Software-defined Storage: an Inevitable Alternative to Traditional SAN or NAS Storage

New dynamics of today's business and unstructured data have pushed the data center storage environment to a new level. It drives the billion dollar storage market through a fundamental structural shift from traditional proprietary storage arrays to new technologies like software defined storage and also pushes forward all of the technologies that support it from storage software itself to hardware components including server platform design, solid state drives (SSD), networking controllers, and so on.

Cloud service providers have been adopting open source software designed to run on standard server hardware to achieve petabyte scale storage capacity. Enterprises are seeking to emulate the efficiency achieved by these public cloud providers and are realizing that traditional SAN or NAS storage is no longer feasible to reliably and dynamically scale-out storage capacity in time. QCT QxStor Red Hat Ceph Storage Edition offers validated and pre-configured hardware and software which combine into a nimble marketplace alternative over historical storage solutions. It is optimized for different workloads, running on QCT ultra dense storage servers, and uses the best of Intel technology for data center storage uses, with the Intel® Xeon® E5-2600 v3 family of processors, Intel® dual port 10GbE network controllers and the Intel® Solid State Drives Data Center Family.

Optimize Ceph* Configurations to Petabyte Scale on QCT Ultra-dense Storage Servers
QCT QxStor Red Hat Ceph Storage Edition: an Optimized Petabyte Scaled Solution for Cloud

QCT is a leader in hyperscale data center technology and now extending this market leadership into the software-defined infrastructure space. QCT has reinvented data center storage technology based on Intel® Xeon® processor platform to design and develop cutting edge storage servers by boosting storage capacity, density and performance, redesigning incredibly scalable hardware for various cloud applications and workloads, and bringing ease of maintenance to the data centers.

QCT QxStor integrates QCT storage servers, Intel technology and Red Hat® Ceph® Storage software, bringing seamless interoperability and optimized performance to data centers. Ceph is open source storage software platform that has a vibrant community, growing market acceptance, and is the number one choice of Open Stack (Cinder) deployments for 2015. It offers a robust, massively scalable and stable platform for both block and object storage that can be used in public clouds or to make a private cloud for an enterprise. It is well suited for rich media, archive, and cloud infrastructure workloads, and when deployed as recommended has no single point of failure.

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Optimal Configuration of QCT Storage Design
QCT QxStor Red Hat Ceph Storage Edition is designed and validated on two storage focused servers optimized either for throughput or cost/capacity: the QuantaGrid D51PH-1ULH, and the QuantaPlex T21P-4U.

QuantaGrid D51PH-1ULH: an Ultra Dense 1U Ceph Building Block
QxStor RCT-200 is configured for optimized data throughput per drive on the QuantaGrid D51PH-1ULH. As Figure 1 shows, it is an ultra dense 1U server with 12x disk drives and 4x SSD, which results in an optimal 1U design for Ceph. The exquisite hot-swappable SSD slots will not sacrifice the HDD spaces, increasing the space utilization rate by 25%, compared to present 1U 3.5'' storage servers in the market.

RCT-200 features the Intel® Xeon® E5-2600 v3 family of processors and Intel 10GbE NICs, resulting in both extreme storage density and the computing power to complete Ceph storage tasks and the necessary networking bandwidth to accelerate throughput. With a 1U enclosure creating an entire

QxStor RCT-200 on QuantaGrid D51PH-1ULH
• Optimized for throughput workloads
• The densest 1U server, providing 4:1 HDD to SSD ratio for best Ceph performance

QxStor RCT-400 & RCC-400 on QuantaPlex T21P-4U
• Optimized for throughput and cost/capacity workloads
• With the highest density up to 620TB capacity per server for Ceph

Figure 1. QCT QxStor Red Hat Ceph Storage Edition offerings – throughput optimized and cost/capacity optimized sku
(building block) ‘node’ in the cluster, it provides a smaller minimum failure domain than most typical Ceph deployments, providing naturally higher reliability and scalability. QuantaPlex T21P-4U Maximizing Storage Capacity at Petabyte Scale

RCC-400 is using QuantaPlex T21P-4U, an optimal configuration for cost/capacity-optimized workloads. Tailored to meet the growing storage capacity demand in hyperscale data center, the QuantaPlex T21P-4U is equipped with two models: one server node has 78x HDD with up to 620 terabytes of storage in 4U space and the other model has two individual nodes, each node with 35x HDD.

To achieve excellent price per TB, RCC-400 enables erasure-coded pools of storage for object archive workloads. The Intel® Xeon® E5-2600 v3 processor family provides sufficient computing power to support writes when using compute-intensive erasure coding while the Intel 10GbE network adaptors support plenty of bandwidth, resulting in an amazing price-performance ratio. Intel has worked with the Ceph open source community to ensure that Ceph has optimized routines for Erasure Coding, thereby helping everyone make best use of Ceph for their large capacity storage needs.

**Accelerating QxStor with Intel SSD Technology**

SSD plays the critical role in Ceph performance, delivering better latency and throughput. Using SSDs for journaling accelerates Ceph performance, especially writes. The falling purchase price per GB may be driving broader adoption. Regardless, enterprises should aggressively exploit their use of SSD-based Ceph solutions to gain major benefits for a range of applications, for instance, high-throughput, high-quality, and large-scale delivery of entertainment, media streaming or block storage.

The ratio of HDD and SSD is key in Ceph architecture. Too few SSDs affect the performance and most stick to the advised ratios unless doing an all flash ceph system.

**RCT-200 Achieving 4:1 Perfect Ratio of HDD to SATA SSD**

RCT-200 adopts QCT D51PH-1ULH server. It’s a perfect design hardware for throughput-optimized Ceph, incorporating 12x spinning disks drives with 3x SSDs of Intel SSD Data Center S3710 Series for Ceph journaling. The 4:1 ratio of HDD to SSD attains the best sizing of Ceph.

**RCT-400 Boosting Ceph through NVMe SSD**

RCT-400 has an extraordinary design, consolidating 2x Intel NVMe SSD DC P3700 Series on each QCT T21P-4U 35-bay server node. NVMe SSDs provide direct write benefits by providing a ‘speedy’ connection from the Intel processor to the logical disk device, dramatically boosting the RCT-400 sequential write performance by 50% and reducing latency by 33% in sequential writes. These improvements are made possible by the NVMe device interface, which was designed from the ground up for solid state disk drives.

**Scaling to Exabyte**

Ceph provides an infinitely scalable Ceph Storage Cluster based upon RADOS (Reliable Autonomic Distributed Object Store). Through thoroughly validation and testing, QxStor demonstrates linear scale-out performance for sequential reads and writes as the number of QxStor server nodes is increased. This capability is critical to allow organizations to scale out storage predictably by simply adding QxStor servers running Red Hat Ceph Storage.

The QCT QxStor RCT-400 enhances Ceph sequential write performance dramatically, with 50% higher throughput and reducing latency by 33%. These improvements are made possible by the NVMe device interface, which was designed from the ground up for solid state drives like the Intel® SSD Data Center P3700 Series for PCIe®.
Faster Time-to-Value

QxStor Red Hat Ceph Storage Edition is integrated with the best fit hardware components for Ceph, and is pre-configured with the optimal Ceph configuration and suitable Ceph replicate scheme – 3x replica in throughput optimized sku and erasure coded pool in cost/capacity optimized sku. It significantly shortens the time for enterprises to adopt Ceph. Enterprises no longer need to spend efforts or hire expertise from scratch on Ceph study, hardware sizing and software deployment.

Ease of Maintenance

Both the unique screw-less design in the QuantaPlex T21P-4U for RCT-400 and RCC-400, and the innovative hard drive carrier design in QuantaGrid D51PH-1ULH for RCT-200 allow IT operators to complete disk drive replacement tasks with simplicity and less time than normal. No drive lasts indefinitely, and this reduced maintenance load, from minutes to seconds to place a hard drive, will significantly reduce the deployment and service time in your data center, freeing your people up for more critical tasks.

Ceph has been redefining the foundation of block and object storage architecture at public and private cloud data centers. QCT QxStor Red Hat Ceph Storage Edition with Intel technology provides a compelling optimal Ceph solution to enterprises and service providers. Organizations can no longer be trapped within yesterday’s more rigid proprietary storage and start embracing the seamless integrated QxStor which QCT has maximized every configuration related to Ceph performance from hardware and software aspects by leveraging Intel processors, SSD and network technology and expertise working with Ceph.

For More Information

For more information visit www.intel.com/storage

About QCT

QCT (Quanta Cloud Technology) is a global data center solution provider extending the power of hyperscale data center design in standard and open SKUs to all data center customers. Product lines include servers, storage, network switches, integrated rack systems and cloud solutions, all delivering hyperscale efficiency, scalability, reliability, manageability, serviceability and optimized performance for each workload. QCT offers a full spectrum of data center products and services from engineering, integration and optimization to global supply chain support, all under one roof. The parent of QCT is Quanta Computer Inc., a Fortune Global 500 technology engineering and manufacturing company. http://www.QCT.io

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