(intel®)

Intel® Select Solutions for Qing³* HCI

As digital transformation goes deeper, cloud computing has become the key technology support for IT restructuring in various industries. At the same time, challenges from the high complexity and cost in deployment, delivery, operation and maintenance of cloud computing are emerging. Against this backdrop, it is a preferred choice for users in finance, manufacturing, education and transportation industries to simplify the operation management of cloud computing systems and implement one-stop delivery by virtue of the standardization and usability of hyper-convergence.

Hyper-convergence, as a new IT infrastructure in the cloud era, has become the key driver for construction of private clouds and industry clouds. QingCloud*'s Qing³ HCI integrates the full-stack cloud computing capabilities of the QingCloud enterprise cloud platform to help enterprises build IaaS, PaaS and SaaS from zero, and provides a complete platform for application development, delivery and operation. It can support enterprises to make full use of the powerful capabilities of software-defined data centers, and smoothly upgrade to the group cloud, industry cloud or hybrid cloud architecture based on business development, creating a solid IT cornerstone for enterprise digital transformation.

Intel and Qingcloud collaborate to develop Intel® Select Solution for Qing³ HCI, which includes Intel® Xeon® Gold 5118 Processor/Silver 4114 Processor, Intel® Optane™ SSD DC P4800X, Intel® SSD DC P4510 Series and Intel® Ethernet Converged Network Adapter X710-DA2. During deployment of Qing³ HCI in an enterprise, the Solutions help the enterprise to reduce the time and cost for verifying and optimizing infrastructure, thus promoting the implementation of cloud strategy.

Qing³ HCI Enabling Enterprise Cloud Strategy

As a technology leader in China's HCI market, Qing³ HCI integrates the QingCloud full-stack cloud capability. It not only helps enterprises quickly build software-defined data centers, desktop clouds, development and testing environments, but adapts to various application scenarios such as IoT, big data, artificial intelligence, containers and hybrid clouds. According to the latest *2018 Q4 Software-defined Storage and HCI Market Overview, IDC China*, Qing³ HCI has been selected as a key manufacturer for two consecutive years, ranking top five in China's HCI market.

Qing³ HCI can meet the digital transformation needs in various business scenarios of the enterprise. Its main values include:

- **Unified architecture:** Qing³ HCI can provide unified use experience and operation management under public, private, hybrid and hosted scenarios.

- **Unified delivery:** Qing³ HCI supports delivery of a complete cloud computing service system from IaaS infrastructure to PaaS and enterprise application management platform.

- **Full-mode coverage:** Qing³ HCI can support the enterprise's "sensitive-state", "steady-state" and "hybrid-state" services, and has the ability to simultaneously carry distributed Internet innovation business and enterprise-centralized critical business.

- **Global interconnection:** In combination with SD-WAN technology, Qing³ HCI can realize one-hop access, global interconnection, and supports various scenarios such as industry cloud and hybrid cloud.

Qing³ HCI supports the software and hardware integrated delivery mode, and realizes deep tuning of software and hardware, which can greatly improve performance and reliability. It has optimized storage space and computational density, which can save a lot of costs and is truly "out of the box, one step cloudification". In addition, its storage service "Enterprise Distributed SAN" provides a single-node performance of up to 500K IOPS, latency as low as 100 microseconds, which can fully meet the system needs of enterprise key business.

Intel® Select Solutions for Qing³ HCI

The Intel® Select solutions for Qing³ HCI are based on the critical hardware components, including Intel® Xeon® Gold 5118 processors/Silver 4114 processors, Intel® Optane™ SSD DC P4800X, Intel® SSD DC P4510 Series and Intel® Ethernet Converged Network Adapter X710-DA2, and integrate with leading Intel® technical features. These components, as validated and optimized by practical workloads, can help Qing³ HCI users optimize performance and cost, reduce the time for product selection and performance tuning, and accelerate deployment.

Specifically, Intel® Select Solutions for Qing³ HCI deliver the following values:

- It simplifies deployment and provides full-stack cloud computing services to enterprise end users.

- Through performance verification and optimization on the Intel® architecture, Qing³ HCI delivers leading-edge performance that can carry distributed Internet innovation business and enterprise-centralized critical business.

- By placing multiple servers in a single share trace, it can optimize computing and storage capabilities while saving the total cost of ownership (TCO).

Hardware Selections

All Intel® Select solutions are are verified to meet a specified minimum level of workload-optimized performance capabilities. In order to meet Qing³ HCI's stringent standards on workload, Intel chose to build a solution based on the Intel® Xeon® Scalable processor.

The Intel® Select Solution provides "Base" and "Plus" configuration options for the different performance demands of Qing³ HCI users. The "Base" configuration uses the Intel® Xeon® Silver 4114 processors and a hybrid hard drive configuration that provides an optimal balance between price and performance. The "Plus" configuration uses the Intel® Xeon® Gold 5118 processors and an all-flash hard drive configuration which can meet more stringent performance requirements (a list of configurations is shown in Appendix 1).

Intel® Xeon® Scalable processor

Qing³ HCI enables deep integration and optimization of computing virtualization and storage services, ensuring that resources are

What Are Intel® Select Solutions?

Intel Select Solutions are pre-defined, workload-optimized solutions designed to minimize the challenges of infrastructure evaluation and deployment. Solutions are validated by OEMs/ODMs, certified by ISVs, and verified by Intel. Intel develops these solutions in extensive collaboration with hardware, software and operating system vendor partners and with the world's leading data center and service providers. Every Intel Select Solution is a tailored combination of Intel® data center compute, memory, storage, and network technologies that delivers predictable, trusted, and compelling performance.

To qualify as an Intel® Select Solution, solution providers must:

1. Meet the software and hardware stack requirements outlined by the solution's reference-design specifications;

2. Replicate or exceed established reference-benchmark test results;

3. Publish a solution brief and a detailed implementation guide to facilitate customer deployment.

Solution providers can develop their own optimizations in order to give end customers a simpler, more consistent deployment experience.

delivered efficiently on demand. Its resilient, on-demand scalable computing resource pool can be built with high-performance Intel® Xeon® Scalable processors with leading virtualization features. The processor's outstanding performance and excellent resource utilization efficiency and agility can effectively meet the performance and scalability requirements for Qing³ HCI deployment.

Intel® Optane™ SSD DC P4800X

The Intel® Select Solutions for Qing³ HCI use the Intel® Optane™ SSD DC P4800X to enhance performance. The SSD is the first product that combines memory and storage attributes, and inventively combines 3D XPoint™ memory medium with Intel advanced system memory controller and interface hardware and software IPs to achieve industry-leading high throughput, low delay, high service quality and super durability.

Intel® SSD DC P4510 Series

The Qing³ HCI uses the Intel® SSD DC P4510 Series to build a storage resource pool. The SSD carries higher-density Intel 64-Layer 3D NAND and enhanced firmware capabilities, enabling to handle tasks such as read-intensive workloads. At the same time, it also features error correction, power-off protection and durability design, which can fully meet the availability and stability requirements of Qing³ HCI.

Intel® Ethernet Converged Network Adapter X710-DA2

Intel® Ethernet Network Adapter XXV710-DA2 accelerates the delivery of new services and features through intelligent offloading, sophisticated packet processing and high quality open source drivers, dramatically improving the performance of the Intel® Select Solutions for Qing³ HCI.

Intel® Xeon® Scalable Processors

2nd Generation Intel® Xeon® Scalable processors:

- Offer high scalability that is cost-efficient and flexible, from the multi-cloud to the intelligent edge

- Establish a seamless performance foundation to help accelerate data's transformative impact

- Support breakthrough Intel® Optane™ DC persistent memory technology

- Accelerate artificial-intelligence (AI) performance and help deliver AI readiness across the data center

- Provide hardware-enhanced platform protection and threat monitoring

Intel® Select Solutions for Qing³ HCI feature Intel® Xeon® Gold processors.

Verified Performance through Benchmark Testing

The Intel® Select Solutions for Qing³ HCI have undergone rigorous and accurate testing to ensure full compatibility of hardware and software, and has its performance fully optimized so as to significantly reduce the time and cost required to deploy Qing³ HCI and to provide optimal infrastructure building practices.

Intel and QingCloud chose Swingbench* and FIO* testing tools. Swingbench is a performance testing tool for Oracle RAC* in OLTP systems; FIO is an I/O tool that is widely used for benchmark testing and stress/hardware verification of block devices and file systems. The testing results are as shown in Table 1. In terms of the transactions per second (TPS) of OLTP, the performance of the Plus configuration is more than 90% higher than that of the Base configuration. On block device storage, the input/output operations per second (IOPS) and the bandwidth throughput (BW/s) are more than 140% higher than those of the Base configuration. Users can choose a configuration scheme more suitable for their own needs according to the cost budget and the actual load level.[1]

Technology Selections for Intel® Select Solutions for Qing³ HCI

In addition to the Intel hardware foundation of Intel® Select Solutions

for Qing³ HCI, other technologies provide further performance, and strengthen reliability and security:

- **Intel® QuickAssist Technology (Intel® QAT):** Accelerates key workloads such as bulk encryption, public key exchange, and data compression based on Intel® architecture platforms. The technology delivers strong performance with up to 100 gigabits (Gbps) per second encryption, 100 Gbps compression, and 100,000 decryptions per second using 2,048-bit RSA keys.

- **Intel® Volume Management Device (Intel® VMD):** The standardized design supported by Intel® VMD brings enterprise-grade reliability, availability, and serviceability (RAS) to NVMe* SSDs, helping to improve users' confidence in deploying the next generation storage systems.

- **Intel® Trusted Execution Technology (Intel® TET):** Intel® TET is a set of general purpose hardware extensions for Intel® processors and chipsets, and can significantly enhance the security of digital office platforms. When this technology is enabled, applications can run in their own space without being affected by any other application in the system.

- **Intel® Hyper-Threading (HT) Technology:** Enables more efficient use of processor resources and multiple threads to run on each core. Intel HT Technology also increases processor throughput, improving the overall performance on threaded software, and keeps system responsiveness while running multiple demanding applications.

- **Intel® Turbo Boost Technology:** For peak demand, Intel® Turbo Boost Technology enables the processor to run faster than the rated operating frequency, accelerates processor and graphics performance for peak loads.

Intel® Select Solutions for Qing³ HCI Deliver Cloud Computing Capabilities to Enterprises

Based on the industry-leading software-defined technology, the Intel® Select Solutions for Qing³ HCI deeply integrate computing, storage and networking to help enterprises smoothly upgrade their IT to full-stack private cloud architecture and allow docking with a public cloud to build a homogeneous hybrid cloud environment. In addition, Qing³ HCI can also integrate with capabilities such as QingCloud backbone network service to build a more comprehensive and integrated overall ICT delivery system, enabling faster business response, greater flexibility and lower operating cost, to progressively achieve the goals of the cloud strategy and ultimately digital transformation.

Table 1: Comparison of Base configuration and Plus configuration testing

QingCloud	8K block size 8/2 Rand R/W IOPS	8K block size 8/2 Rand R/W Bandwidth (MB/s)
Base	16300/4100	130/30
Plus	40800/10200	330/80

Appendix 1: The Base and Plus Configurations for Intel® Select Solutions for Qing³ HCI

QingCloud	Base Config (compute & storage/hybrid - min 3 nodes)	Plus Config (compute & storage/all flash - min 3 nodes)
Processsor	2 x Intel® Xeon® Silver 4114 at 2.20 GHz 10C or Intel® Xeon® Silver 4214 at 2.20 GHz 12C or higher	2 x Intel® Xeon® Gold 5118 @ 2.30 GHz 12C or Intel® Xeon® Gold 5218 @ 2.30 GHz 16C or higher
Memory	128 GB or higher (8 x 16 GB DDR4-2400)	384 GB or higher (24 x 16 GB DDR4-2400)
Boot Drive	2 x 240 GB or larger Intel® SSD DC S4510	2 x 240 GB or larger Intel® SSD DC S4510
Storage Cache	1 x 375 GB Intel® Optane™ SSD DC P4800X Series or larger	N/A
Storage Drive	4 x 4 TB SATA HDD or larger	4 x 4TB Intel® SSD DC P4510 or larger
Data Network	1 x 10 GB Dual-Port Intel® Ethernet Converged Network Adapter X710-DA2 SFP+ or better	1 x 10 GB Dual-Port Intel® Ethernet Converged Network Adapter X710-DA2 SFP+ or better
Mgmt Network	Integrated 1 GbE or better	Integrated 1 GbE or better

Qingcloud	Base Config (management - min 2 nodes)	Plus Config (management - min 2 nodes)
Processsor	Intel® Xeon® Silver 4114 at 2.20 GHz 10C or Intel® Xeon® Silver 4214 at 2.20 GHz 12C or higher	Intel® Xeon® Silver 4114 at 2.20 GHz 10C or Intel® Xeon® Silver 4214 at 2.20 GHz 12C or higher
Memory	128 GB or higher (8 x 16 GB DDR4-2400)	128 GB or higher (8 x 16 GB DDR4-2400)
Boot Drive	2 x 240 GB or larger Intel® SSD DC S4510	2 x 240 GB or larger Intel® SSD DC S4510
Data Network	1 x 10 GB Dual-Port Intel® Ethernet Converged Network Adapter X710-DA2 SFP+ or better	1 x 10 GB Dual-Port Intel® Ethernet Converged Network Adapter X710-DA2 SFP+ or better
Mgmt Network	Integrated 1 GbE or better	Integrated 1 GbE or better

[1] CONFIG1 - Base: Test by Intel & Qingcloud as of 5/30/2019. 5-node, 2x Intel® Xeon® Silver 4114 Processor, 8 cores HT On Turbo ON Total Memory 128 GB (8 slots/ 16GB/ 2400 MHz), 2x 240 GB Intel® SSD DC S4510, 1x 375GB Intel® Optane™ SSD DC P4800X, 4x 4TB SATA 7200RPM HDD, Microcode:0x200005e, Ubuntu 16.04, Kernel 4.14.125. Swingbench 2.6, FIO 3.2, Qing Express 3.0.

CONFIG2 - Plus: Test by Intel & Qingcloud as of 5/30/2019. 3-node, 2x Intel® Xeon® Gold 5118 Processor, 12 cores HT On Turbo ON Total Memory 384 GB (24 slots/ 16GB/ 2400 MHz), 2x 240 GB Intel® SSD DC S4510, 4x 4TB Intel® SSD DC P4510, Microcode:0x200005e, Ubuntu 16.04, Kernel 4.14.125. 2-node, 2x Intel® Xeon® Silver 4114 Processor, 8 cores HT On Turbo ON Total Memory 128 GB (8 slots/ 16GB/ 2400 MHz), 2x 240 GB Intel® SSD DC S4510, Microcode:0x200005e, Ubuntu 16.04, Kernel 4.14.125. Swingbench 2.6, FIO 3.2, Qing Express 3.0.

Component performance tests are measured using specific computer systems. Any difference in system hardware or software design or configuration may affect actual performance. Buyers should consult other sources of information to evaluate the performance of systems or components they are considering purchasing. For more information on performance tests and on the performance of Intel products, visit intel.com/benchmarks

Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as SYSmark* and MobileMark*, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products. For more complete information visit intel.com/benchmarks

Cost reduction scenarios described are intended as examples of how a given Intel- based product, in the specified circumstances and configurations, may affect future costs and provide cost savings. Circumstances will vary. Intel does not guarantee any costs or cost reduction.

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