QNAP

Application Server ➕ Storage Server

TDS-16489U
Hyperconverged Enterprise NAS

Storage Server

Application Server
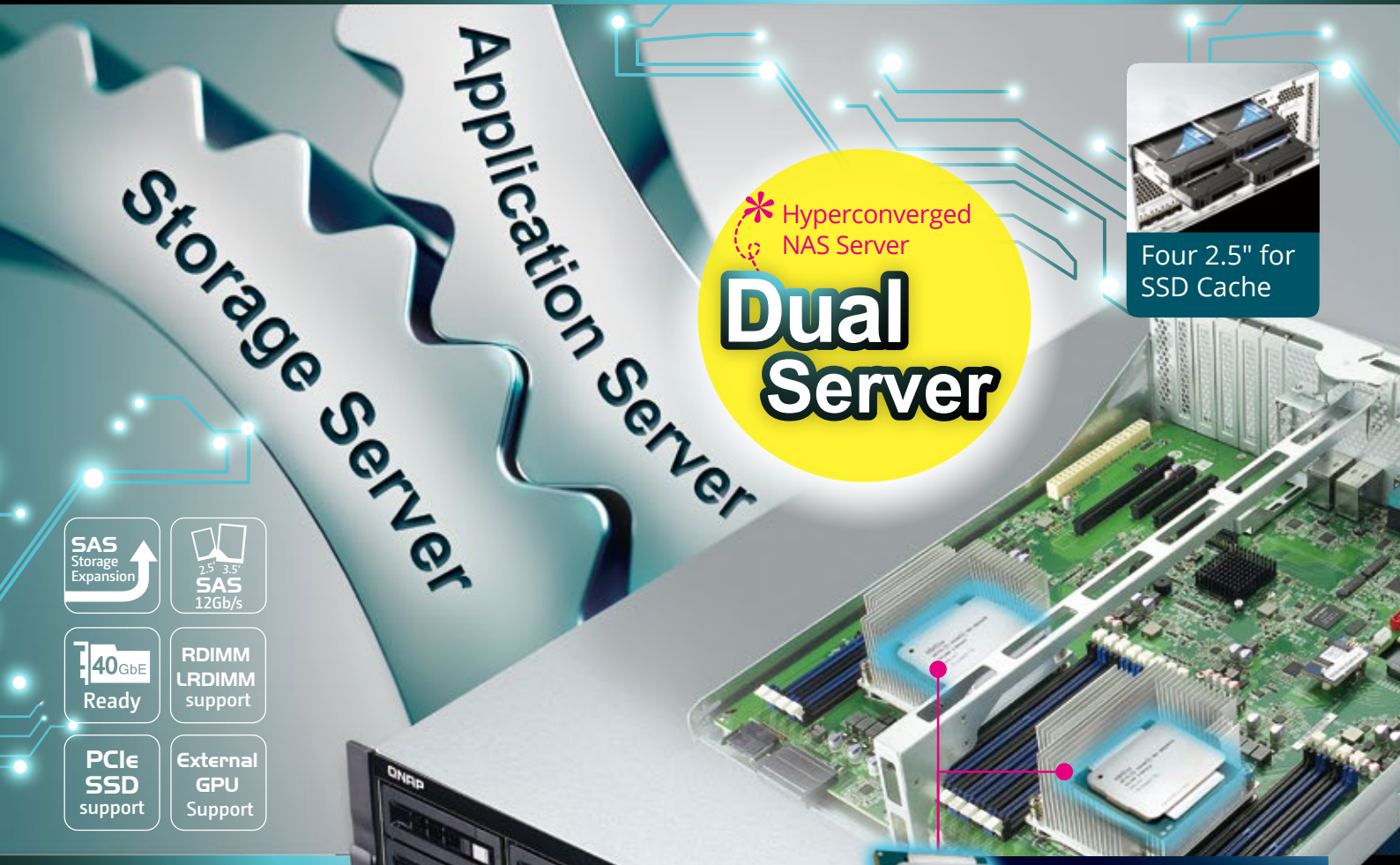
✳ Hyperconverged
NAS Server

Dual Server

Four 2.5" for SSD Cache

SAS Storage Expansion

2.5" 3.5'
SAS 12Gb/s

40GbE Ready

RDIMM LRDIMM support

PCIe SSD support

External GPU Support

QNAP

x2

Industry-leading Compute
Dual Intel® Xeon® E5-2600 v3
Data-Center Server CPUs

intel inside™
Xeon®

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

PCIe SSD NVMe
Offers the best random read performance

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

Double-Take® Availability™ Disaster Recovery

Comprehensive high availability and data protection

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

TDS-16489U
Hardware Architecture

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

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

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

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
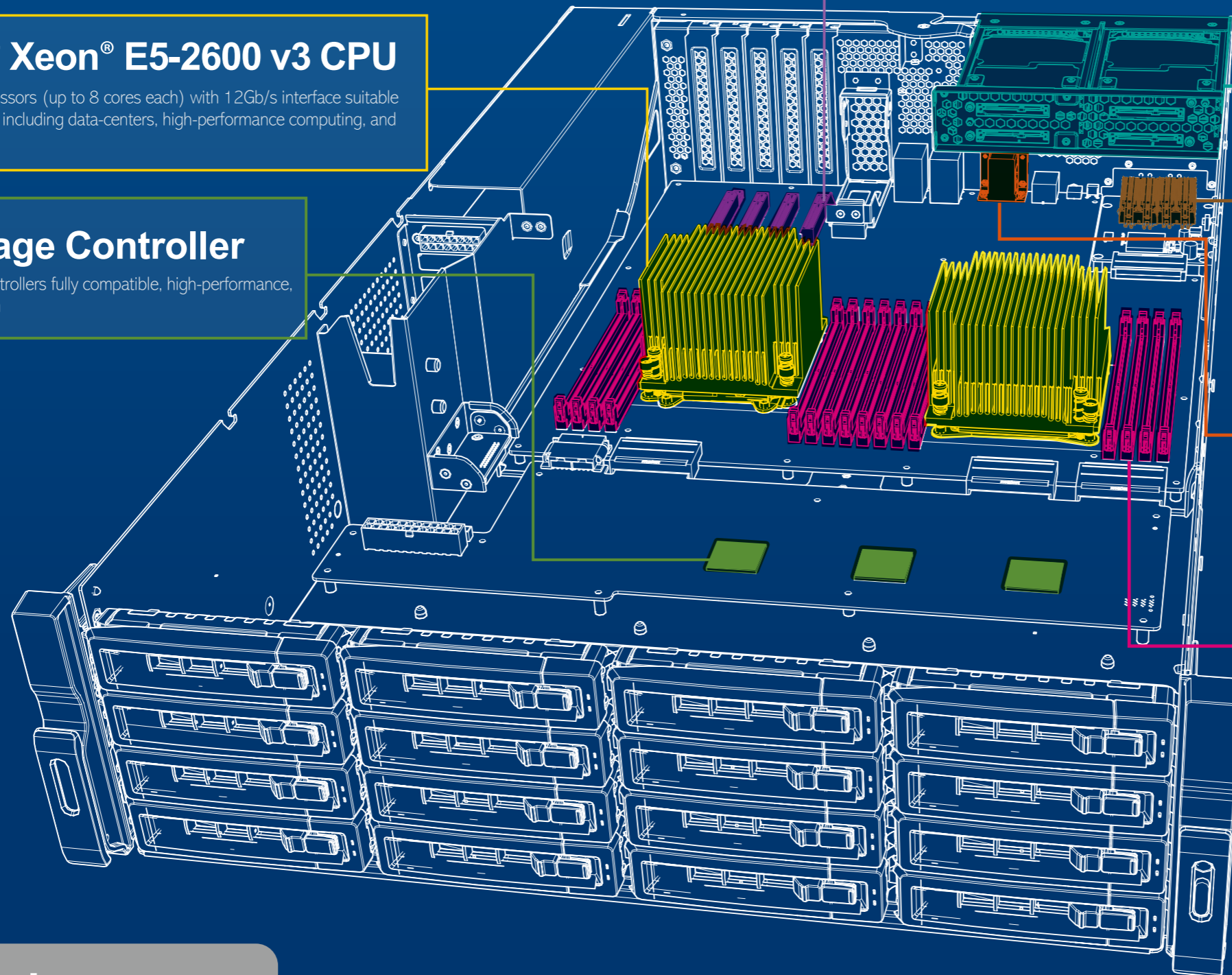Dedicated flash cache

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

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.
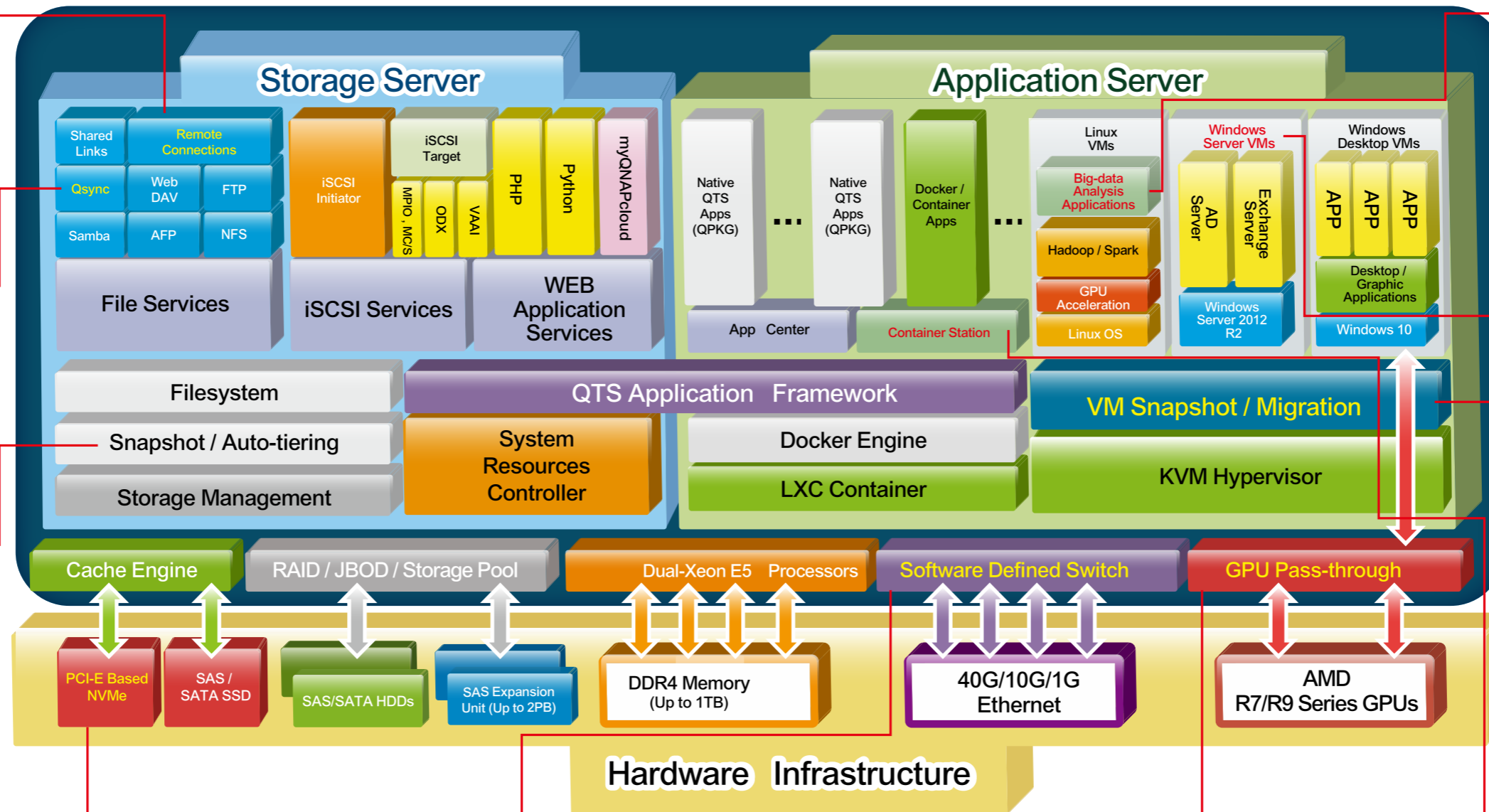
Big Data Analytics

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 maintenance of running multiple servers.

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.

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.
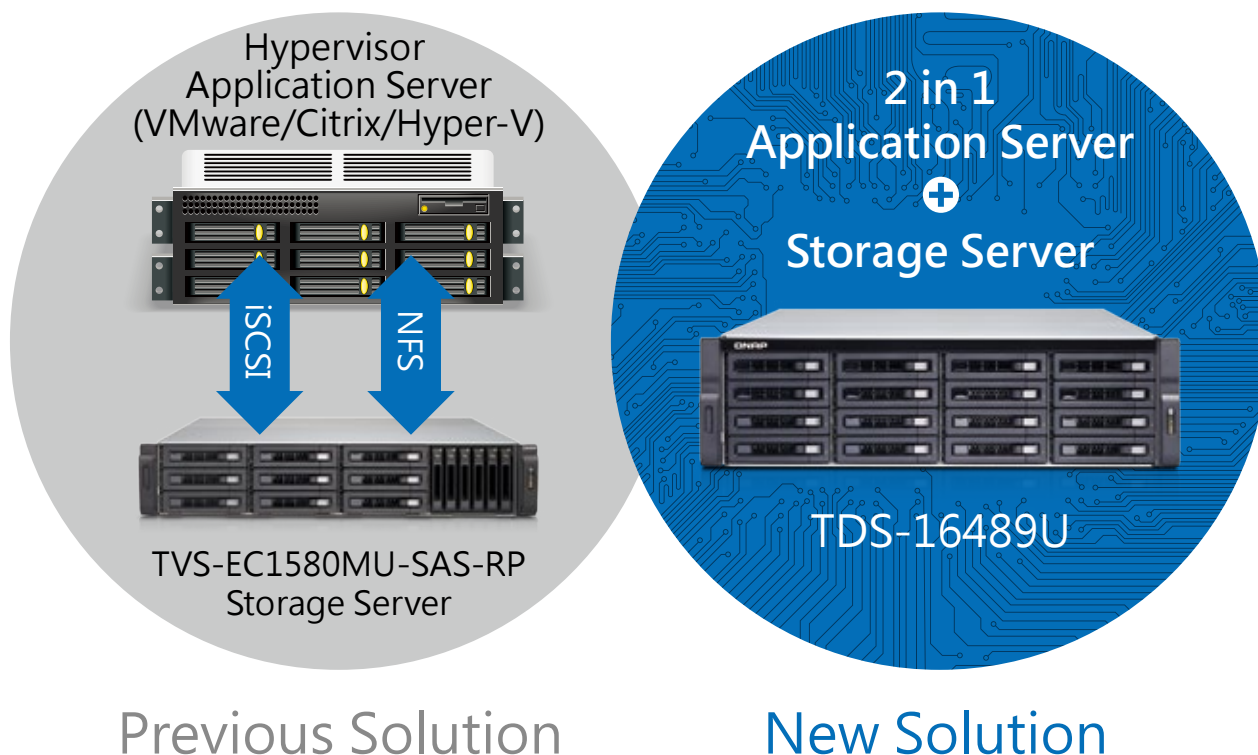
GPU Pass-through

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*.

Storage Server

- Shared Links
- Remote Connections
- Qsync
- Web DAV
- FTP
- Samba
- AFP
- NFS
- iSCSI Initiator
- iSCSI Target
- MPIO / MC/S
- ODX
- VAAI
- PHP
- Python
- myQNAPcloud
- File Services
- iSCSI Services
- WEB Application Services
- Filesystem
- Snapshot / Auto-tiering
- Storage Management
- QTS Application Framework
- System Resources Controller

Application Server

- Native QTS Apps (QPKG)
- Native QTS Apps (QPKG)
- Docker / Container Apps
- Linux VMs
- Big-data Analysis Applications
- Hadoop / Spark
- GPU Acceleration
- Linux OS
- Windows Server VMs
- AD Server
- Exchange Server
- Windows Server 2012 R2
- Windows Desktop VMs
- APP
- APP
- APP
- Desktop / Graphic Applications
- Windows 10
- App Center
- Container Station
- Docker Engine
- LXC Container
- VM Snapshot / Migration
- KVM Hypervisor

Hardware Infrastructure

- Cache Engine
- RAID / JBOD / Storage Pool
- Dual-Xeon E5 Processors
- Software Defined Switch
- GPU Pass-through
- PCI-E Based NVMe
- SAS / SATA SSD
- SAS/SATA HDDs
- SAS Expansion Unit (Up to 2PB)
- DDR4 Memory (Up to 1TB)
- 40G/10G/1G Ethernet
- AMD R7/R9 Series GPUs

Hyperconverged NAS Server

Hypervisor Application Server (VMware/Citrix/Hyper-V)

iSCSI

NFS

TVS-EC1580MU-SAS-RP
Storage Server

2 in 1 Application Server ⊕ Storage Server

TDS-16489U

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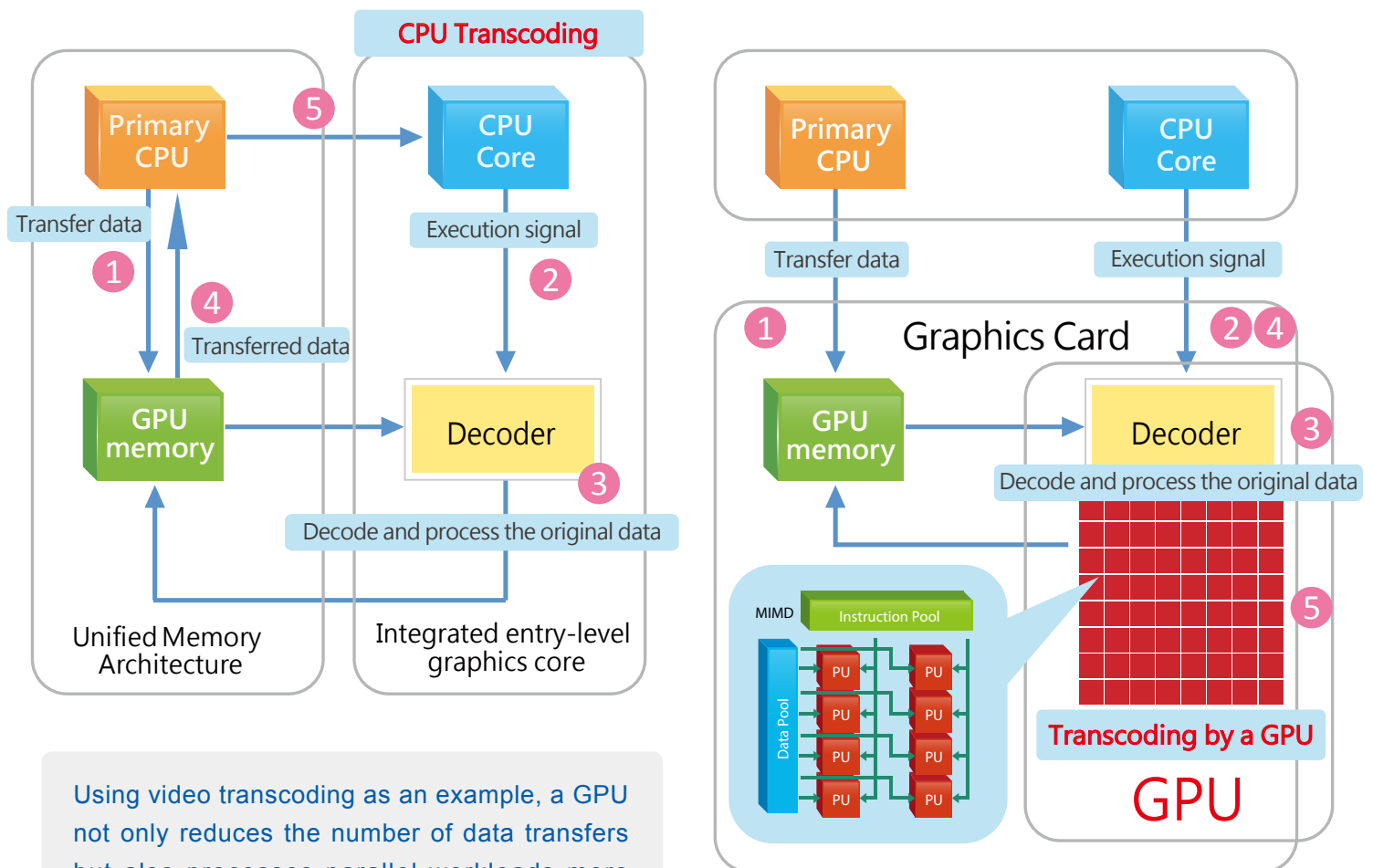
QNAP solve the challenges facing IT administrators: Hyperconverged Server (Application Server + Storage Server).

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.

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.

CPU Transcoding

Primary CPU
5
CPU Core

Transfer data
1
Execution signal
4
Transferred data
2

GPU memory
Decoder
3

Decode and process the original data

Unified Memory Architecture
Integrated entry-level graphics core

Primary CPU
CPU Core

Transfer data
1
Execution signal
2 4

Graphics Card

GPU memory
Decoder
3

Decode and process the original data

MIMD
Instruction Pool
Data Pool
PU PU
PU PU
PU PU
PU PU

Transcoding by a GPU

GPU

5

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.)

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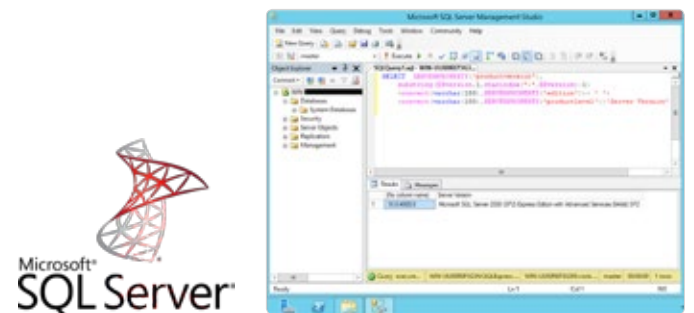
AD (Active Directory), DNS (Domain Name System)

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.
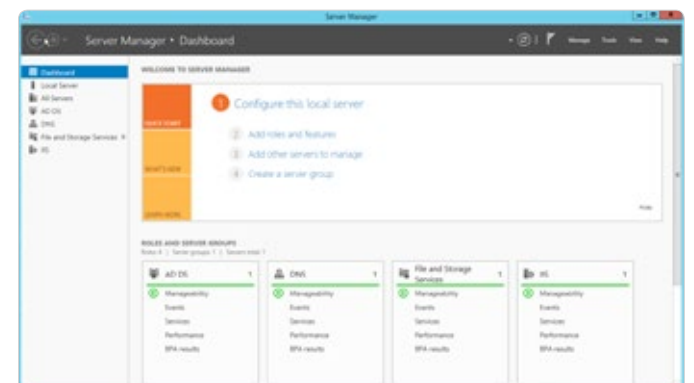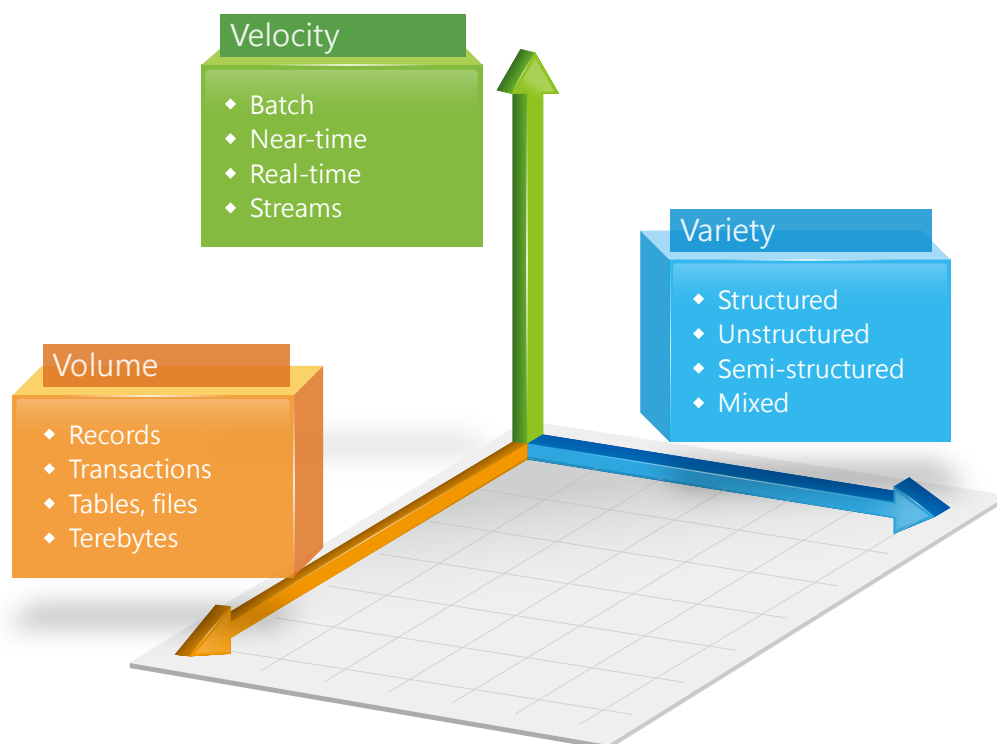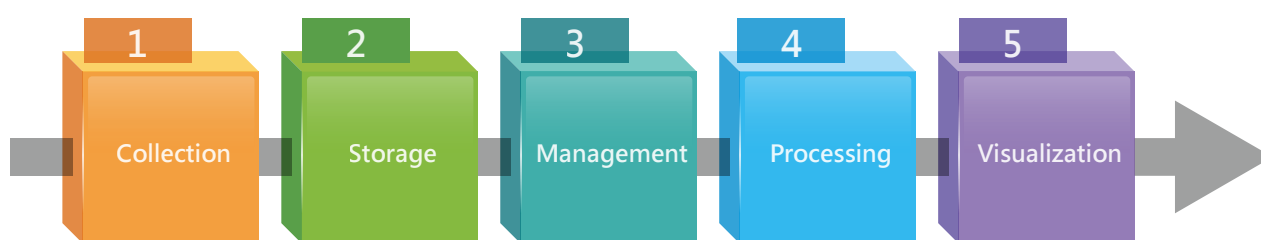
Big Data Storage and Analytics

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.

Velocity
- Batch
- Near-time
- Real-time
- Streams

Variety
- Structured
- Unstructured
- Semi-structured
- Mixed

Volume
- Records
- Transactions
- Tables, files
- Terebytes

5 Phases of Big Data analytics

| 1 Collection	2 Storage	3 Management	4 Processing	5 Visualization

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.
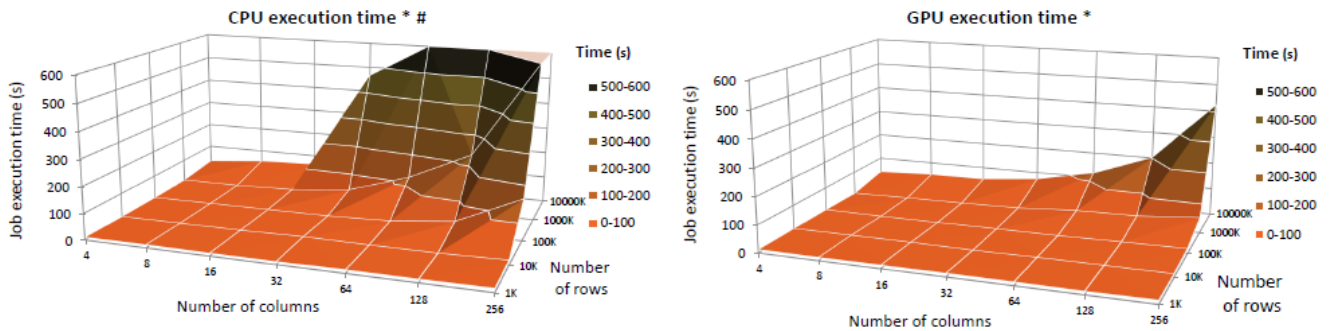
5 Data presentation: The processed data should be presented in a way that helps users gain insights from data to inform decision making. Present your data efficiently by hosting websites on the TDS-16489U or via mobile apps.
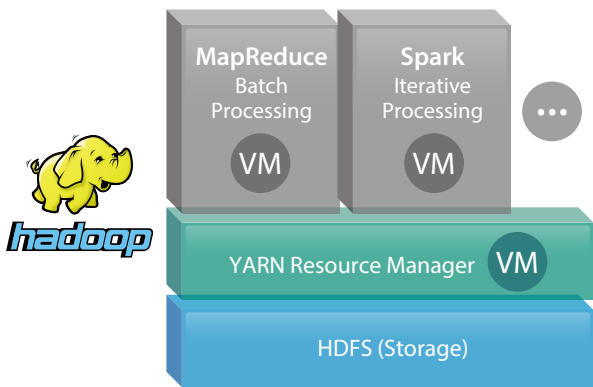
Examples would include analysis of website logs using Hadoop MapReduce or Spark's Machine Learning libraries. The built-in Qtier technology on the TDS-16489U can categorize the data into hot, warm, and cold by analyzing how frequently the data has been accessed so that data can be migrated to nVME, SSD, SAS disks, or SATA expansion enclosures accordingly.
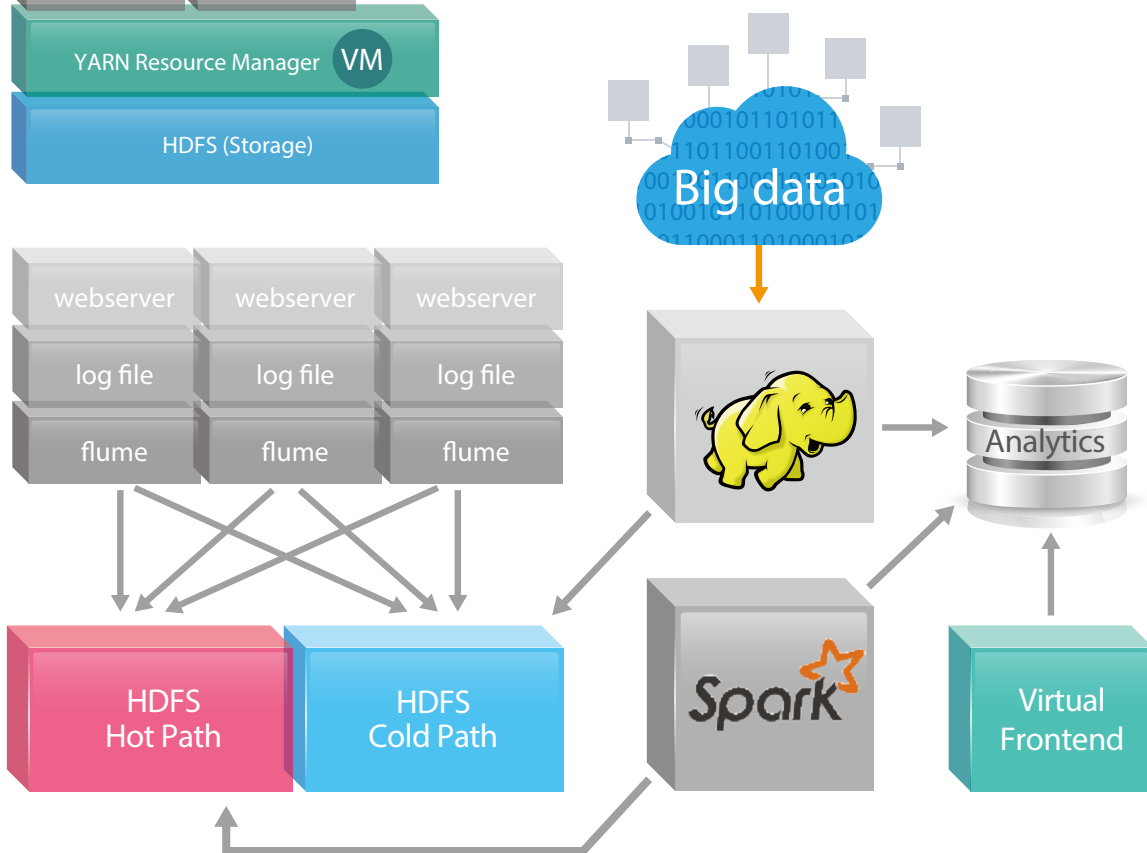
Use Spark Streaming to perform predictive analytics by analyzing a website's workloads, click rates, and data from Global CDN. Dynamically adjusting system resources enables the highest system utilization to be achieved among multiple TDS-16489U units on the local network or across different deployment sites.

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

S: SAS interface

CPU

- A : E5-2620 V3
- B : E5-2630 V3
- C : E5-2623 V3
- D : E5-2640 V3

Memory

- 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

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.

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