on criteria such as modified dates, file sizes, etc.



Content Preview

Thumbnail previews for photo, videos, and PDFs makes searching and browsing through voluminous data a lot faster, while the Gmail preview function enables you to preview emails and your Gmail backup files easily and quickly.

Advanced indexing technology

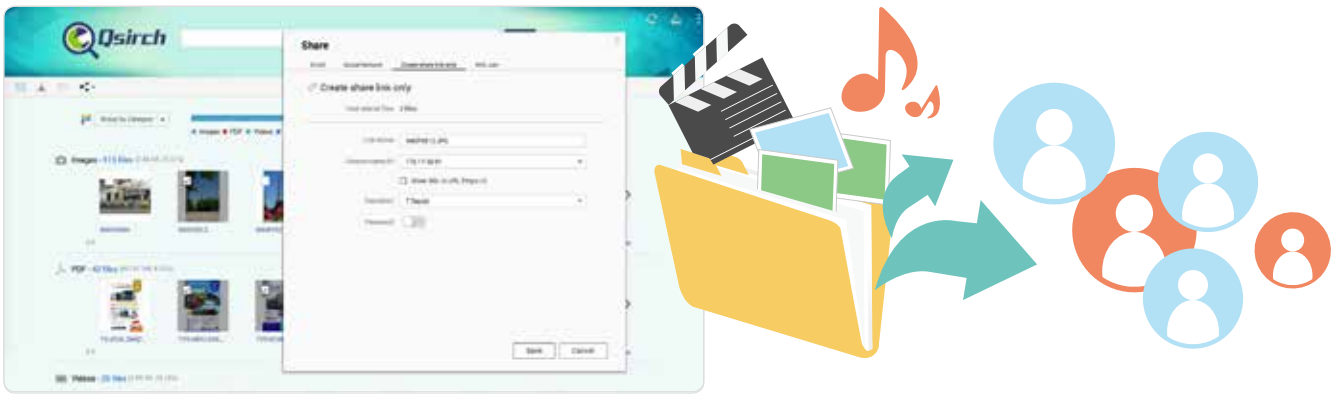
Indexing runs as a background task, enabling you to oversee the indexing progress and current status. This feature can also be used to exclude files from indexing.

Saved searches for even faster results

Records of every search are kept, and users can even search through these records and store frequently-used search criteria.

Share directly from your search results

Use the direct sharing function in Qsirch 2.1 to share from your search results instantly.

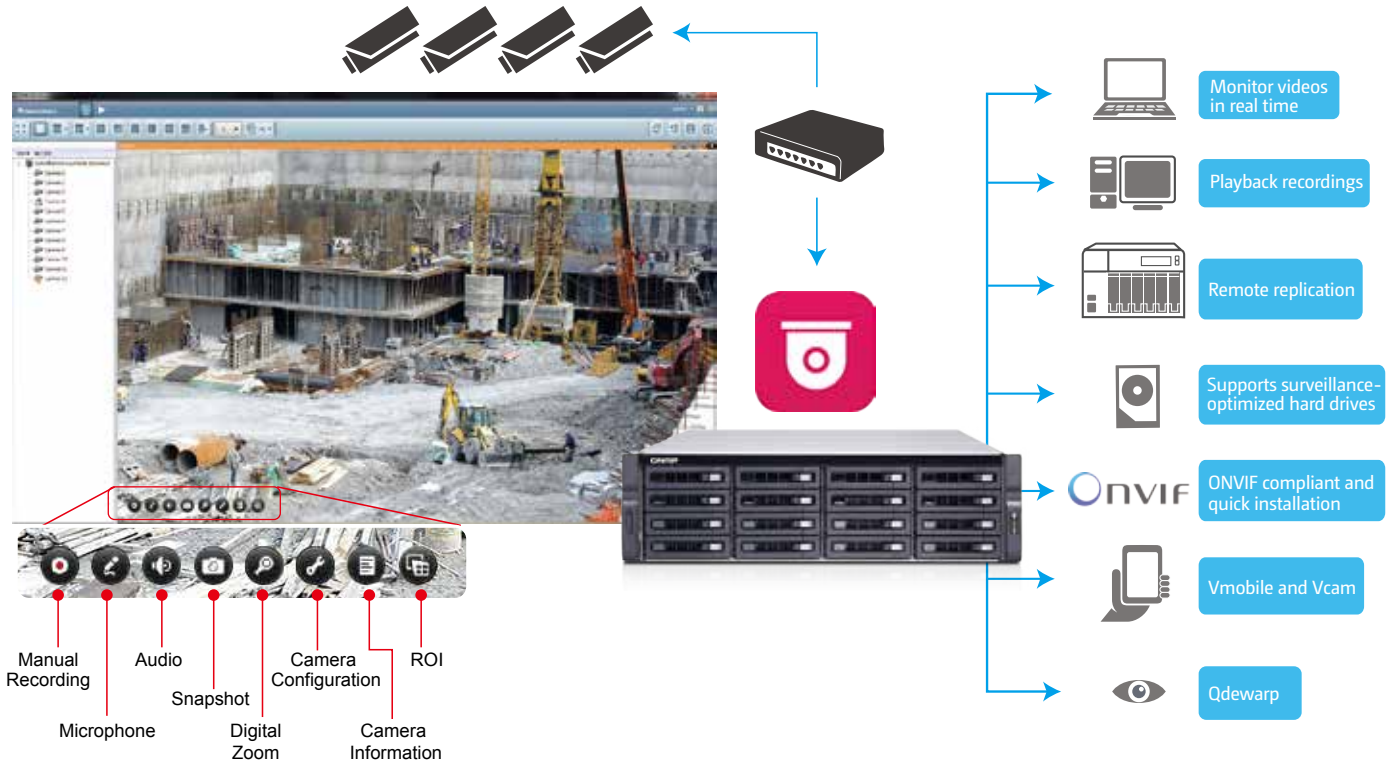


QTS 4.2.0 or later versions is required for Qsirch 2.1 and the sharing function of Qsirch is only available on QTS 4.2.1.

Surveillance Station 5.1

Build a professional surveillance system

QNAP Surveillance Station 5.1 is a professional network surveillance video management system. One of the QNAP NAS flagship applications, Surveillance Station turns your NAS into a professional Network Video Recorder (NVR) that can be operated from a PC, mobile device, or with an HDMI® local display. Supporting real-time monitoring, recording, playback, alarm notifications, Intelligent Video Analytics (IVA), and management, Surveillance Station safeguards your assets and property when used with supported IP cameras. Every QNAP NAS comes with a minimum of two free camera channels as standard, is ONVIF® and PSIA compliant, and compatible with over 100 camera brands (and more than 3000 camera channels,) allowing you to easily build a professional video recording and monitoring system.



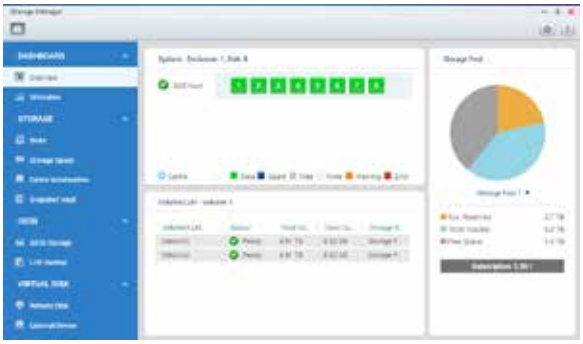
Before using Surveillance Station, please install the Surveillance Station App from the App Center. For a list of compatible cameras, please refer to www.qnap.com.

Tiered Storage for Hybrid NAS and NVR Operations

Empowered with a tiered storage architecture, QTS can now separately store NAS and NVR data in different storage pools that consist of dedicated hard drives. Additionally, you can designate dedicated network ports for NVR or NAS traffic to achieve the best data write/read performance.

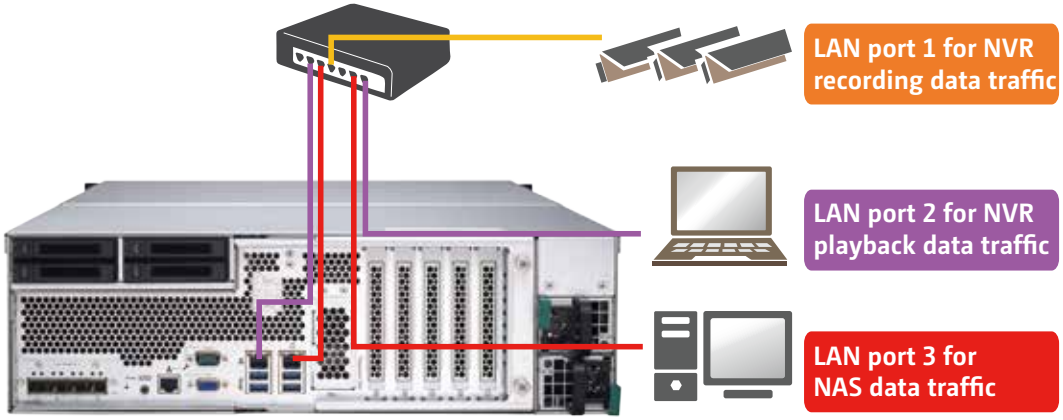
Set Dedicated Storage Pools for NVR

Using Storage Manager, it is possible to set dedicated storage pools for Surveillance Station to isolate disk arrays to ensure that NAS and NVR operations are separate.



Network Tap

In addition to tiered storage, QNAP have also added a “network tap” capability to Surveillance Station. Activate this function on a QNAP NAS with more than one network port and easily reroute the monitoring network flow to other QNAP NAS network ports, optimizing the read/write performance for NAS and NVR traffic.

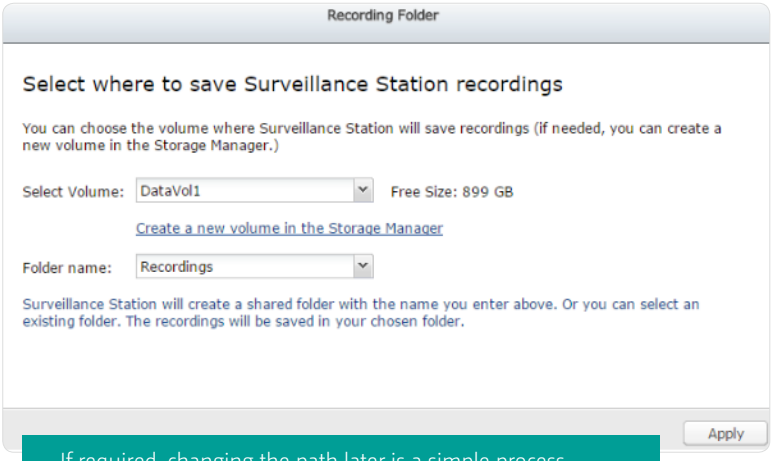


Quickly Build a Professional Surveillance System in 3 Easy Steps

1. Choose where Surveillance Station recordings are saved.

During the initial setup of Surveillance Station, designate a location to save Surveillance Station recordings. QNAP advises a dedicated storage pool for recordings.

We recommend using hard drives specifically designed for NVR/ surveillance purposes.
Please refer to www.qnap.com for the compatibility list.

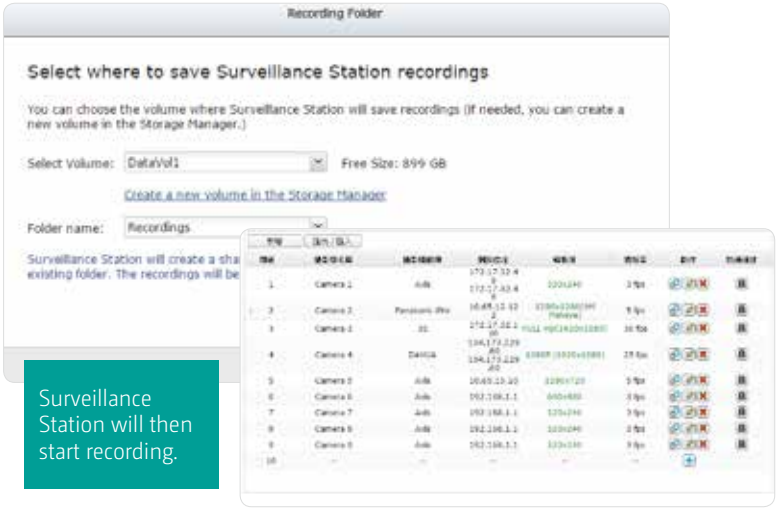


If required, changing the path later is a simple process.

2. Set up the cameras

Complete the camera installation and confirm the cameras are on the same LAN, click “Add” and Surveillance Station will search for available cameras.

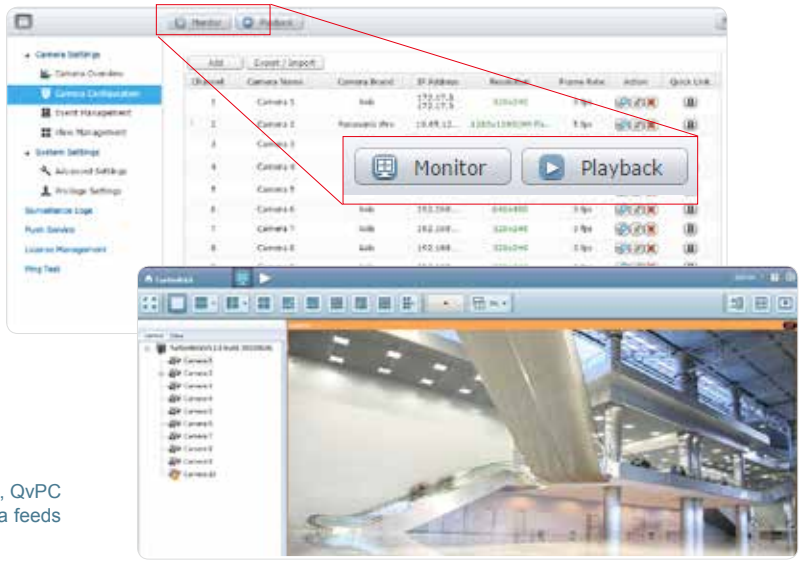
In addition to IP cameras, USB cameras are supported by installing the QUSBCam app. Using USB cameras is an inexpensive way to extend surveillance coverage offering a huge array of camera form factors for suitable for a wide array of deployment scenarios.



Surveillance Station will then start recording.

3. Start monitoring or playback.

There are several ways to playback recordings or to monitor cameras with QNAP surveillance solutions. Click “Playback” or “Monitor” in Surveillance Station, or use the Vmobile App or QvPC to monitor the camera feeds.



For NAS models with an HDMI® port and memory larger than 4GB, QvPC Surveillance Station (Local Display) can display monitored camera feeds on Smart TVs.

If you are using a PC or Mac, please install the client utility first. Click “Monitor” or “Playback” and the wizard will show up to guide you through the installation process. Clients are able to log into different surveillance stations to monitor their subset of cameras.

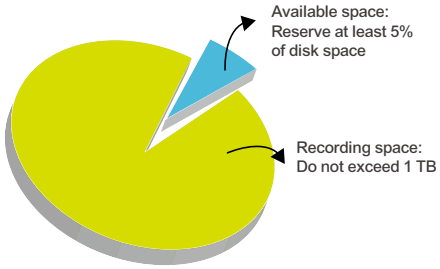
Never miss any recordings

Playback path management

Following a configuration change of the recording location, Surveillance Station 5.1 will automatically register the old recordings path in the Playback Path list. With this feature, Surveillance Station 5.1 maintains all recordings are readily available for convenient playback.

Automatically configuration updating

Surveillance Station 5.1 with a double video space usage threshold default settings, will not let you save images remaining space is less than 5%, or image space than 1TB. If you construct more than 1TB hard disk space for image storage monitoring, it is recommended to adjust the video size of the space and you can use the larger storage space.

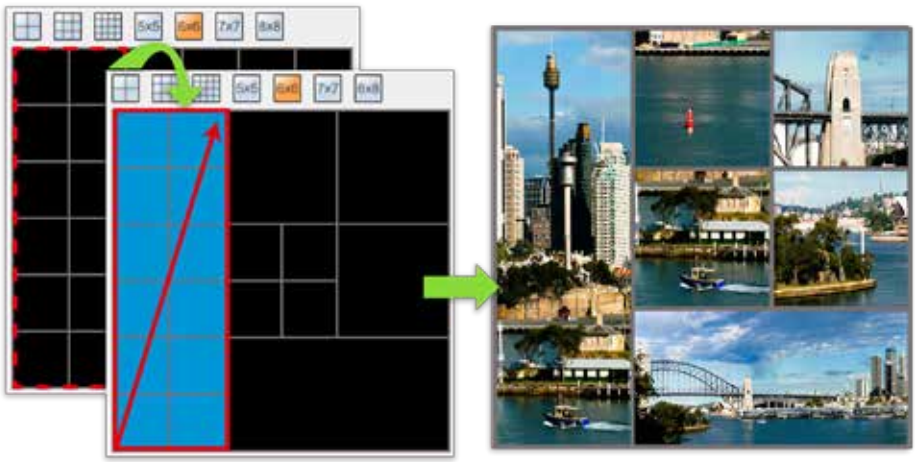


Threshold values can be adjusted on-the-fly.

Flexible monitoring modes

Diverse layout choices for playback and monitoring

Surveillance Station 5.1 supports various monitoring modes to display 1, 2, 3, 4, 6, 8, 9, 10, 12, 16, 20, 25, 36, 49 and 64 channels on a single screen. Choose to display each channel sequentially, or use dual displays for a wider view.



Click “Refresh” to view the adjusted layout.

Playback speed control with the shuttle bar

With the speed-control shuttle bar, users are able to fast forward and rewind playback by dragging the bar to find the desired capture quickly.

Preview recordings using timeline

You can move the mouse cursor over the timeline to preview video thumbnails to quickly identify and search for events. No need to play the video from the start and wait.

Virtual camera

Very high-resolution cameras often lose details in playback display of huge coverage areas, presenting a problem for surveillance users. Using virtual camera technology, users are able to focus on defined sub-areas within the area captured. Virtual cameras do not require additional licenses, making them ideal for deployment in areas requiring expansive coverage.

PTZ control (Pan/Tilt/Zoom)

Directly adjust the vertical tilt, left/right panning angles, and zoom on cameras with compatible PTZ (Pan/Tilt/ Zoom) functions. The “Click Go” PTZ control feature greatly enhances the convenience of remote surveillance..

The support of digital watermarking assists in verifying the authenticity of exported videos and snapshots by showing the exact recording date & time, camera name, and QNAP NAS model name, making it essential when videos are needed as verifiable evidence.

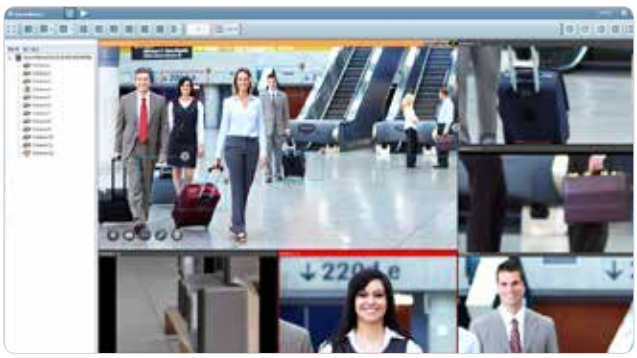
Qdewarp and ROI

QNAP Qdewarp

Fisheye lenses are ideal for wide-angle scenes. With dewarping technology, users are able view detailed images without distortion. Qdewarp is compatible with every fisheye camera that QNAP supports, and enables users to de-warp images at any time point in a recording. Qdewarp supports real-time monitoring and recording playback, ensuring there are no blind spots.

Region of Interest

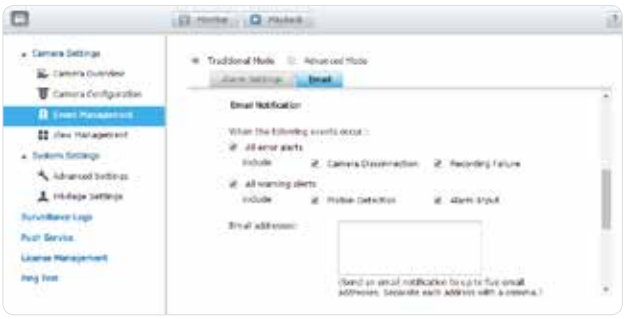
The 4K era is upon us and a huge number of cameras on the market now support 4K HD images. The ROI function is excellent for high definition cameras and enables users to freely enlarge, adjust, or move the region of interest on any recording channel. Surveillance Station 5.1 retains ROI settings for each session so it is ready at the next log in.



Immediate alerts for events

Set alert and notifications

When cameras detect motion or alerts are triggered, Surveillance Station will automatically send notifications to up to 5 email addresses.



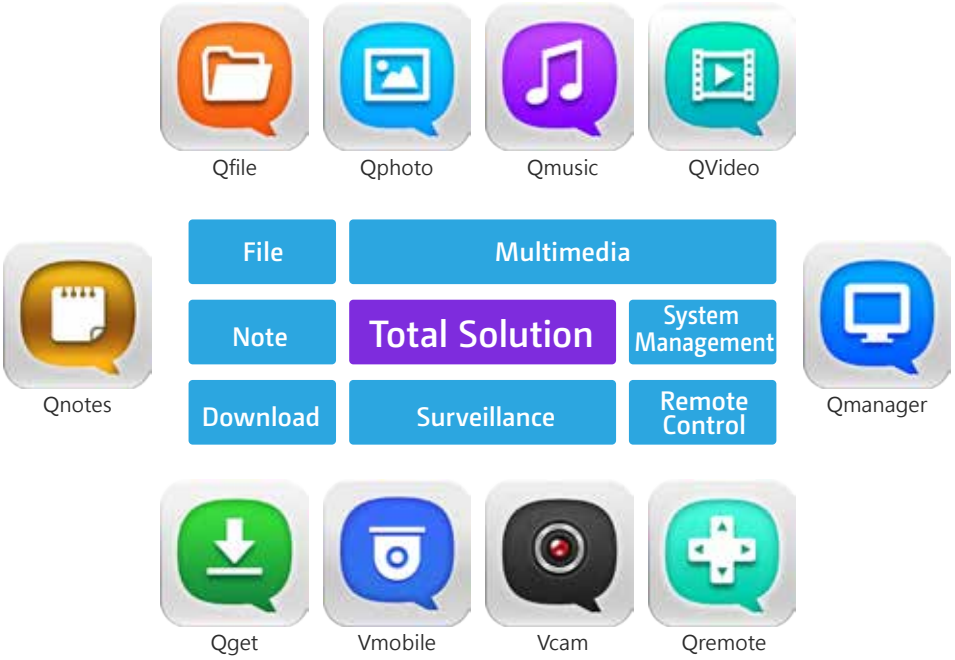
Digital floor plan for camera locations

Uploading a floor plan to Surveillance Station enables users to map out where cameras are located. Based on alarm settings, the camera icons will then alert users to assist in decision making for appropriate action to be taken.

Mobile Apps & Utilities

Conveniently access your QNAP NAS with mobile devices

In the digital age, mobile devices have become a popular choice for Internet and NAS access. For various mobile user scenarios, QNAP has introduced a list of mobile Apps to help users access their NAS with their mobile phone.



Automatically update photos from your smart phones in your trip

- In your trip, photos on your mobile device can be automatically uploaded to your NAS, allowing you to focus on your photos instead of worrying about running out of space.

Easily share large files with friends and families

- Sharing huge files is extremely easy with QNAP mobile apps.
- Share them whenever and wherever you want.

Browse files stored on your NAS

- Access your multimedia (photos, videos and music) and office documents (Word, PDF, or Excel) stored on your NAS using your mobile phone.

Manage services on your NAS with ease

- Check the status of your NAS or enable/disable NAS application services remotely using your phone.

Qfile 2.0

Access files stored on your NAS remotely using a mobile device

Supports iOS (iPhone and iPad), Android devices (phone and tablet), and Window phones.

Versatile and real-time file management

Remotely upload/download, share, manage and stream files from a QNAP NAS and synchronize between the NAS and your mobile device.

Remote file access

The file thumbnails help you easily identify file types at a glance, allowing you to spot music, videos and photos rapidly.

You can stream multimedia files and play them on your mobile phone, turning it into a mobile media player.

Efficient storage use for your mobile phone

Download documents to your mobile devices for offline reading, manually or automatically back up photos and music stored on your mobile phone to your QNAP NAS.

Folder and file sharing

Create download links for shared folders or files to share via email, SMS or mobile apps, or email the files as attachment.

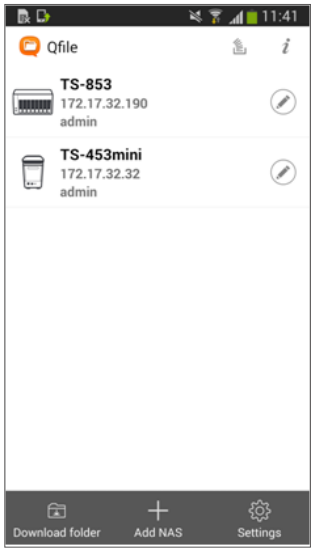
Using Qfile

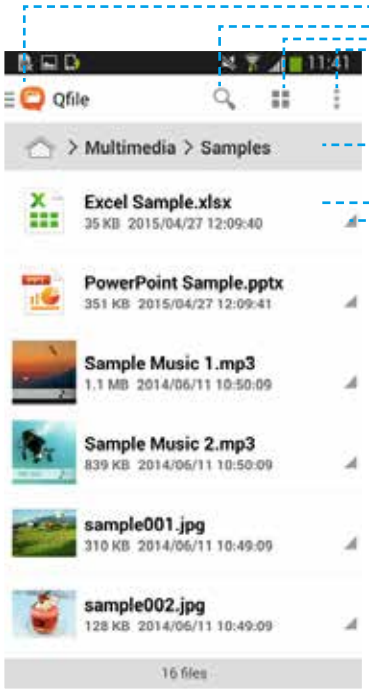
Tap “+” to add a NAS.

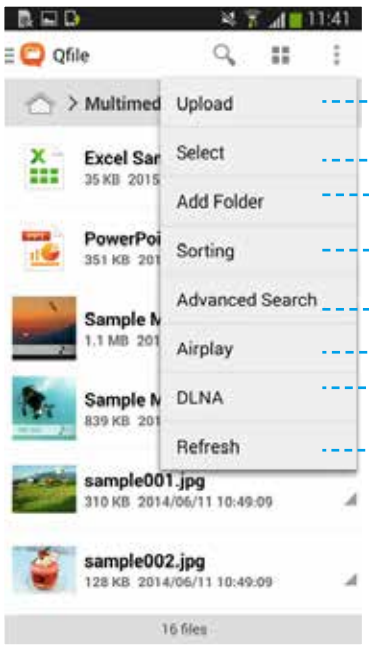
Qfile will search for a QNAP NAS on your LAN. Tap on one of the NAS to add it.

Tap “Add NAS manually” If you are not at your home.

Qfile will save your login details after you successfully log in to a NAS the first time, and you don't need to enter login details later.



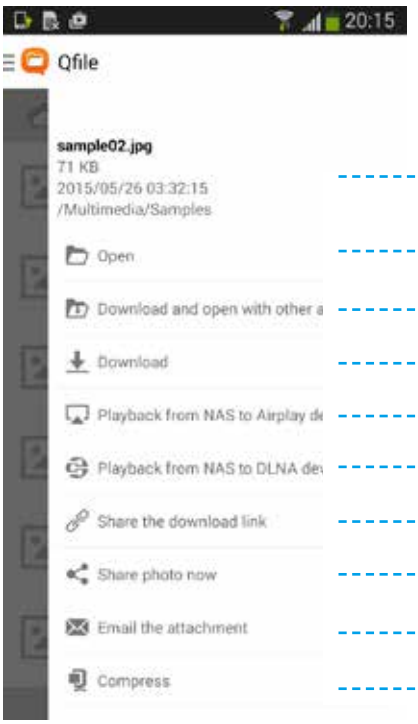




Access files and folders on your NAS after your login.

1. Tap to open a file
2. File path: Click to quickly change your location
3. Switch between shared folders, check background tasks or Qfile settings
4. Search files
5. Menu and thumbnail modes
6. More functions

7. Upload files to the NAS and supported upload options: Upload photos from the photo library or camera, upload files from the Qfile download folder, and upload files from the local download folder (this option is only supported for Android devices.)
8. Enable multi-select mode
9. Add a new folder
10. Sort: Sort files by filename, size, modified date or file attribute
11. Advanced search: Quickly locate files you are looking for based on file size, modified date, filename or user. The thumbnail preview feature allows you to instantly preview the file in a simpler and intuitive approach.
12. Stream multimedia files to Airplay devices
13. Stream multimedia files to DLNA devices
14. Refresh the current page.
15. Show available actions for the selected file.



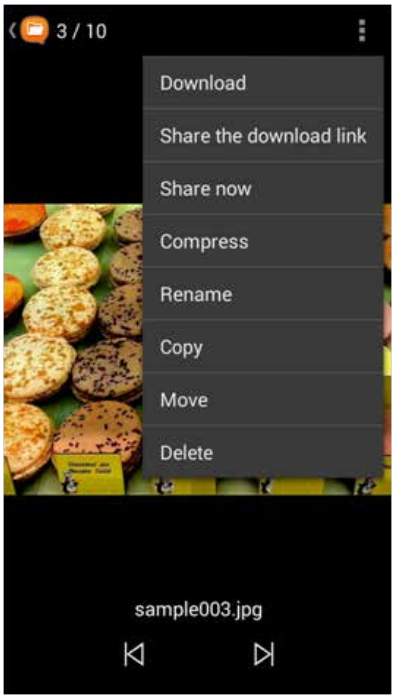
1. File details.
2. Open the file.
3. Open the file using a different mobile app.
4. Download the file to the Qfile download folder.
5. Playback the streamed file on an Airplay device.
6. Playback the streamed file on a DLNA® device.
7. Share a download link.
8. Share the photo using a different mobile app.
9. Email the file as an attachment.
10. Zip the file.

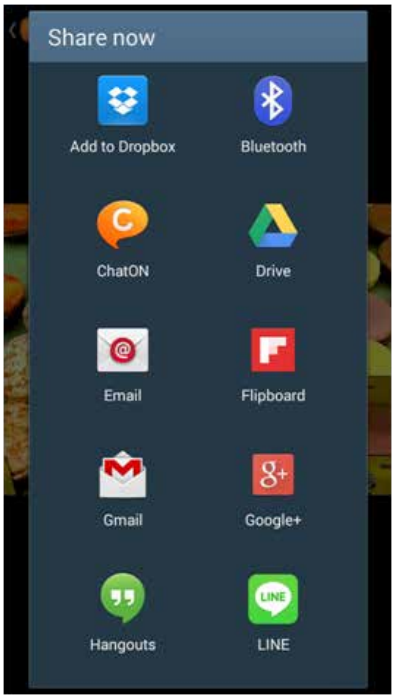
Three file sharing methods:

1. Directly share photos you are browsing on social networks using apps such as Line or Facebook (as the below figure.)

2. Share files as email attachments.

3. Create download links. To share a huge file, you can create a download link in Qfile and share that download link on social network sites, in an email, or SMS message. The recipient will be able to directly download the shared file using that link you provide.





Qmanager 2.0

Remotely manage and monitor your QNAP NAS

Supports iOS (iPhone and iPad), Android devices (phone and tablet), and Window phones.

Manage your private cloud

Monitor your system information, check backup tasks and system events and manage services.

Manage users and shared folder privileges

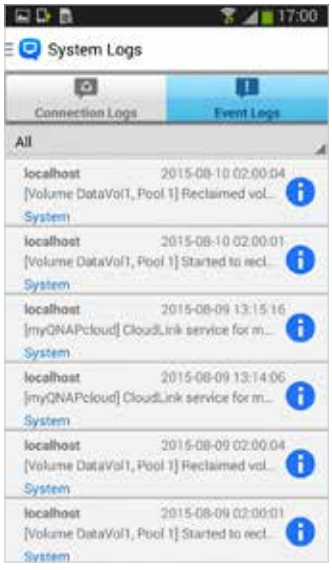
Check the user, user group and shared folder status. The intuitive interface helps to improve your management efficiency.

Manage system services

Get up to date about system status. Remotely pause/run backup tasks and enable/disable application services or third-party Apps.

Manage download/backup tasks

Check the backup task information and run existing backup.



Monitor system status

Review system and connection records, restart or shutdown your QNAP NAS remotely, identify the location of your NAS, wake up your NAS via WOL, and safely reject external devices.

Push notification

Check system events and real-time updates and receive important push notifications on your mobile phone.

Available on the App Store

Google play

Vmobile 2.0

Professional mobile surveillance App

Supports iOS (iPhone and iPad), Android devices (phone and tablet), and Window phones.

Mobile surveillance

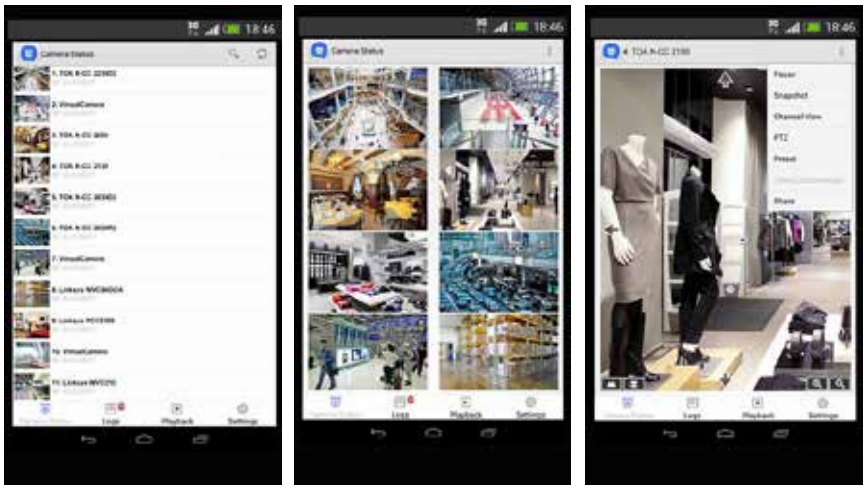
Access surveillance system to manage and monitor IP cameras anytime, anywhere.

Profile management

Create multiple profiles with different sets of VioStor NVR/QNAP NAS and IP cameras, and efficiently switch between different monitoring views from the profile list.

PTZ control and preset position control

The PTZ (Pan/Tile/Zoom) cameras can be controlled directly on mobile devices. It's easy to adjust the monitoring angles and preset monitoring position.



Event notification

When an event occurs, Vmobile can notify by ringtone, push notifications, or vibration to alert you immediately.

Recording playback

After you receive event notifications, you can tap the event logs to directly play them and to see the incident for yourself.

Low bandwidth mode

If you have a slow Internet connection, you can select a stream optimized for low bandwidth to provide smoother video playback. The quality of the video recording will not be affected.

Video playback

Slide on the timeline to conveniently play back recorded videos. You can also choose to play back alarm events only for quick review.

Quick search by date and time

Search a specific video section by date and time, quickly and precisely.

Other QNAP Mobile Apps

Qmusic

Play your music, video and pictures on your NAS from anywhere at any time.

Qphoto

Browse, share, or download your photos using a timeline view, thumbnails, detailed list and folders.

Qvideo

Download, stream, share videos to other people from the NAS.

Qnotes

Jot down, edit and share your ideas wherever you are.

Qget

Directly upload torrent files by searching the Internet Qget to create or manage download tasks in Qget.

Qremote

Remotely control the playback of multimedia files in HD Station.

Computer Utilities

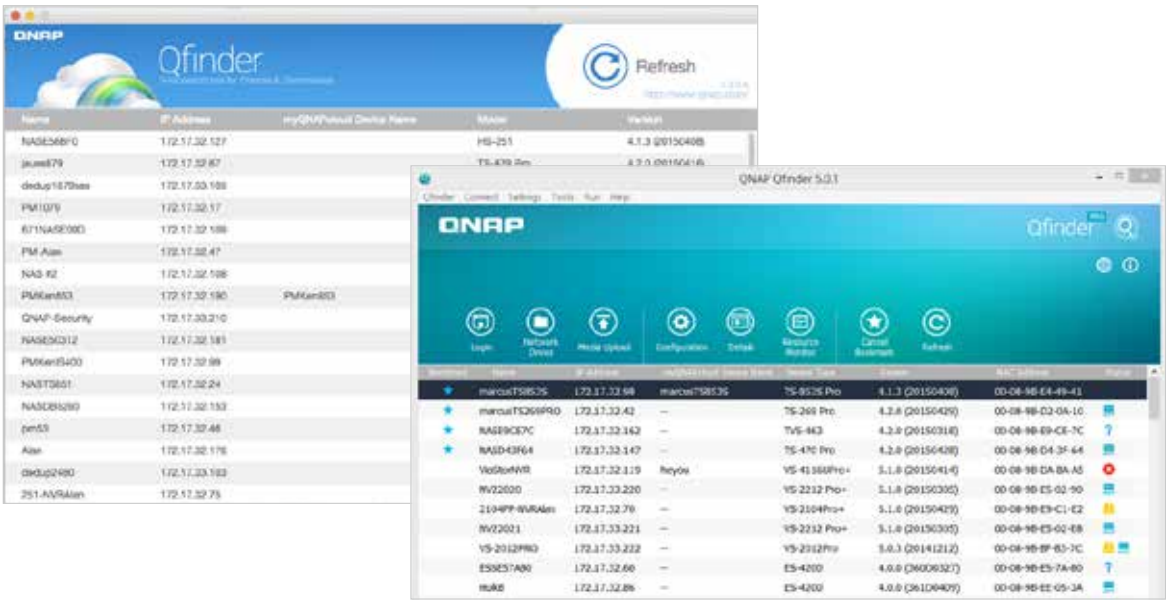
Boosting your Productivity

Qfinder Pro

Search, connect and set up your QNAP NAS

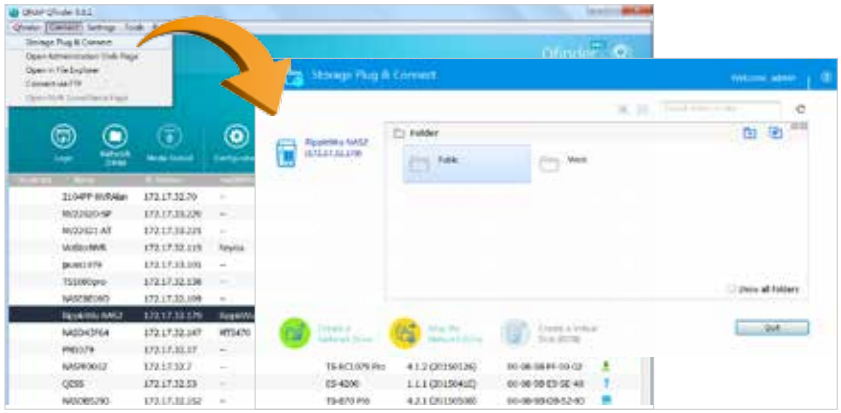
Available for Windows, OS X, Linux and Chrome Browser.

Qfinder is a utility to quickly find, access and set up the QNAP NAS over a LAN. Install Qfinder on your computer, open it, and double click your QNAP NAS name, and the login page is ready for you.



Easily access the NAS by Storage Plug & Connect

The Windows version of Qfinder provides a convenient way to connect to QNAP NAS and map a network drive or a virtual disk. By creating a shared folder on the QNAP NAS and mapping it as a network drive, you can use it as an additional drive and store files on it as it is a local drive of the computer.



NetBak Replicator

A hassle-free way to back up data on PC

Available for Windows

The QNAP NetBak Replicator is free for anyone with a QNAP NAS and helps you easily back up files from Windows PC - entire disk drives, documents, pictures, music, videos, fonts, emails, and more - to the QNAP NAS. The operation is very simple. You can set up the backup task in just a few clicks using NetBak Replicator by the setting real-time synchronization, scheduled backup and auto-backup from multiple PCs to the QNAP NAS. NetBak Replicator also supports backing up to a remote server via FTP and WebDAV through the Internet. Imagine that you can backup new photos whenever on vacation. Even you are away from home, the convenient backup supports your memories.

Qsync

Sync Files Anytime and Everywhere

Available for Windows and OS X.

Qsync is a useful tool to synchronize files across multiple computers and supports Windows and Mac. It creates a specific “Qsync folder” in your devices that you can simply drop files in, and synchronizes the files to all your devices linked to the QNAP NAS. For more information, refer to the Qsync Center Station 2.0 section in this catalog.

vSphere Client plug-in

Manage QNAP NAS within vSphere Client

Available for Windows.

QNAP NAS supports vSphere Client Plug-in that enables managing VMware datastores on your QNAP NAS directly from the vSphere client console. In a large scale server virtualization environment, management is centralized and straightforward. Administrators can easily control the status of the QNAP NAS and datastores and create additional datastores to multiple ESXi hosts in just a few clicks.

App Center

Customize your QNAP NAS for endless possibilities

Extend the functionality of your QNAP NAS to enrich your work and home life. QTS App Center provides various install-on-demand apps for you to enjoy more applications and to increase the total value of the NAS.

Powerful and, rich-incontent

The App Center provides more than 100 add-on apps, including backup/ sync, business, content management, communications, developer tools, download, entertainment, surveillance and utilities.

1-click Install on demand

Find what you need and install it immediately with just one click.

Upgrade reminder

Once your installed apps have upgrade version, an upgrade reminder will show on the QTS desktop to help keep your NAS applications up-to-date.

Gmail Backup 1.3

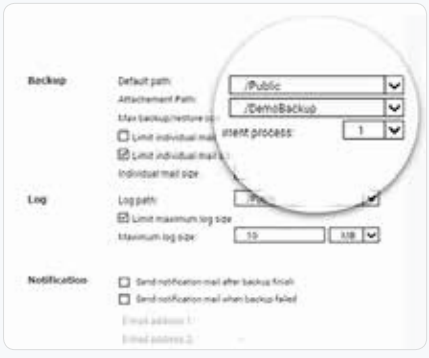
The QNAP Gmail Backup app provides Gmail backup and recovery functionality, allowing users to search and organize archived emails and their attachments.

Complete email backup

Gmail Backup supports Oauth 2 authentication for individual and domain account email backup and migration. The application can be configured with a dedicated folder for each backup task for single or domain accounts, assisting users in quickly backing up, searching and managing their emails.

Efficient Gmail recovery

If emails of are mistakenly deleted, the recovery function can restore them to their original email account without needing additional tools. Users can also choose to restore a specific email or all emails from an account.

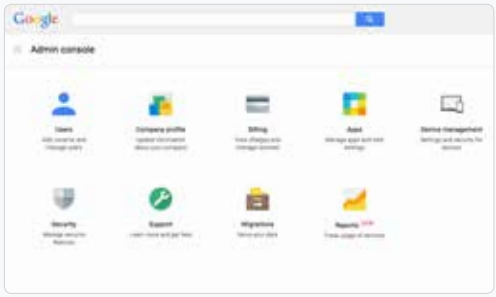


Separately access and search attachments from an email

Back up attachments to a separate backup folder for better organization of archived data.

Complete operation logging

Gmail Backup is capable of logging all of the activities and backup status for users to view their backup process in detail.



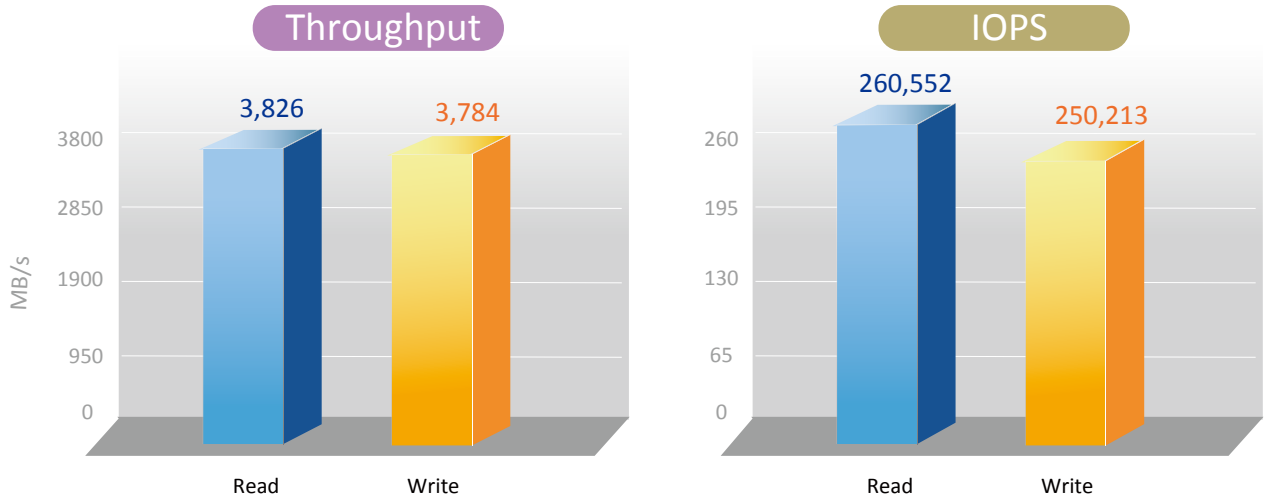
Hardware Introduction

The TDS-16489U series is virtualization-ready and ideal for deployment in the data center for building hybrid cloud storage. This series offers advantages in hardware design and reduced price, bringing a breakthrough level of price/performance.

Intel® Xeon® E5-2600 v3

The TDS-16489U series is powered by Intel® Xeon® E5-2600 v3 family processors, providing 16-bay (hybrid) storage capacity. It delivers superior performance with up to 3,800 MB/s throughput & 260,000 IOPS. The SSD cache acceleration with four 2.5" SSD can further enhance NAS performance for IOPS-demanding applications.

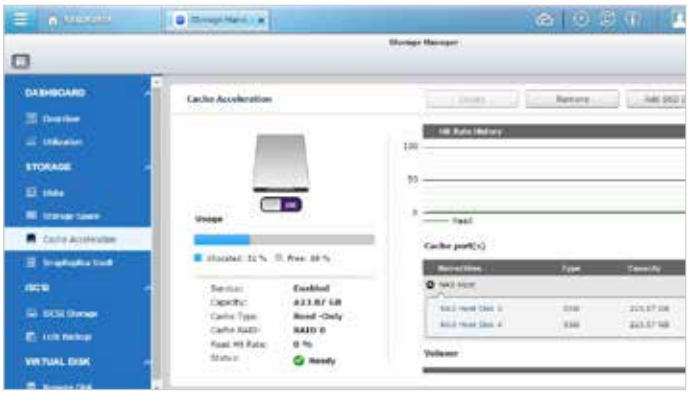
TDS-16489U



Test Environment:
2 Client PC: Intel® Core™ E5-2600 V3 CPU, 32GB DDR4 RAM, Windows server 2012 , Dual Port Intel XL710 10GbE Server Adapter, IOMeter sequential read and write.
NAS: Seagate 2.5" SAS 12Gbps ST200FM0053 with RAID 5 configuration, TDS-16489-SAS-RP on board 10GbE x 4
Tested in QNAP Lab. Figures could vary by environment.

SSD cache acceleration

The TDS-16489U series supports SSD caching options with four dedicated 2.5" SSD slots to the rear of the chassis to improve the overall workflow of IOPS-demanding applications such as virtualization and data center deployment. The SSD caching can be easily utilized and managed with the QTS Storage Manager. The SSD cache adopts the Read Cache with Write Through algorithm and can greatly improve random read performance and ensure data security.



40GbE Ready

QNAP and Mellanox provide the most cost-effective compute and storage Ethernet Interconnect Solution

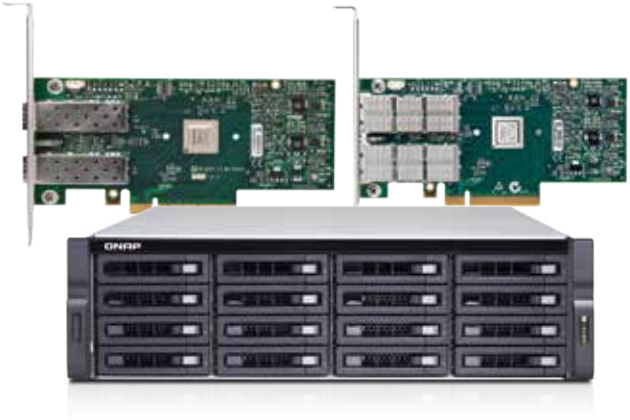
TDS-16489U with ConnectX3 Pro hardware offload engines to Overlay Networks ("Tunneling"), provide the highest performing and most flexible interconnect solution for PCI Express Gen3 servers used in public and private clouds, enterprise data centers, and high performance computing.

Public and private cloud clustered databases, parallel processing, transactional services, and high-performance embedded I/O applications will achieve significant performance improvements resulting in reduced completion time and lower cost per operation.

ConnectX-3 PRO

LAN-10G 2SF-MLX-U Dual SFP+

LAN-40G2SF-MLX-U Dual QSFP+



Highest Throughput

scalable bandwidth with 10/40/56 GbE per Port

Lowest Latency

end-to-end latency <1us

Virtualization

eSwitch and SR-IOV to improve VM performance

Overlay Networks

hardware offload of VXLAN/NVGRE to reduce CPU overhead

RDMA over Ethernet

RoCE to accelerate application execution

Data Center Bridging

future proofs the network

Convergence

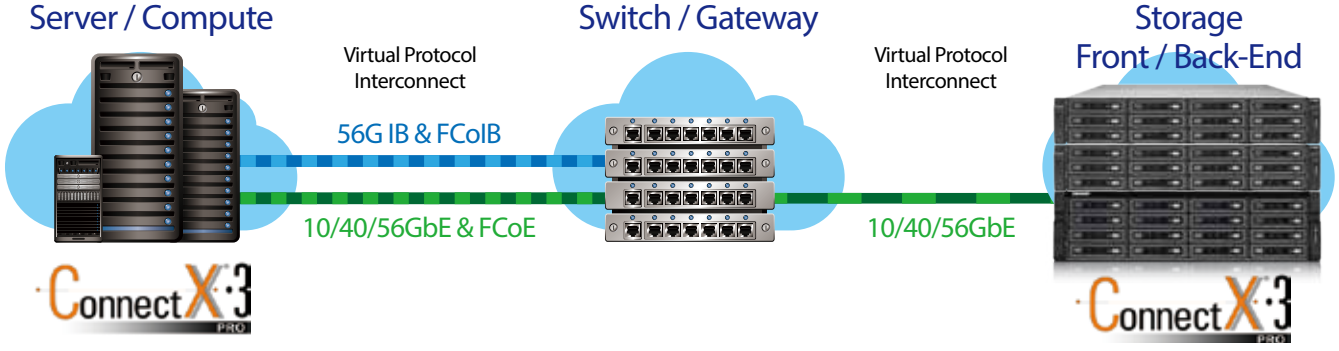
hardware based isolation, security and QoS

Virtual Protocol Interconnect

VPI enables seamless operation over any converged network

Building a fast storage network is THE way to go

- 56GbE for storage network, 40GbE to the existing network
- Improved isolation (much easier to troubleshoot)
- Low latency (core switches are slow, typically store & forward)



10/40GbE Application

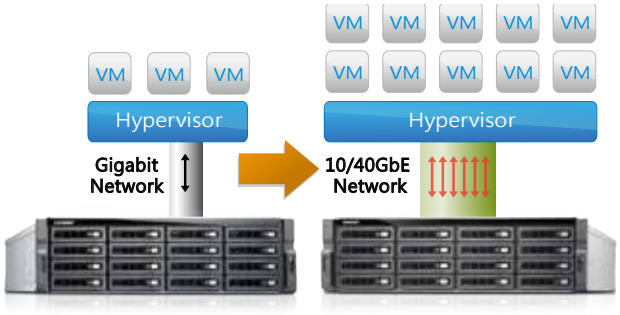
10/40GbE NAS Solution

A 10/40GbE (10/40 Gigabit Ethernet) network is essential for businesses that demand high bandwidth for virtualization and fast backup and restore for an ever-growing amount of data. QNAP's 10/40GbE Turbo NAS series is an affordable and reliable storage solution for deploying a 10GbE environment

10/40GbE Virtualization Solution

Robust storage solution for virtualized data centers

Application and processing requirements constantly evolve demanding ever increasing performance from storage infrastructure. The advent of IaaS has further accelerated the need for high performance storage to the point of making high performance storage an enterprise baseline requirement. QNAP NAS offers class leading hardware matched with unparalleled 10/40Gb speed for all virtualization needs. The 10/40Gb throughput dramatically increases the agility of data transmission in virtualized environments and intensifies NFS and iSCSI connection performance..



Benefits of QNAP super-high-speed Turbo NAS:

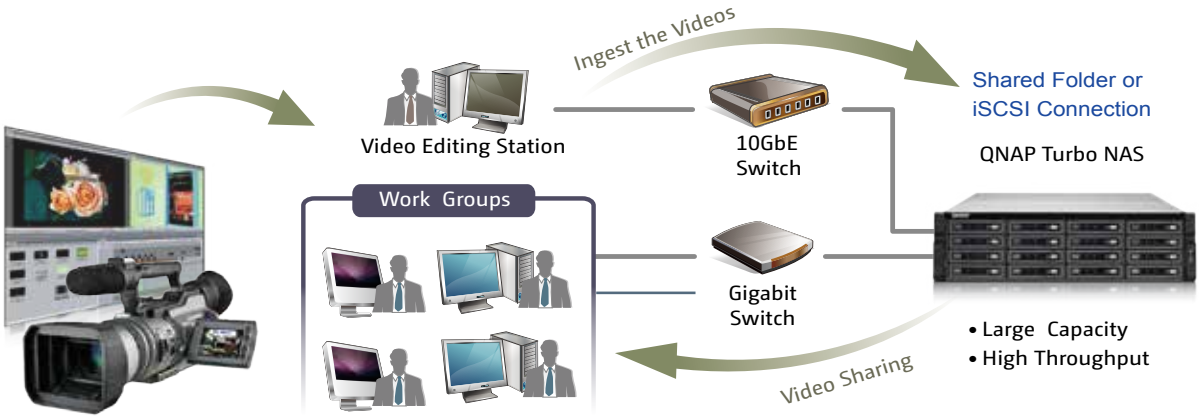
- Leverage all the benefits from virtualization technology
- Deploy the virtualization environment with flexibility
- Improve work continuity

Video Editing Solution

QNAP 10GbE NAS is an ideal solution for a digital video workflow

Digital film and video production produces volumes of data that require high performance RAID storage with sustainable throughput to balance with the demanding output of video editing. QNAP NAS fulfill storage and video editing needs with a high-speed 10GbE network interface. Digital videos can be quickly stored and edited on the QNAP NAS directly over the network.

QNAP NAS support various network file sharing protocols such as NFS, AFP, and SMB/CIFS, so sharing files among PCs with different operating systems is trivial. The scalable design of QNAP NAS allows for capacity to be expanded on the fly so your QNAP NAS can grow as the business data does.



QNAP 12Gbps SAS JBOD Expansion Enclosure

SME (small and medium-sized enterprises) do not usually acquire all storage assets at once. Instead, SME need a flexible storage system which provides high scalability and capability of agile data migration to efficiently handle the unpredictable and explosive growth of storage in business-critical environments.

QNAP scale-up solutions

QTS storage management coupled with QNAP scale-up solutions enables businesses to balance costs and benefits when deploying storage systems for large scale data storage.

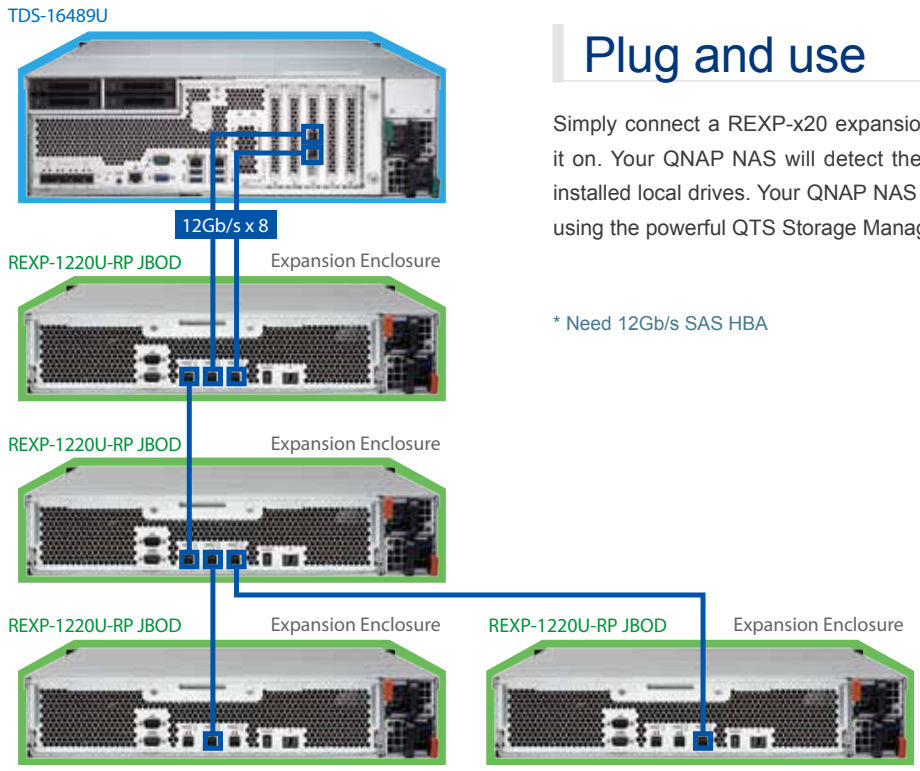
QNAP NAS business series supports QNAP RAID expansion enclosures to expand the total storage of over 1000TB raw capacity*. The RAID expansion enclosures support Missing Mode protection to ensure data protection.

Available maximum raw capacity is varied by NAS models.

QNAP 12Gbps SAS Expansion Enclosure

The QNAP REXP-1220/1620 expansion enclosure is designed for expanding the storage space on a QNAP NAS by connecting multiple expansion enclosures via high-speed mini SAS cables. This is especially useful for large data applications, such as video surveillance, data archiving, and TV broadcast storage. Featuring a 12 Gbps SAS interface on the chassis, the REXP-1220/1620 ensures fast data pass-through from 12 Gbps SAS-enabled QNAP NAS even when using 6Gbps hard drives.

Use 12Gb/s SAS HBA

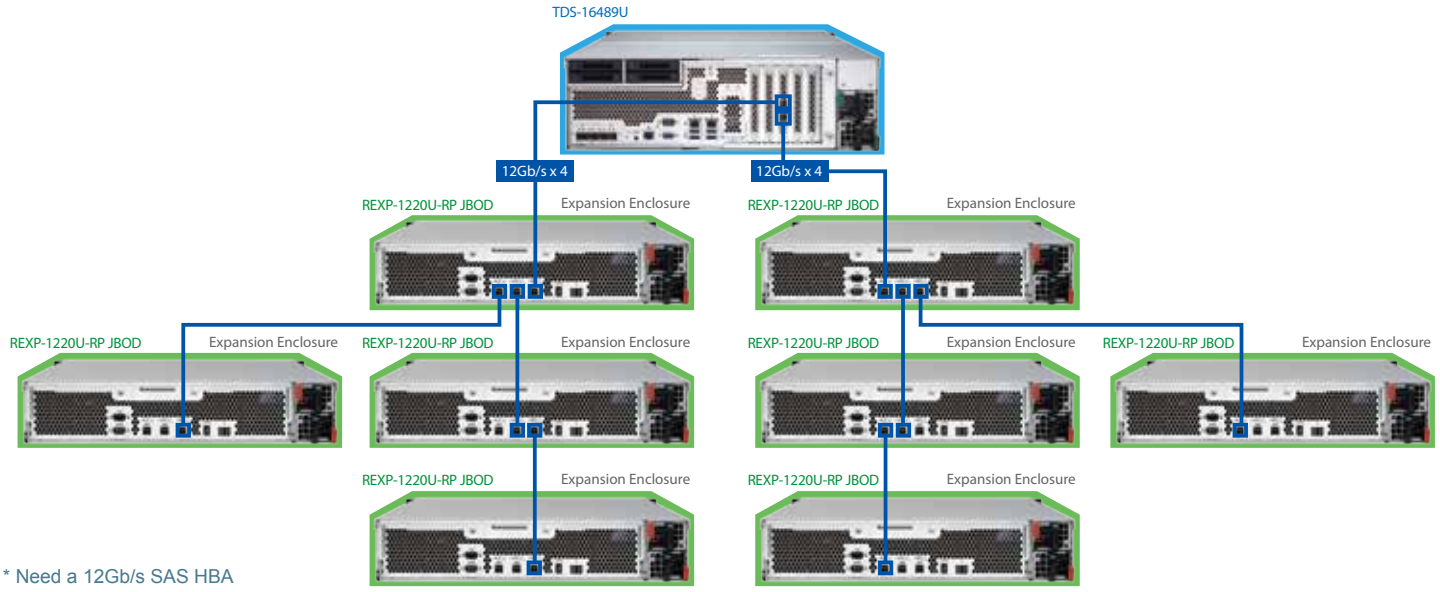


Plug and use

Simply connect a REXP-x20 expansion enclosure to a QNAP NAS and power it on. Your QNAP NAS will detect the hard drives in the REXP-x20 as newly installed local drives. Your QNAP NAS capacity can be managed seamlessly by using the powerful QTS Storage Manager.

* Need 12Gb/s SAS HBA

Use 12Gb/s SAS HBA



* Need a 12Gb/s SAS HBA

Seamless capacity expansion

The TDS-16489U series supports online capacity expansion by cascading multiple QNAP RAID expansion enclosures to meet the needs of growing business data. With the QNAP scale-up solution, total storage capacity can be gradually expanded on demand. It is especially useful for large data applications, such as video surveillance, data archiving, and TV broadcast storage.

Missing mode protection

When the disconnection of a RAID expansion enclosure is detected, QNAP NAS will block IO access to protect data. The system can recover from the missing mode to the normal state with data remaining intact.

Flexible drive type and capacity

The REXP-1620/1220 offers high flexibility in hard drive selection. IT administrators can choose enterprise-level SAS HDDs with high performance and high reliability for mission-critical applications, low-cost but high-capacity SATA HDDs for large data archiving, or high-speed and high stability SSDs for I/O-intensive operations.

SAS 2.5″/3.5″ **SATA 2.5″/3.5″** **SSD**

The maximum raw storage capacity available by connecting QNAP expasion enclosures:

Turbo NAS Model	TDS-16489U
Maximum number of connected REXP-1620U-RP	8
Maximum number of hard drives	144
Max. Raw Capacity	1152TB

The maximum capacity is calculated by using 8 TB 3.5" HDDs & 1 TB 2.5" HDDs.

Hardware specifications

Model	TDS-16489U-SA1 (E5-2620 2.4GHz hex-core CPU, 64GB DDR4 RDIMM)	TDS-16489U-SA2 (E5-2620 2.4GHz hex-core CPU, 128GB DDR4 RDIMM)
	TDS-16489U-SB2 (E5-2630 2.4GHz octa-core CPU, 128GB DDR4 RDIMM)	TDS-16489U-SB3 (E5-2630 2.4GHz octa-core CPU, 256GB DDR4 RDIMM)
CPU	Intel® Xeon® E5-2600 v3 Family Processors A Intel® Xeon® 6 core Processor E5-2620 v3 (15M Cache, 2.40 GHz) B Intel® Xeon® 8 core Processor E5-2630 v3 (20M Cache, 2.40 GHz) C Intel® Xeon® 4 core Processor E5-2623 v3 (10M Cache, 3.00 GHz, 4 core) ** D Intel® Xeon® 8 core Processor E5-2640 v3 (20M Cache, 2.60 GHz) **	
Memory (RAM)	System memory: RDIMM / LRDIMM Total memory slots: 16 Memory expandable up to: 1 TB (64 GB x 16)	

Model Naming Convention

TDS-16489U-SA1

HDD/SSD Interface	CPU	Memory
S: SAS interface	A : E5-2620 V3 B : E5-2630 V3 C : E5-2623 V3 D : E5-2640 V3	1: 64GB (8GB x 8 = 64GB RDIMM) 2: 128GB (16GB x 8 = 128GB RDIMM) 3: 256GB (32GB x 8 = 256GB RDIMM) 4: 512GB (64GB x 8 = 512GB RDIMM) 5: 1TB (64GB x 16 = 1TB RDIMM)

USB 2.0 / 3.0	2/2
Internal Hard Drive and Type	16 x 3.5"SAS (12Gbps/6Gbps) / SATA (6Gbps/3Gbps) HDDs · or 2.5"SAS/SATA SSD 4 x 2.5"SAS (12Gbps) SSD or SAS/SATA (6Gbps/3Gbps) SSD
Max. Raw Capacity	128TB
Interface	SAS 12Gb/s backward-compatible to SAS/SATA 6Gb/s
10/100/1000 Mbps	2
10Gbps	4 x SFP+, Intel XL710
PCIe slot	4 (3 x PCIe Gen3 x8, 1x PCIe Gen3 x16)
Cache	M.2 Gen.2x4
Form Factor	3U, Rackmount
Dimensions (HxWxD) mm	88(H) x 442.5(W) x 530.5(D) mm
Power	650W (Redundant)
Fan	Smart Fan 4 (6cm 12V DC)
Weight (Net/Gross) kg	Net (NAS) : 22.42 kg/ 49.43 lb Gross (with accessories and package) : 30.19 kg/ 66.56 lb
Noise	Sound Pressure Level (LpAm): 64.8 dB
Power Consumption	Sleep mode: 254.21 W In Operation: 362.86 W

Design and specifications are subject to change without notice.

* The standard system is shipped without hard drives. Check https://www.qnap.com/i/useng/product_x_grade/index.php for HDD compatibility list.

** with Customization options

JBOD Hardware specifications

Model	REXP-1620U-RP	REXP-1220U-RP
Form Factor	3U rack mount	2U rack mount
Host Interface	Three SAS 12Gbps 4x wide port	
LED Indicators	Front panel: Status, fault, system over heat, fan error Rear panel: SAS link, SAS error, enclosure ID	
Dimensions (DxWxH) mm	130x 442.4 x 528.3 mm	88 x 439x 520 mm
Weight (Net/ Gross) kg	18.14 kg / 25.92 kg 39.99 lb / 57.14 lb	18.14 kg / 25.92 kg 39.99 lb / 57.14 lb
Max. number of HDDs/SSDs supported	16	12
Hard Drive Type	3.5" SAS/SATA 12/6Gb/s, SAS/SATA 3Gb/s hard drive or 2.5" SAS/SATA SSD	
Humidity	0-40˚C	
Power Supply Specification	5~95% RH non-condensing, wet bulb: 27˚C.	
Management	Redundant/ Hot Swap ATX Power Supply, 650W, 90-240Vac~, 50-60Hz	
Management	Managed via QNAP QTS OS 1. Supports disk S.M.A.R.T. information 2. RAID expansion enclosure identifier 3. Locate RAID expansion enclosures 4. Locate hard disks on RAID expansion enclosure 5. Smart fan control by detecting system and hard drive temperature 6. In-band SAS firmware update	

Accessories

Category		Order P/N	Description
SAS Card		SAS-12G2E-U	Dual-wide-port storage expansion card, SAS 12Gbps
Rail kit		RAIL-A03-57	A03 series (Chassis) rail kit, max. load 57kg
RAM		RAM-8GDR4-RD-2133	8GB DDR4 RDIMM, 2133MHz
		RAM-16GDR4-RD-2133	16GB DDR4 RDIMM, 2133MHz
		RAM-32GDR4-RD-2133	32GB DDR4 RDIMM, 2133MHz
Cable		CAB-SAS10M-8644	MiniSAS external (SFF-8644 to SFF-8644), 1.0m
		CAB-SAS05M-8644	MiniSAS external (SFF-8644 to SFF-8644), 0.5m

External adapter compatibility list

Category		Description
PCIe SSD		Intel® SSD DC P3700 Series (1/2 Height PCIe 3.0, 20nm, MLC)
		Seagate PCIe SSD Nytro® XP6302
Graphic Cards		AMD Radeon™ R7 and R9 series graphic cards
Intel® QuickAssist Adapter		Intel® QuickAssist Adapter 8950

Design and specifications are subject to change without notice.

10/40GbE NIC compatibility list

10GBASE-T Interface

Category		Order P/N	Description
QNAP		LAN-10G2T-U	Dual-port 10 GbE network expansion card for rack mount model, low-profile bracket, cat6A cable
Emulex		Oce11102-NT	Dual-port 10GbE network expansion card for rackmount models, cat6A cable
Intel		X520-T2 (E10G42BT)	Dual-port 10GbE network expansion card for tower models, desktop bracket, cat6A cable

SFP+ OPTIC Interface

Category		Order P/N	Description
QNAP		LAN-10G2SF-MLX-U	Dual-port 10 Gigabit network adapter
Emulex		OCe11102-NM	Dual-port 10 Gigabit network adapter, short range optical cable
		OCe11102-IM	
Intel		X520-SR2 (10G42BFSR)	

SFP+ DAC (Direct Attach Copper) Interface

Category		Order P/N	Description
Emulex		OCe11102-NX	Dual port 10 Gigabit network adapter, SFP+ direct attach copper cable
		OCe11102-IX	
Intel		X520-DA2 (E10G42BTDA)	

QSFP Interface

Category		Order P/N	Description
QNAP		LAN-40G2SF-MLX-U	Dual port QSFP 40 Gigabit network adapter

Software Specifications

Operating System
- QTS 4.2 (embedded Linux)

Supported Clients
- Windows 7 (32/64-bit), Windows 8 (32/64-bit), Windows Server 2003/2008 R2/2012/2012R2
- Apple Mac OS X
- Linux & UNIX

Supported Browsers
- Google Chrome
- Microsoft Internet Explorer 10+
- Mozilla Firefox 8+
- Apple Safari

Multilingual Support
- 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

File System
- Internal Hard Drive: EXT4
- External Hard Drive: EXT3, EXT4, NTFS, FAT32, HFS+

Networking
- TCP/IP (IPv4 & IPv6: Dual Stack)
- Quad Gigabit NICs with jumbo frame (failover, multi-IP settings, port trunking/NIC teaming)
- Service binding based on network interfaces
- Squid Proxy server
- Proxy client
- DHCP client, DHCP server
- Protocols: CIFS/SMB, AFP (v3.3), NFS(v3), FTP, FTPS, SFTP, TFTP, HTTP(S), Telnet, SSH, iSCSI, SNMP, SMTP, and SMSC
- UPnP & Bonjour Discovery

Security
- Network access protection with auto-blocking: SSH, Telnet, HTTP(S), FTP, CIFS/SMB, AFP
- CIFS host access control for shared folders
- FIPS 140-2 validated AES 256-bit volume-based data encryption*
- AES 256-bit external drive encryption*
- Importable SSL certificates
- Instant alert via E-mail, SMS, beep, push service, and LCD panel**
- 2-step verification

* SomeThe data encryption functions may not available in accordance with the legislative restrictions of some countries.

Storage Management
- QNAP flexible Volume/LUN with thin provisioning and space reclaim
- RAID 0,1, 5, 6, 10, + hot spare
- Supports storage pool*
- Support snapshot (4GB System RAM required)*
  -Support Volume/LUN snapshot*
  -Snapshot manager*
  -Snapshot clone*
  -Snapshot vault*
  -Snapshot replica*
  -Snapshot Agent for Windows VSS and VMware*
- Online volume expansion
- Online storage pool expansion
- Online RAID capacity expansion and online RAID level migration
- SMART data migration
- Storage expansion
- JBOD enclosure roaming
- SSD read-only/read-write cache
- Bad block scan and hard drive S.M.A.R.T.
- Bad block recovery
- RAID recovery
- Bitmap support

Power Management
- Wake on LAN
- Internal hard drive standby mode
- Scheduled power on/off
- Automatic power on after power recovery
- USB and network UPS support with SNMP management

Access Right Management
- Batch users creation
- Import/export users
- User quota management
- Local user access control for CIFS, AFP, FTP, and WebDAV
- Application access control for Photo Station, Music Station, Video Station, and Multimedia Station
- Subfolder permissions support for CIFS/SMB, AFP, FTP, and File Station

myQNAPcloud Service
- Private cloud storage and sharing with myQNAPcloud id (QID)
- Free host name registration (DDNS)
- Auto router (via UPnP) configuration
- Web-based file manager with HTTPS 2048-bit encryption
- Cloudlink for remote access without complicated router setup
- myQNAPcloud connect for easy VPN connection (Windows VPN utility)

Qsync
- Syncs files among multiple devices with SSL support
- Selective synchronization for syncing specific folders only
- Share team folder as a file center for team collaboration (Maximum sync tasks: 32)
- Shares files by links via emaile-mail
- Policy settings for conflicted files and file type filter support
- Version control: up to 64 versions.
- Incremental synchronization for HDD space saving
- Unified privilege management
- Unified configuration management
- Support central configuration mode
- Support remote erase / restore
- Support shared folders sync
- Supports Windows & Mac OS

Web Administration
- Multi-window, multi-tasking based system management
- Movable Icons and personalized desktop
- Smart toolbar and dashboard for neat system status display on system status
- Smart fan Control
- Dynamic DNS (DDNS)
- SNMP (v2 & v3)
- Resource monitor
- Network recycle bin for file deletion via CIFS/SMB, AFP, and File Station
  - Automatic Cleanup
  - File Type Filter
- Comprehensive logs (events & connection)
- Syslog client/server
- System settings backup and restore
- Restore to factory default
- Mobile app: Qmanager for remote system monitoring & management

File Server
- File Sharing across Windows, Mac, and Linux/UNIX
- Windows ACL
- Advanced folder permission for CIFS/SMB, AFP, FTP
- Shared folder aggregation (CIFS/SMB)

FTP Server
- FTP over SSL/TLS (Explicit)
- FXP support
- Passive ftp port range control

File Station
- Support mount Cloud Drive (such as Google Drive, Dropbox, Microsoft OneDrive, Amazon Cloud Drive, Yandex Disk and Box)
- Support mount remote shared folder through FTP, WebDAV or Microsoft networking (SMB/CIFS)
- Supported open office document via Office Online, Google Docs or Chrome Extension (Edit Office files in Google Docs, Sheets, and Slides)
- Supports ISO Mounting (Up to 256 ISO Files)
- Supports thumbnail display of multimedia files
- Supportsed sharinge download links and upload links
- Drag-n-drop Files via Google Chrome and Mozilla Firefox Browsers
- Photo, music, and video preview and playback with hardware- accelerated transcoding
- File Compression (ZIP or 7z)
- Creation of and sending download links for sharing public files with expiration time and password protection
- Support for displaying subtitles display (*.SRT, UTF-8 format)
  - Video seeking support for video playback during on-the-fly transcoding
  - Support slideshow playback in media viewer
- Mobile App: Qfile for file browsing and management)

Backup Station
- Remote replication server (over rsync)
- Real-time remote replication (RTRR) to another QNAP NAS or FTP server
- Works as both RTRR server & client with bandwidth control
- Real-time & scheduled backup
- Backup versioning for RTRR
- Encryption, compression, file filter, and transfer rate limitation
- Encrypted replication between QNAP NAS servers
- Desktop backup with QNAP NetBak Replicator for Windows
- Apple Time Machine backup support
- Data backup to multiple external storage devices
- Third party backup software support: Veeam backup & replication, Acronis True Image, Arcserve backup, EMC retrospect, Symantec Backup Exec, etc.

Cloud Storage Backup
- Amazon S3
- Amazon Glacier
- WebDAV-based cloud storage
- Microsoft Azure
- Open Stack
- Google Drive
- Dropbox
- ElephantDrive
- Symform

Print Server
- Max. number of printers: 3
- Support for Internet Printing Protocol
- Print job display and management
- IP-based and domain name-based privilege control

Virtualization Station
- Support Virtual Machine (VM) creating to run an operating system such as Windows, Linux, Unix and Android
- Support VM import and export
- Support VM clone
- Support VM snapshot
- Support VM backup and restore
- VM console can be displayed via HDMI output - QVM
- HTML5-based shared remote console

Signage Station
- Supports dynamic content includinges videos, images, music, and text messages
- Supports multi- users collaboration
- Supports searching via keywords,
- Supports sharing via email and social networks sharing
- Supports design software - iArtist Lite
- Supports account authority management
- Supports various web browsers for playback (Chrome, Firefox, IE, Safari)
- Supports most- viewed, latest- released and different categories content list

iSCSI (IP SAN)
- iSCSI target with multi-LUNs per target (Up to 256 targets/LUNs combined)
- Support for LUN mapping & masking
- Online LUN capacity expansion
- Support for SPC-3 persistent reservation
- Support for MPIO & MC/S
- iSCSI LUN backup, one-time snapshot, and restoration
- iSCSI connection and management by QNAP Windows Qfinder
- Virtual disk drive (via iSCSI initiator)
- Stack chaining master
- Max No. of virtual disk drives: 8

Server Virtualization & Clustering
- Server Virtualization & Clustering
- VMware vSphere (ESXi 5.x)
- VMware VAAI for iSCSI and VAAI for NAS
- vSphere Plug-in
- Citrix XenServer (6.2)
- Windows Server 2012 R2 Hyper-V
- Supports Microsoft ODX
- QNAP SMI-S provider for Microsoft SCVMM

Surveillance Station
- Supports over 2,100 IP ip cameras
- Includes 8 free camera licenses, up to 80 camera channels via additional license purchase
- Instant playback to check the recent events
- Online editing to change edit cameras when in live view
- Visual aid by using e-maps
- Playback and speed control by shuttle bar
- Video preview using on playback timeline
- Intelligent Vvideo Aanalytics (IVAiva) for advanced video search
- Surveillance client for Mac
- Mobile surveillance app: Vvmobile (iOS and Android)
- Mobile recording app: Vvcam (iOS and Android)

Notes Station
- A handy Note-taking tool for everywhere you go on your private cloud.
- Direct and quick backup from Evernote with re-editing availability
- Support Google Calendar
- Import/Export PDF file available
- RSS live feed and auto update
- Online quick preview multimedia attachments available
- Notes encrypt/decrypt available
- Smart snapshot for version control
- Background task available for multi-tasks users
- Collaborate notes with multi users
- Support graphical editor for note editing
- Three tiers Note structure for easy organizing
- Support keyword search
- Collaborate notes with multi users
- Provide Chrome Extension: Notes Station Clipper (Clip web page content to your note)

VPN Server
- Secure remote access: PPTP、L2TP/IPsec & OpenVPN VPN services
- Max number of clients: 30

VPN Client
- Supported VPN protocols: PPTP & OpenVPN services
- PPTP Authentication: PAP, CHAP, MS-CHAP, MS-CHAPv2
- PPTP Encryption: None, AES 40/128 bit, AES 256 bit
- OpenVPN Encryption: None, AES 40/128 bit, AES 256 bit
- Transmission package monitor
- OpenVPN port control
- OpenVPN link compression

Domain Authentication Integration
- Microsoft Active Directory (AD)
- Domain controller
- LDAP server, LDAP client
- Domain users login via CIFS/SMB, AFP, FTP, and File Station

AirPlay & Chromecast
- Streams videos, photos and music from the NAS to Apple TV via Qfile or QAirPlay&Chromecast's web-based controller
- Streams videos, photos and music from the NAS to TV with a Chromecast dongle via Qfile , Qvideo or QAirPlay&Chromecast's web-based controller

App Center
- More than 100 official and community software add-ons (ex: Dropbox, Google Drive Sync, McAfee, WordPress, HappyGet II, etc.)
- Photo Station
- Music Station
- Video Station
- iTunes Server
- DLNA Server
- AirPlay: Streams videos, photos and music from NAS to Apple TV via Qfile or QAirPlay's web-based controller
- Digital TV Station
- Download Station
- HD Station + XBMC media player + Google Chrome

Mobile Apps
- Qfile: iOS, Android, Windows Phone 8+
- Qfile HD: iPad version
- Qmanager: iOS, Android
- Qmusic: iOS, Android
- Qremote: iOS, Android
- Qget: Android
- Vmobile: iOS, iPad, Android

PC Utilities
- Qfinder: Windows, Mac, Linux
- myQNAPcloud Connect: Windows
- Qsync: Windows, Mac
- NetBak Replicator: Windows
- QGet: Windows, Mac, Linux
- vSphere Client plug-in: Windows
- Qsnap: Windows

Q'center (NAS CMS)
- Multiple NAS monitoring
- Utilization history reports
- Unified configuration management
- Visual display reports
- Monitor NAS behind NAT router with Q'center Assistant
- Virtual appliances supported for Hyper-V and VMware

Design and specifications are subject to change without notice.

The harmonious integration of Application Server + Storage Server

TDS-16489U

Virtualization has faced many challenges, in particular the underlying infrastructure.
QNAP accepted this challenge and provides a comprehensive solution: Application Server + Storage Server

Hypercoverged NAS with License-Free Virtualization

Instant deployment without prior knowledge requirements. Stellar performance with server-grade CPU and capacious memory. Support for third-party high-availability data protection and storage virtualization solutions. Abundant expansion opportunities with NVMe PCIe SSD and PCIe graphics cards. Built-in Software-defined Networking (vSwitch) for VMs with 1GbE/10GbE to negate network latency.

Built-in with multiple storage and virtualization applications

Virtualization Station
QNAP proprietary virtualization

QPulse™
Unified Server Management Solution

Snapshot
Efficiently reduces space for backup

Software Container
The new era of virtualization and cloud computing

Qtier™
QNAP's auto-tiering technology

Hybrid Backup Solutions
Consolidated backup solutions

QNAP Systems, Inc.

TEL : +886-2-2641-2000 FAX : +886-2-2641-0555 Email: qnapsales@qnap.com
Address : 3F, No.22, Zhongxing Rd., Xizhi Dist., New Taipei City, 221, Taiwan

Netherlands (Warehouse Services)
Email : nlsales@qnap.com
TEL : +31(0)107600830

Germany
Email : desales@qnap.com
TEL : +49-89-381562991

China
Email : cnsales@qnap.com.cn
TEL : +86-400-628-0079

India
Email : indiasales@qnap.com

US
Email : usasales@qnap.com
TEL : +1-909-595-2782

Thailand
Email : thsales@qnap.com
TEL : +66-2-5415988

51000-023926-RS
201512 (ENG) B