



QxVDI

VMware Edition-OA

The Best Desktop
Virtualization Solution



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Executive Summary

As virtualization technologies advance, information technology departments have begun to apply virtualization in order to reduce energy costs and equipment damage caused by heat load inside datacenters. In light of the developments in virtual environments, aside from the above advantages, desktop virtualization and its applications are also expected to be an upcoming trend.

This paper discusses the development and use of Virtual Desktop Infrastructure (VDI) as well as the requirements and difficulties associated with VDI solutions. The design of QxVDI VMware Edition-OA hardware and software architectures and embedded network technologies are described in detail, as is the importance of considering QxVDI VMware Edition-OA as a means of VDI implementation in business, proven via the results of efficiency tests.



VDI Development and Application

Development Trends in VDI Application

After experiencing the vast benefits provided by virtualization technologies in server-side operations, companies also hope to resolve client-side performance issues by reducing costs and improving working efficiency with the aid of virtualization. To keep abreast with advancing mature network technologies, faster network computing is to be provided in future. Also, as workplace mobility becomes more common, companies face the growing BYOD (Bring Your Own Device) trend while considering the consistency and safety of data management, simplification of operations management, and the enhancement of data security and management systems in order to meet BYOD requirements. Over the past few years, VDI application objectives have extended from simple system maintenance and security to mobility. It is predicted that desktop virtualization will follow server virtualization as the next key method applied by companies searching for ways to improve the quality and efficiency of IT services.

Challenges of and User Requirements for VDI Application

Long Installation Process

Despite the advantages of virtualization technologies, their integration into desktop environments brings certain problems and challenges. Companies' main expectation for desktop virtualization is the ability to provide a single virtual environment for users regardless of their location or equipment. However, the desktop virtualization solutions provided by current suppliers have long implementation times, excessive centralization, IOPS performance bottlenecks, and high costs that discourage companies from incorporating these technologies.

Traditional VDI solutions also require a time-consuming arrangements for hosting servers, storage devices, switchboards, and other equipment.

Low Service Stability

Although some management aspects can be simplified by establishing a virtual environment, problems remain with maintenance and VDI stability in order to ensure simple and timely delivery of cloud services. In the case of traditional single servers, low system availability can be quickly remedied by repairing the host. However, system availability and utilization present more serious problems for IT personnel working with a cloud virtual environment. Thus, management of service stability and risks is one factor influencing the adoption of cloud desktop services.

High IOPS Requirements

IOPS refers to a total number of input/output operations per second. Workload and IOPS efficiency of the physical desktop environment must be estimated prior to VDI deployment. Usually one to three hosting servers are used for 100 users, so when one host malfunctions, it affects many people. This presents a major management risk to companies for whom uptime is crucial. The use of one server for 50 people





also results in high IOPS loads and reduces computing speed, leading to dissatisfied users.

High Initial Costs

High initial costs are the main reason why companies hesitate to use virtualization technologies. While it is generally believed that virtualization reduces cost, this is only in terms of electricity and management costs after incorporation. The initial installation of servers, storage devices, and network equipment is quite costly.

QxVDI VMware Edition-OA Solution

Due to its outstanding design structure, QxVDI VMware Edition-OA, developed by QCT (Quanta Cloud Technology), resolves issues related to the adoption of desktop virtualization. Unlike typical VDI architectures, it is a highly integrated appliance (hosting server, storage, and network) which improves the system price-performance ratio, simplifies IT management, and reduces implementation costs. Moreover, the optimal storage environment improves user experience and the modular design provides flexibility for future extension in case of business expansion. With VMware Horizon (with View) software pre-installed, it is ready for use out of the box, further minimizing setup time.

Business Continuity

Existing entity concepts are generally used in a virtual environment when establishing business continuity plans. Server virtualization reduces the recovery time objective (RTO), thus minimizing downtime and reducing the complexity of problems that need to be solved by system administrators during the development and implementation of cost-efficient solutions. The following are the important components of VDI hardware, software, and storage devices.

Hardware Considerations

Fault Tolerance

Fault tolerance (FT) refers to the ability of a system to operate normally during hardware component failure. A number of factors, such as electric power and hard drive, must be considered to ensure proper VDI operating time.

Integrated Architecture and Modular Design

A clustered software architecture with partitioned nodes is recommended for modular designs so that fewer users are affected and risk is dispersed in case of system failure. Each node (including HDD and SSD nodes) is compatible with VMware Virtual SAN, allowing implementation of simple, high-performance, and quickly recoverable shared storage spaces on virtualized servers.



Cooling System

Heat dissipation must be given serious consideration in high-density environments in order to extend operational life span. QxVDI VMware Edition-OA includes a CPU cooling system for each node as well as two fans installed inside the power supply and six external fans in the rear server panels. This greatly increases the usability and stability of equipment which then saves power and energy and reduces carbon emissions in the long run.

Space Saving

QxVDI VMware Edition-OA is a 3U, nine-node high-density server. Nodes share power supplies and fans to increase energy efficiency. One QxVDI VMware Edition-OA unit can support 100 users, which saves 50% more server space compared to the three 2U servers used in traditional architectures.

Software Considerations

Companies may consider the following questions before implementing desktop virtualization:

1. Can we use our existing equipment (e.g. non-Windows operating environments and mobile devices)?
2. Can we easily expand the number of users?
3. Do we need to provide desktop services to highly mobile users (e.g. executive managers, business personnel)?

Storage Technology

In traditional virtualization technologies, one common shared storage device is used for all servers to ensure the availability of server disk data; however, the costs associated with expanding shared storage during future expansion of data are high. New storage technology applies software-defined storage (SDS) frameworks to achieve high availability, storage space allocation, automation maintenance, and vMotion, while efficiently using hard disk space.

VDI

QxVDI VMware Edition-OA -VMware Horizon View

The use of one platform for virtual and remote desktops facilitates management and user authorization and provides users with fast access to the necessary Windows resources. IT technicians can use Horizon 6 to deliver virtual desktops and applications to end users through one workspace (e.g., Remote Desktop Services (RDS), ThinApp package, and various software and service applications). Equipped with Blast Performance, it guarantees great user experience regardless of user devices, location, medium, or connection. By providing virtual computing, virtual storage and virtual network as well as safe expansion of virtualization technologies, Horizon 6 reduces costs, improves user experience, and increases business mobility.



Design Strategies

Stand-alone Solution

Stand-alone solutions are used in designing virtualization infrastructures aimed at the users who are interested in virtual desktops or who only need one additional server, but no external storage.

QxVDI VMware Edition-OA can be used by companies in office and testing environments. It is a 3U, nine-node appliance where each node has 32GB of RAM memory and a 27TB hard drive (Figure 1). Partitioned nodes also reduce the risk and effects of system failures on users. The integrated architecture and modular design make system management and expansion easier than with typical VDI architectures. The embedded switch module and hard drive and storage virtualization software make external SAN and switches unnecessary, enabling quick VDI implementation.

Allocation is considered in the product design to ensure protection of VMs operated in the system and other application issues. In case of inefficient server operation, all VMs are immediately relocated to another server using vMotion technology, avoiding interruptions. (Figure 2).

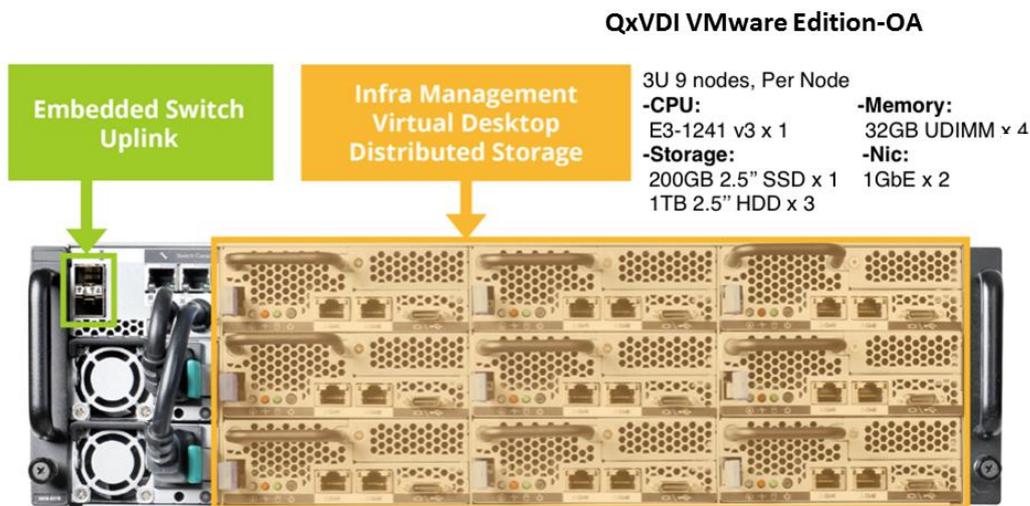


Figure 1. Hardware Rear Panel

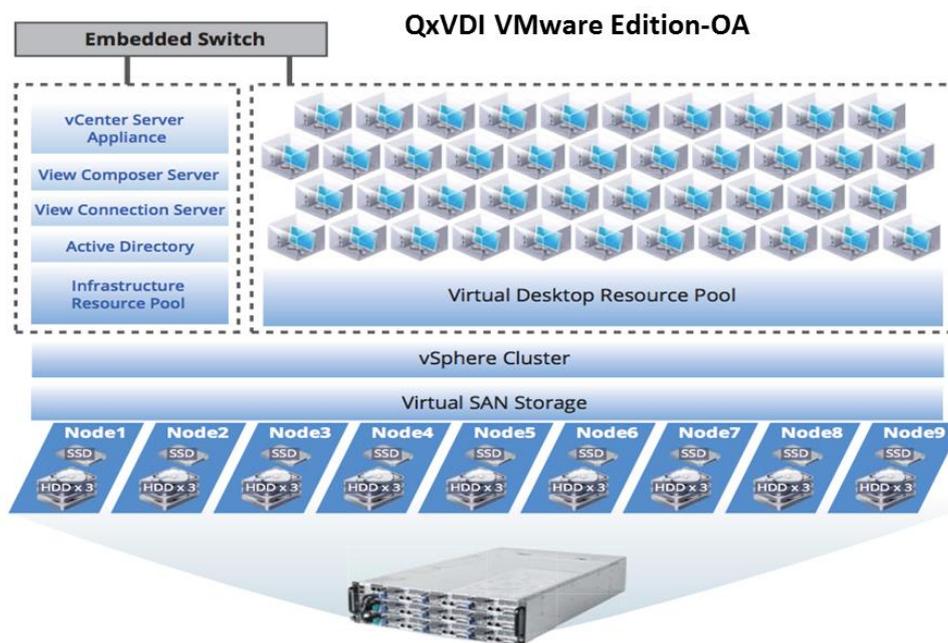


Figure 2. Structure of QxVDI VMware Edition-OA

VMware Horizon Architecture

To meet customer requirements, VMware Horizon is installed in QxVDI VMware Edition-OA due to its superior functionality and low risk as well as the reduced software- and hardware-related costs. VMware Horizon products are easy to manage and learn and a technical support system is provided to VMware users to solve any difficulties occurring during product use.

VMware Horizon supports RDP (Remote Desktop Protocol) and PCoIP (PC-over-IP), allowing View Client users access to virtual desktop software as well as remote data in iPad/Android/Windows/Mac-OS terminal devices.

VMware Horizon provides system back-up and management for Microsoft desktops and enables synchronization between Windows virtual and physical desktop environments and a data center. Supported desktop operating systems include Windows XP, Windows Vista, Windows 7, Windows 8, and Windows 8.1.

VMware Horizon provides layered management for Microsoft desktop systems, which allows separating desktop space into layers for file information, applications, and business operating environments. Thus, an administrator can update or restore operating environment information without making any changes to user files or install and update applications, and terminal users can also recover deleted or altered files.

Saved data uses a snapshot system so that all system data can be recovered to any state preserved in a snapshot with all sent and backed-up files transmitted using an encryption code. The snapshot function can be used by administrators to return the system to a previous state in the case of a terminal failure.

VMware Horizon allows the recovery of data from a present terminal device to new hardware. User groups can be established and updated using Active Directory accounts. Administrators can install a desktop for a user with an updated account or send applications to a specified end user. A user desktop can also be transferred from Windows XP and Vista to Windows 7 and from Windows 7 to Windows 8.1.

Terminal device drivers are supported with a management mechanism which enables the transfer of information between a user system and other hardware. Windows virtual and physical systems connected to the Internet can be directly linked to data center backup and management environments without using VPN or SSL-VPN. A Windows operating system can also be virtually run on a MAC OS..

Virtual SAN Architecture

For data storage purposes, QxVDI VMware Edition-OA uses Virtual SAN embedded in the virtualization software. Virtual SAN provides effective and flexible shared virtual storage via x86 server-attached hard disks and flash devices (Figure 3). Its operation and management are centered on application programs. Reliability and stability of business-class storage services provided by Virtual SAN help to effectively avoid data loss in case of system failure.

Virtual SAN can be installed on server SSDs and hard disks to cluster and save server data in a VM. Virtual SAN accelerates I/O performance via SSD read cache and write buffer and ensures fault-tolerant transfer, recovery, and dynamic resource allocation (vMotion/HA/DRS). Dispersed storage increases IOPS speed 3- to 5-fold.

IOPS Comparison- 4K random write

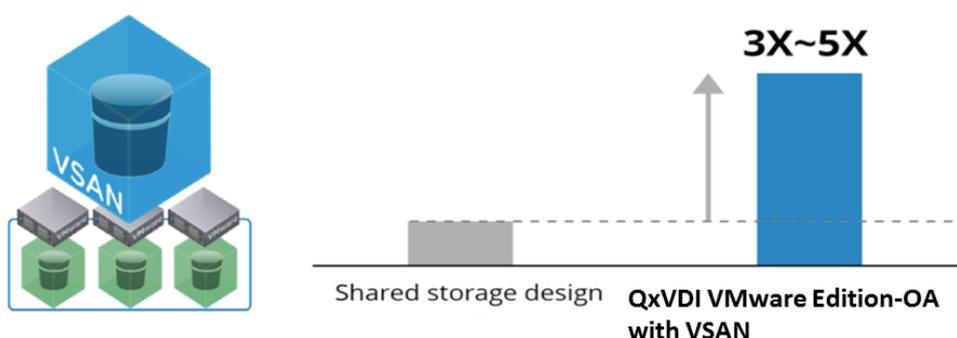


Figure 3. IOPS Efficiency

QxVDI VMware Edition-OA versus Traditional VDI Solutions

QxVDI VMware Edition-OA uses a hyper-converged system with an embedded switch module, software-driven shared storage, and a unique design that combines multiple IT devices into a single VDI solution. It simplifies system management for IT

Each of the nine nodes in one QxVDI VMware Edition-OA has its own independent system, whereas typical VDI architecture uses one server for a hundred of users and system failure leads to complete service interruption. QxVDI VMware Edition-OA users are distributed over different nodes; failure of one node only affects a small number of users and virtual desktops on working nodes are automatically restarted.

The entire system is hot swappable, allowing for easy maintenance of system operations. Users can purchase or get new PnP (plug-and-play) nodes from QCT agents without affecting business continuity.

High-density, multi-mode design provides more effective risk management; fewer users are affected by failure of one node [resolves the issue of low service stability]

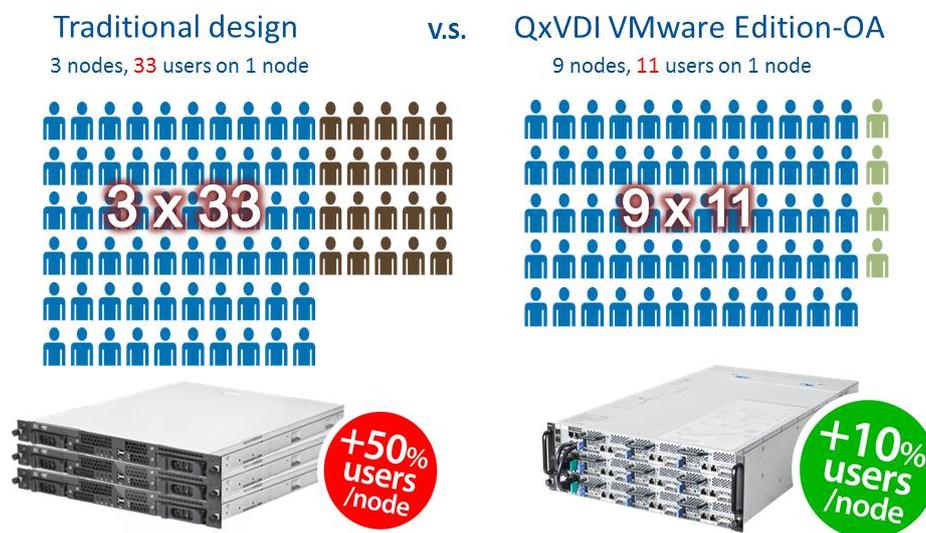


Figure 5. High-Density, Multi-Node Design

To provide service to 100 users, typical VDI employs a three-node design with 33 users per node. This means that when one server fails, 33 users are affected and two working servers receive 50% more load. Conversely, QxVDI VMware Edition-OA employs a nine-node design with 11 users per node; thus one server failure affects only 11 users. Moreover, these 11 users do not experience serious interruption since they can log into a group account using vCenter server management software in order to recover operations. Then, vMotion quickly transfers users to the eight functioning nodes, which only increases the workload by 10% and does not influence overall system efficiency. Hot swappable system components allows IT technicians to replace equipment quickly and the system can automatically recover within one hour.

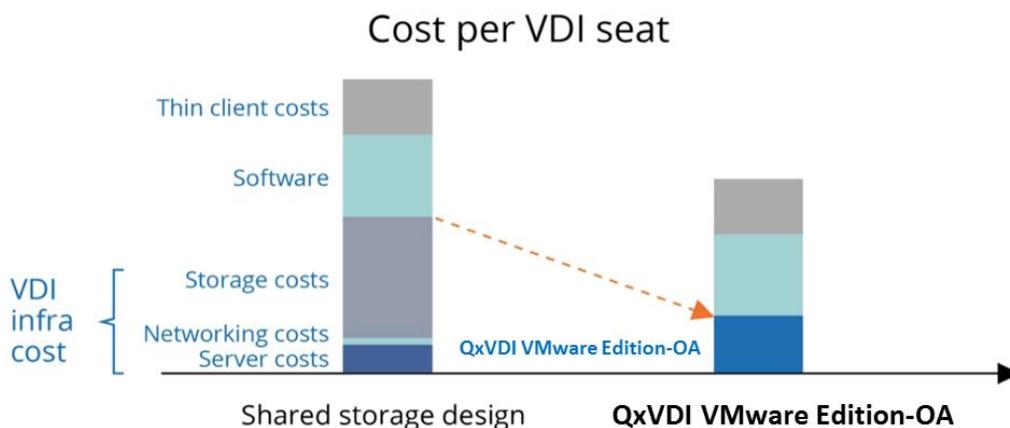
Optimized storage environment, enhanced user experience [resolves the issue of high IOPS requirements]



Distribution of users over multiple server nodes and clustering of user data in a shared space increases IOPS speed for each client and minimizes latency. Hard disk data is retrieved directly from an SSD, increasing the read-write speed for each user and improving user experience.

Reduced initial costs of desktop virtualization [resolves the issue of high implementation costs]

QxVDI VMware Edition-OA desktop virtualization does not require a complicated storage design or the purchase of costly storage devices and switches [TL(1)], considerably reducing VDI implementation costs for companies.



Source: VMware, QCT analysis

Figure 6. Comparison of VDI Costs



QxVDI VMware Edition-OA Efficiency Test

Description of Test Environment

One QxVDI VMware Edition-OA and one 10G Switch were evaluated according to VMware's VDI performance measures. View Planner software was installed. The test structure is illustrated below.

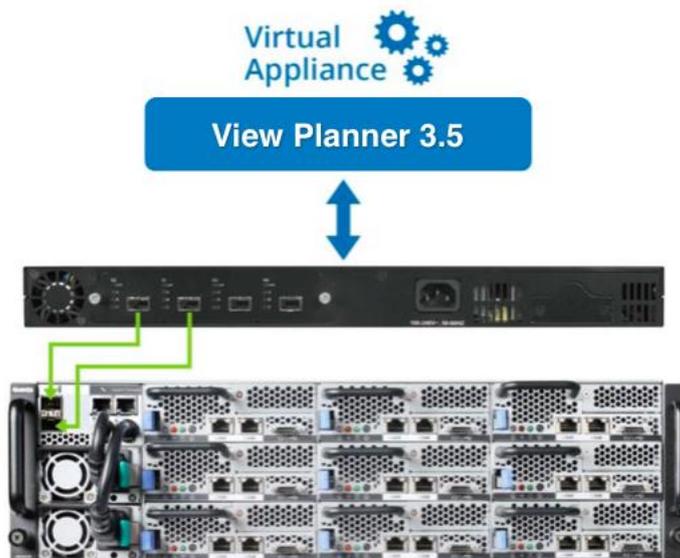


Figure 7. Test Environment

Hardware Specifications

Server Node			Total Capacity
Component	Specification	Number	
CPU	E3 -1241 V3	1	9
SSD	200 GB 2.5"	1	9
HDD	1TB 2.5"	3	27 TB
Memory	8 GB UDIMM	4	288G
NIC	10GbE	2Port	18 Port

Table 1. Hardware Specifications

Software Specifications

Virtual Desktop Software Allocation
Win7_x32
Virtual Machine Software Components
Horizon View v6.0
vCenter Server Appliance v6.0
Virtual SAN v6.0

Table 2. Software Specifications

Test Configuration

Configuration Item	Settings
Profile Name	100 VM
Number of VMs	100
Desktop Name Prefix	VP
VM Ramp up time	260
Test type	Local

Table 3. Test Configuration Parameters

Test Results

Details of system efficiency monitoring with View Planner are given in Table 4. In the case of 100 concurrent users, QxVDI VMware Edition-OA performance efficiency was high, particularly for IOPS speed, CPU utilization, and I/O latency (Figures 8-10).

Item	Expected Values	Results
Number of concurrent users	>100 User	>100 User
IOPS 4K Random R/W	54,000 / 6,500 ¹	203,000 / 12,000 ²
CPU utilization	< 80%	38%
Memory usage	< 80%	44%
I/O latency, s	< 10ms	< 2s

Table 4. Test Results

¹ Expected values based on VMware View Planner simulation.

² Results measured using IOMeter.



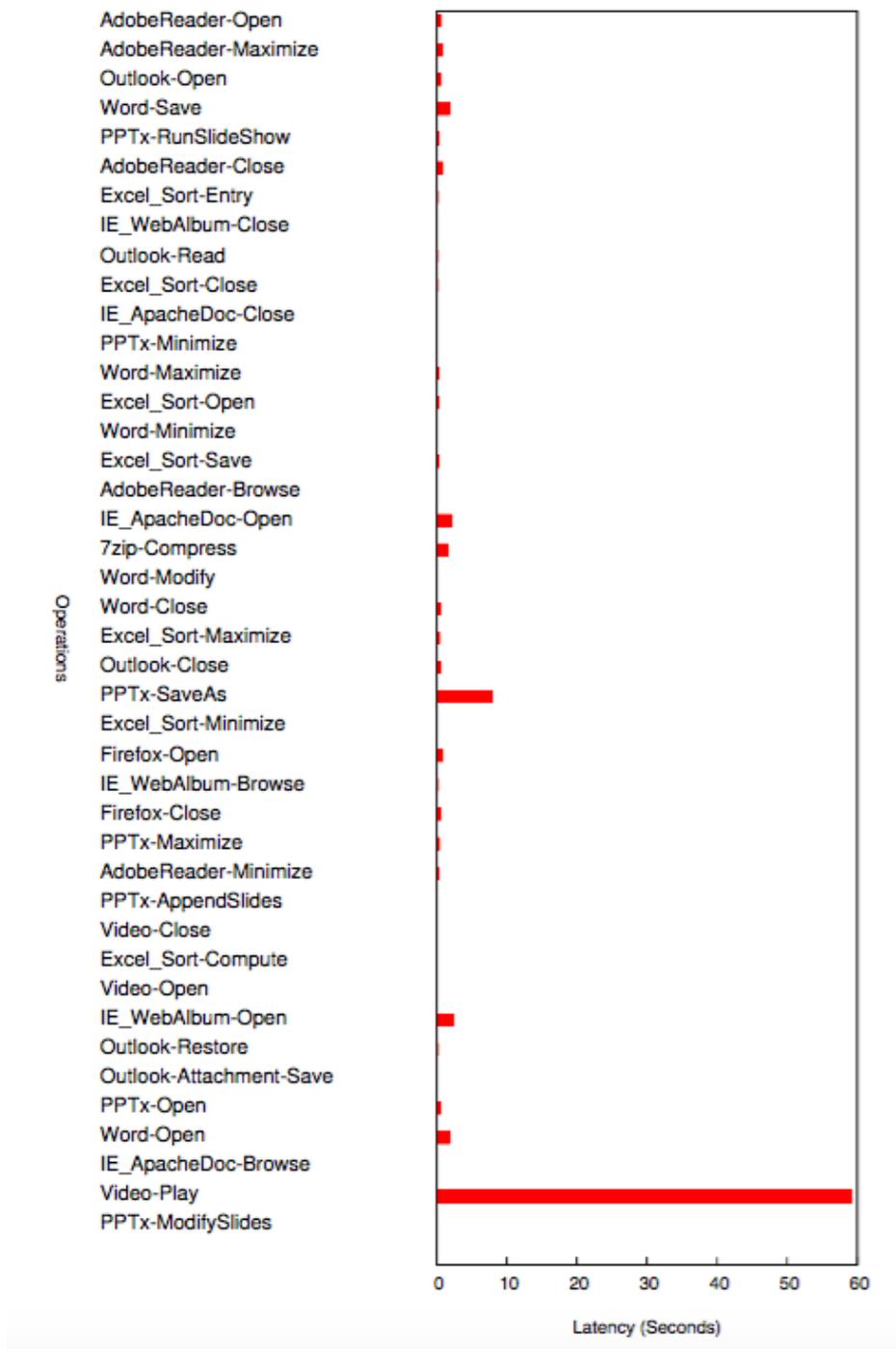


Figure 8. Application Response Time

QxVDI VMware Edition-OA demonstrated particular effectiveness in the application of office tools (such as Word, Excel, IE, Adobe Reader, and unzipping). The average response time being less than two seconds; thus, no latency was observed.



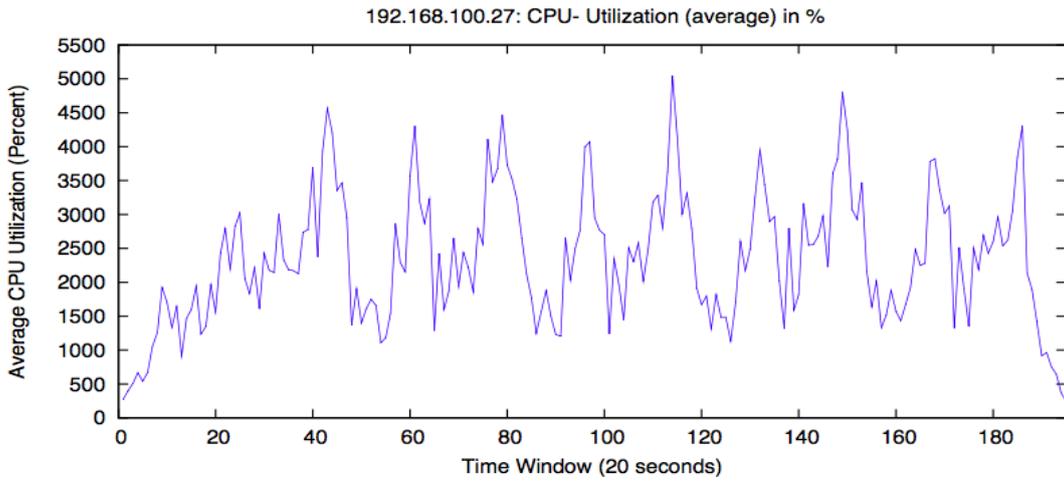


Figure 9. Average CPU Utilization

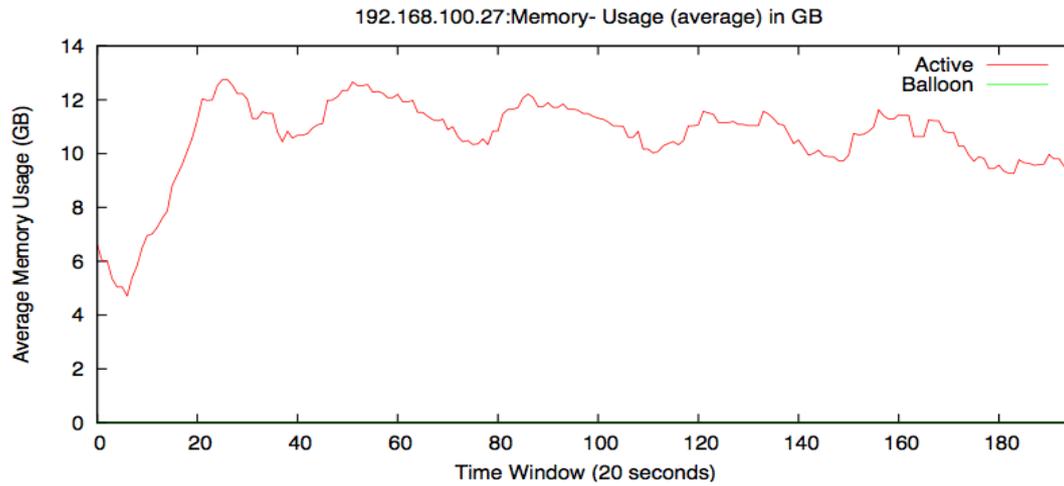


Figure 10. Average Memory Usage

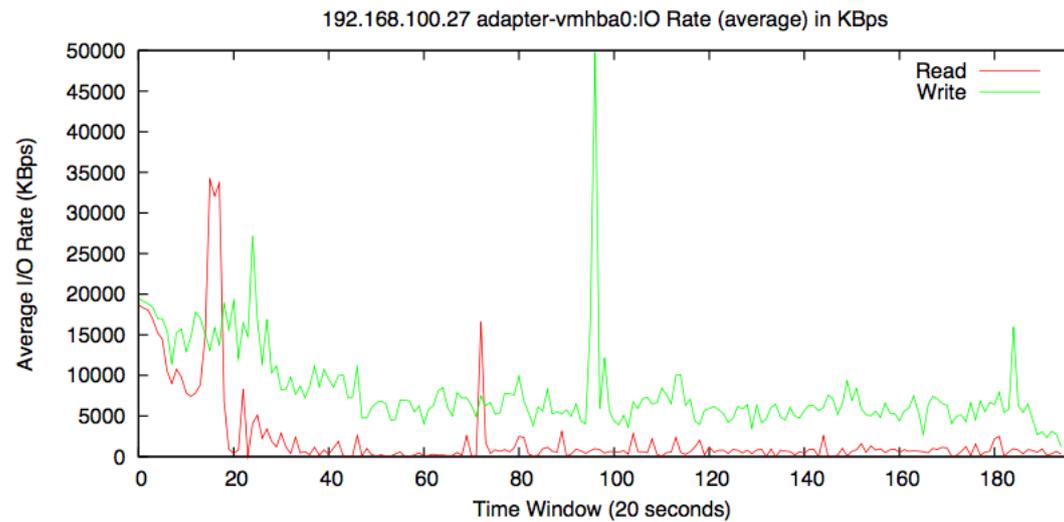


Figure 11. Average I/O Rate



Conclusion

As IT environments grow in complexity, they will eventually fall behind business operations if traditional technologies continue to be used. Along with the rapid development of virtualization technologies, companies expect to extend virtualization from servers to desktops. VDI provides many benefits and their deployment with available resources is simple and easy. They also provide a new level of desktop application. The users can access and operate desktops, applications, and storage space at any time via their PC, notebook computer, or mobile device. Problems encountered by companies regarding the deployment of desktop virtualization, for instance, network structure and network bottlenecks, and storage space, imply that VDI management requires automation, flexibility, and fast deployment.

Aside from centralized and less costly management, virtualization benefits include provision of identical user experiences to users and protection of companies' confidential data.

The demonstrated advantages and design features prove that QCT's QxVDI VMware Edition-OA is a perfect business solution.

By avoiding complex storage systems and the purchase of expensive storage devices and switches, and by reducing the costs of virtualization desktop deployment, QxVDI VMware Edition-OA fulfills desktop virtualization by "providing a single virtual environment for users regardless of location or equipment."





About QCT

QCT (Quanta Cloud Technology) is a global data center solution provider that extends 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 that all deliver hyperscale efficiency, scalability, reliability, manageability, serviceability, and optimized performance for each workload.

QCT offers a full spectrum of datacenter products and services from engineering, integration, and optimization to global supply chain support, all under one roof.

QCT is a subsidiary of Quanta Computer Inc., a Fortune Global 500 technology engineering and manufacturing company.

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