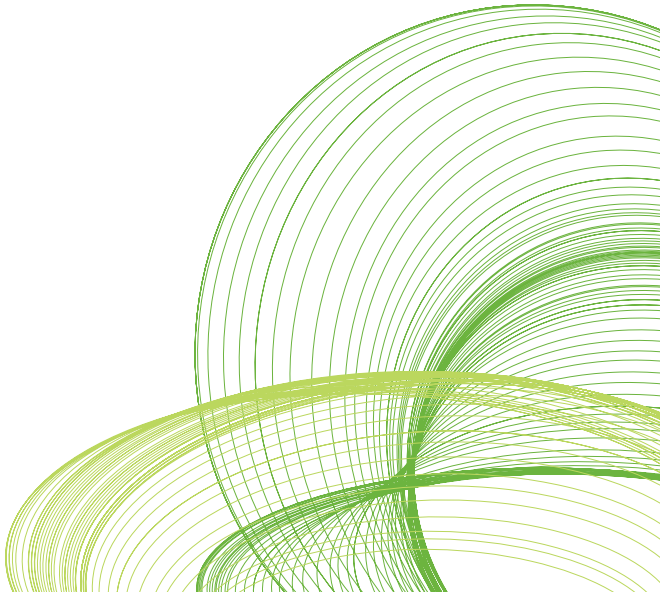
QlikView

QLIKVIEW AND SERVER VIRTUALIZATION

A QlikView Technology White Paper

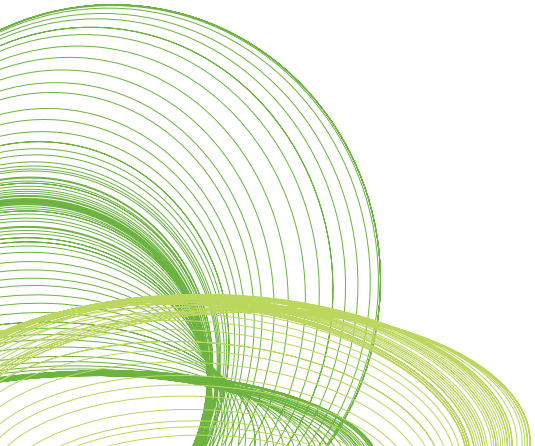


June 2013

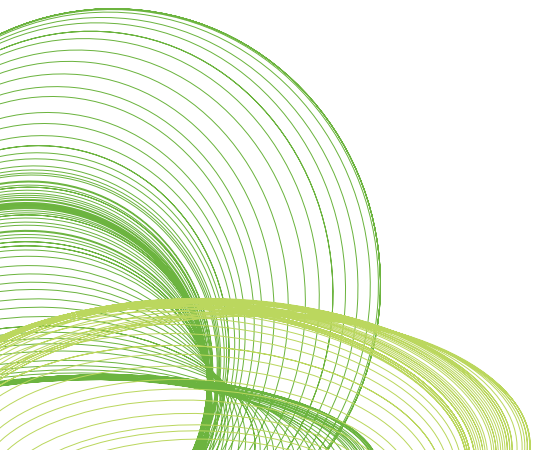
qlikview.com

QlikView

Table of Contents



QlikView



Overview

Although server virtualization has been around for many years, it is only within the past decade that its use has become mainstreamed. Additionally, it is only within the past few years that large enterprises have been willing to adopt server virtualization for even their most critical applications. Even so, virtualization has already become so widely accepted that for many companies it is a strategic mandate with the use of dedicated physical servers requiring an exception, if allowed at all. These exceptions are generally reserved for high performance memory and CPU intensive applications which do not fit the model of underutilization, which was the original catalyst for server virtualization.

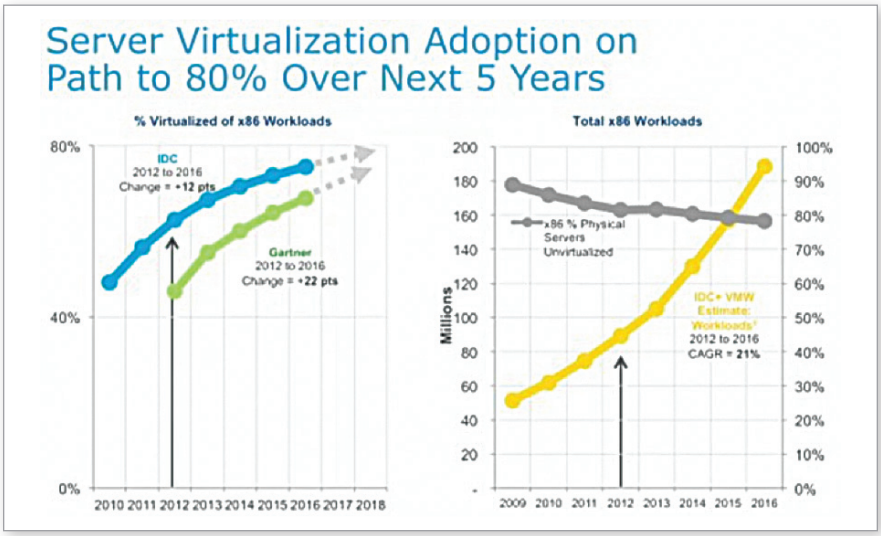
Many QlikView customers will find that they can virtualize all components of their QlikView deployment. However, QlikView provides a robust platform on which a wide range of business discovery applications can be built. As such, some customers with complex business requirements and demanding performance expectations may find that their production QlikView Server performs better on dedicated physical hardware. It is important to recognize that even in these cases, many other components of the deployment can be virtualized allowing customers to meet their overall virtualization rate objectives.

This document is intended for use by IT professionals who are considering the virtualization of their QlikView server deployment. The paper first provides a brief background on server virtualization and then continues with considerations for the virtualization of the QlikView server components.

Server Virtualization to Cloud

SIGNIFICANT COSTS SAVINGS

It is not surprising that the rapid adoption of server virtualization within large enterprises has been fueled by the opportunity for cost savings. By allowing multiple operating systems to share a single piece of server hardware, server virtualization allows companies to significantly reduce the number of physical servers they need to purchase and manage. Furthermore, there are significant additional savings that can be realized through corresponding reductions in related infrastructure including data center capacity and power consumption.



http://www.theregister.co.uk/2013/03/15/vmware_server_virtualization_sddc/page3.html

OPERATIONAL BENEFITS

Companies are realizing many operational benefits as well which can be just as important as costs. For example, modern hypervisors allow administrators to move an active server operating system from one piece of hardware to another with no downtime eliminating the need for scheduled outages to support hardware maintenance or upgrades.

DRIVEN BY HISTORICAL UNDERUTILIZATION

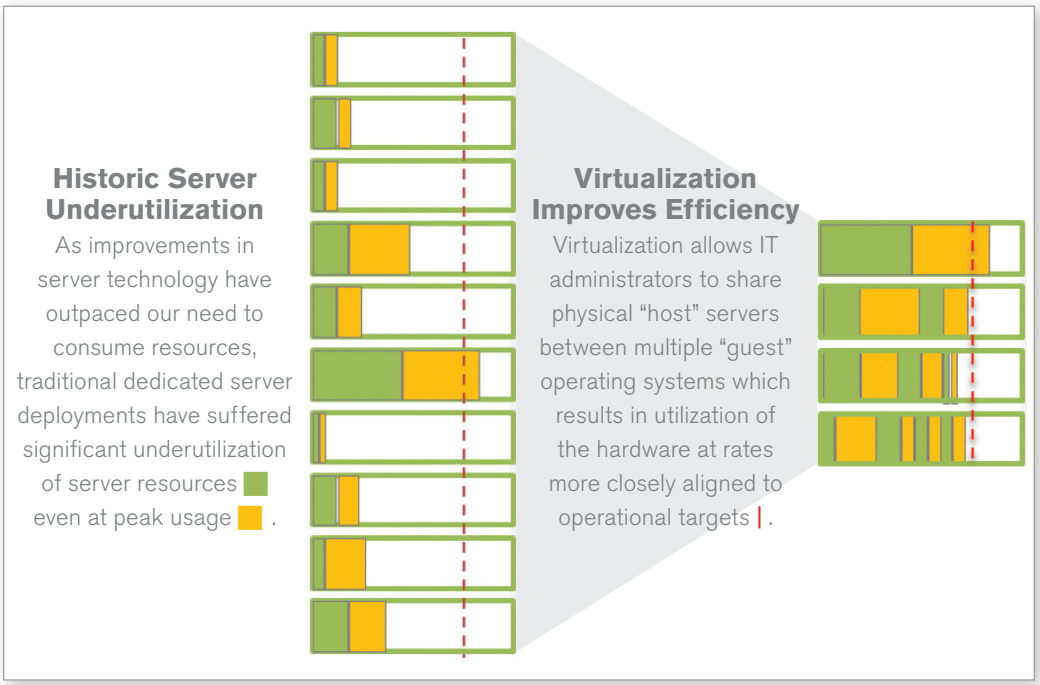
While it is important to understand the cost and operational benefits, it is equally important to remember that virtualization was made possible because of historic underutilization of system resources such as memory and CPU.

This underutilization was driven by the fact that demand for computing power has not always kept pace with advances in server technology. Even applications which were once starved for resources eventually found themselves with excess capacity as their hardware was refreshed with equipment 2-4 times more powerful than that which it was replacing. The result was often significant underutilization -sometimes with peak utilization rates in the single digits.

BASIC SERVER VIRTUALIZATION

In an effort to make better use of the firm's IT infrastructure, systems administrators have implemented server virtualization allowing them to share a single piece of server hardware (the "host") between multiple operating systems (the "guests"). Here each guest is allocated a portion of the underlying physical infrastructure.

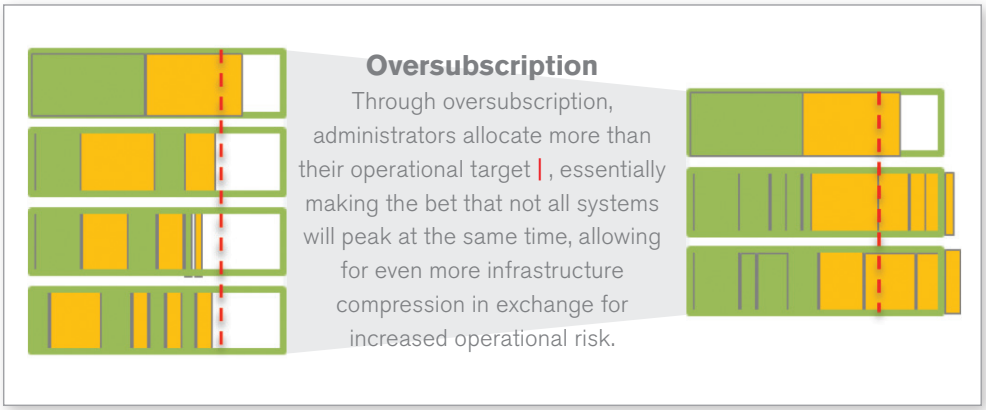
The software which orchestrates this resource sharing is referred to as the hypervisor. Although the hypervisor adds another layer of complexity to the environment, modern hypervisors have become increasingly efficient. On a properly sized and well managed machine, the performance impact of the virtualization layer will usually be minimal (less than 5%). In fact, in some situations, virtualization can actually improve performance. This usually occurs when servers which previously needed to traverse the network to communicate with each other co-exist on the same host, eliminating network latency between these systems.



OVERSUBSCRIPTION

Over time, a continued increase in hardware performance has resulted in increasing numbers of guests which can be supported on any given host.

As more guests co-exist on the same host, it becomes less likely that they will all experience peak utilization at the same time. Therefore, administrators once again found themselves looking for strategies to improve utilization of the underlying host hardware.



One commonly implemented method to drive utilization even higher is oversubscription where the administrator allocates more system resources than actually exists in an effort to maintain high utilization rates despite each system peaking at different times. Here the administrator must balance the desire to make effective use of the underlying resources with the real risk that too many guest systems will attempt to make use of the resources at the same time.

When this happens, the hypervisor must coordinate this contention and does so by essentially slowing down the speed at which the guests receive access to the underlying resources such as memory and CPU. For real-time memory and CPU intensive applications, this can mean a significant and unacceptable decrease in performance.

Application performance cannot be guaranteed when utilizing oversubscription methods and therefore QlikTech strongly recommends that the QlikView server-side components, especially QlikView Server, are provided with dedicated resources including CPU and memory.

CLOUD

Conversations about virtualization often lead to a discussion about Cloud. The term Cloud can mean very different things. For purposes of this discussion, we will assume that cloud represents a situation where the virtual guest is hosted on offsite infrastructure managed by a third party.

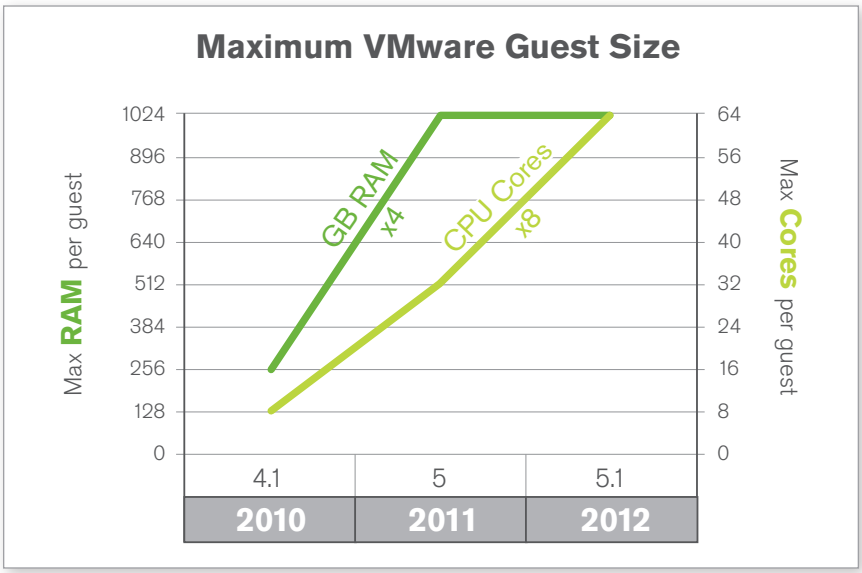
Customers who buy server capacity within the cloud have the advantage of being able to turn servers on or off as needed only paying for resources when they are in use. However, cloud customers typically have no visibility into the hypervisor layer or the underlying physical hardware, which means that very little if anything can be done to tune these components potentially leading to performance issues.

A much more detailed review of QlikView and Cloud can be found in the QlikView in the Cloud White Paper: http://www.qlikview.com/us/explore/resources/whitepapers/qlikview-in-the-cloud

HYPERVISOR EVOLUTION

As we have seen, virtual machine management isn't quite as simple as cutting up a physical machine into multiple pieces. The hypervisor manages the complex task of ensuring that each guest operating system gains access to the underlying hardware resources that it needs in turn with other guests. This orchestration imposes a penalty on system performance which can be small but which can also be quite dramatic when multiple guests are vying for the same resources.

Just as there are multiple manufacturers of server hardware, there are multiple hypervisor vendors (e.g. Xen, KVM, VMWare, Hyper-V). It is important to understand that each hypervisor will have different performance characteristics and each will evolve at a different pace as the vendors work to improve management tools, performance and maximum guest size. This is important because applications which may not be a good candidate for virtualization today may very well become good candidates over time as the hypervisors continue to evolve.



VMware is the prevalent hypervisor in use across large enterprises today. Here we see the guest size limit has evolved from 8 cores with 256 G of memory to 64 cores with 1 TB of memory in just two years.

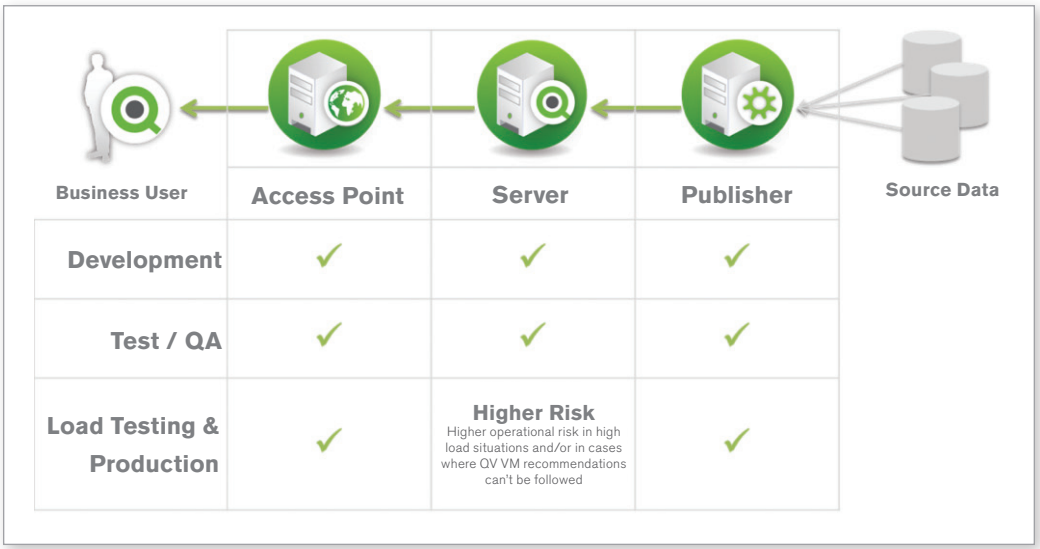
However, it is important to recognize that these are theoretical limits. For operational reason including performance many IT groups impose limits on the size of the guests that they are willing to manage within their virtualization environments. This will vary from firm to firm.

General Virtualization Considerations

QlikTech fully supports QlikView server products in a virtualized environment. (For the full support statement, please see **Appendix B: QlikView Virtualization Support Statement**.)

However, special care should be taken when considering the virtualization of any memory and CPU intensive application. QlikView Server is no exception. QlikView provides a robust platform on which a wide range of business discovery applications can be built. These applications are driven by QlikView Server's in-memory analytics engine which provides real-time recalculation of reports, visualizations, and dashboards directly to the business users.

Although many QlikView customers will find that they can virtualize all components of their QlikView deployment, the hypervisor does impose some performance overhead and therefore some customers with complex business requirements and demanding performance expectations find that their production QlikView Server performs better on dedicated physical hardware. It is important to recognize that even in these cases many other components of the deployment can be virtualized allowing customers to meet their overall virtualization rate objectives.



You will find more detailed descriptions of each of the QlikView platform components in Appendix C: QlikView Platform Server Components.

When considering the virtualization of the QlikView platform, the component of primary concern is the Production QlikView Server (QVS). The QVS is the component which contains the in-memory analytics engine which is the heart of QlikView's ability to deliver on-the-fly recalculation of QlikView applications as users dynamically explore their data.

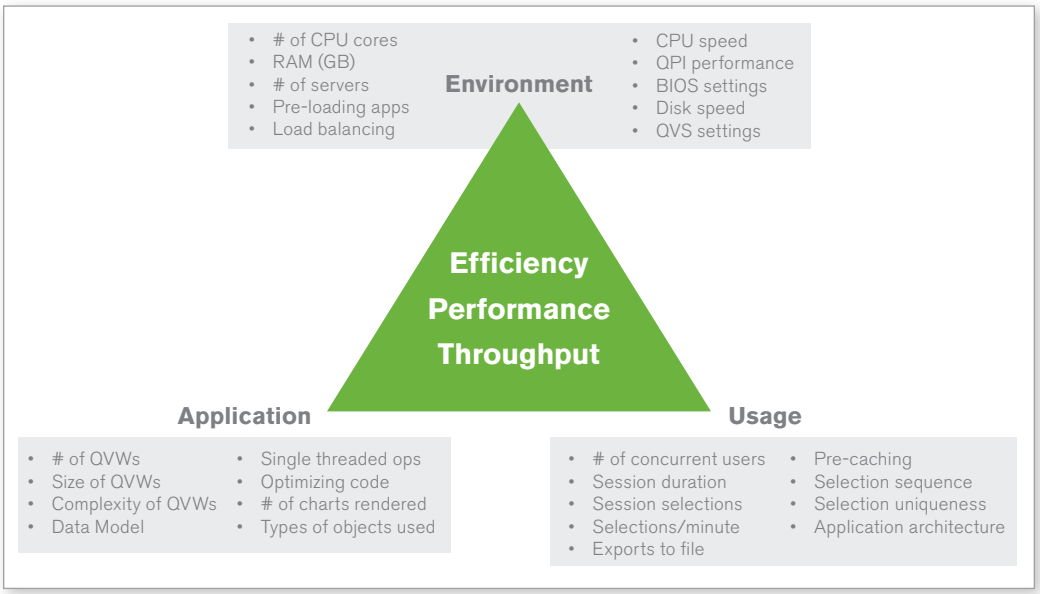
The remainder of this document is focused on general considerations for the virtualization of the QlikView Server. Additional documentation regarding performance and scalability is periodically published by the QlikTech Scalability Center and is available on our website as well as within the QlikView Scalability Group on our community site: http://community.qlikview.com/groups/qlikview-scalability.

QlikView Server (QVS) Virtualization Considerations

QVS PERFORMANCE DRIVERS

QVS performance is driven by a number of factors which can be categorized as Environment, Application Development and Usage Patterns. When discussing performance in your QlikView environment, it is important to consider all of these components.

From an environment perspective, QlikView Server is particularly sensitive to memory and CPU performance. This is different than many other BI applications which are dependent on disk I/O and network throughput as they support queries and small, high volume requests. QlikView Server is a real-time memory based BI platform. Therefore, QlikView performance depends not only on available memory and CPU, but also the speed at which the CPUs can access RAM.



QVS VIRTUALIZATION PERFORMANCE IMPACT

There are many factors which impact the performance of QlikView Server in a virtualized environment including the underlying hardware model, the BIOS settings, the hypervisor software, and the use of resource reservations or oversubscription.

Testing done by the QlikTech Scalability Center has shown that the addition of server virtualization generally has a small impact on performance (<5%). However, in some test scenarios, particularly those where the server was under heavy load, the addition of virtualization degraded performance as much as 35%.

General recommendations are provided below. For the most current test results and recommendations, please visit the QlikView Scalability Group on our community site: http://community.qlikview.com/groups/qlikview-scalability.

QVS VIRTUALIZATION GENERAL RECOMMENDATIONS

Capacity Planning

Proper sizing and ongoing monitoring of the QlikView environment is a key to success with any QlikView deployment but this is especially true in a virtualized server environment. Test results have shown that performance degrades more quickly on a virtualized server than on dedicated physical hardware especially when under heavy load.

Monitoring of the CPU and memory can be implemented with a variety of standard systems tools available to operational teams. In addition, the QlikView Systems Monitor tool can be used to provide further insight into the operations of the QlikView Server.

Use of Whitelist Server Hardware & BIOS Settings

Based on test results, the QlikTech Scalability Center maintains a list of recommended hardware for QlikView. This information along with associated BIOS setting recommendations is made available through the QlikView Scalability Group on our community site.

QlikView Server CPU and Memory Must Be Reserved

Oversubscription of the virtualization environment works by imposing delays into the server's ability to access the underlying resources. Given the real time CPU and memory intensive nature of the QlikView Server, these delays can substantially impact QlikView server performance.

Application performance cannot be guaranteed when utilizing oversubscription methods and therefore QlikTech strongly recommends that the QlikView server-side components, especially QlikView Server, are provided with dedicated resources including CPU and memory.

Maintain Configuration

Virtualized server environments are exposed to unique operational risks that need to be considered. By its very nature, virtualization abstracts the operating system from the underlying hardware allowing administrators to, among other things, move guests from one physical server to another in order to perform hardware maintenance or upgrades with little or no outage to the guest. This means that it would be quite easy for a QlikView Server to be moved from properly configured hardware to less optimal hardware without the QlikView administrator's knowledge.

QVS DEDICATED PHYSICAL HARDWARE

Despite QlikTech's support, many customers will still choose to deploy the QlikView Server component on dedicated physical hardware while other components of the implementation including Access Point and Publisher are deployed virtually. When this is the case, hardware should be selected directly from our server hardware whitelist which can be found on the QlikView Scalability Community Group.

A number of valid reasons may be cited during the policy exception process.

- QlikView does not match the pattern of resource underutilization which is the primary driver for server virtualization.
- The performance of the QlikView Server is extremely sensitive to resource (CPU/memory) contention.
- Optimal QlikView performances require specific machine level configuration settings which are difficult to maintain in a dynamically managed virtual deployment.
- Lack of support for a virtual machine large enough to meet the sizing requirement estimated for the firm's QlikView Server

Conclusion

Server Virtualization has rapidly become a strategic component of enterprise infrastructure management and in some cases has even become a corporate mandate. QlikView is supported in a virtualized server environment. However, as with any CPU and memory intensive application, special care should be given to the virtualization of the QlikView Server.

With proper sizing and configuration, many firms will find that a fully virtualized QlikView deployment provides both the capacity and performance that they need to deliver an exceptional QlikView business discovery experience for their business users. Proper sizing, ongoing capacity planning and dedicated system resources are the primary factors necessary to ensure success.

For some firms however, the risk of performance issues in a heavily utilized and/or rapidly growing QlikView environment will result in the decision to deploy QVS on dedicated physical hardware. But even here, many other components of the deployment can be virtualized allowing customers to meet their overall virtualization rate objectives.

In the end, QlikView Server performance is not a simple topic and virtualization is only one component to consider. There are a number of White Papers and Technical Briefs on our website to assist you in your understanding of performance, scalability, and architecture. In addition, you may wish to seek help in tuning your environment. Here you may find it helpful to enlist one of our many partners or QlikView Consulting Services.

Appendix A: References

Server Virtualization Adoption on path to 80% over next 5 years.
http://www.theregister.co.uk/2013/03/15/vmware_server_virtualization_sddc/page3.html

QlikTech Scalability Center – QlikView Scalability Group
http://community.qlikview.com/groups/qlikview-scalability

QlikView Consulting Services
http://www.qlikview.com/us/services/consulting-services

RELATED QLIKVIEW WHITE PAPERS AND TECHNICAL BRIEFS

QlikView Architectural Overview
http://www.qlikview.com/us/explore/resources/whitepapers/qlikview-architectural-overview

QlikView Scalability Overview
http://www.qlikview.com/us/explore/resources/whitepapers/qlikview-scalability-overview

QlikView Scalability Benchmark
http://www.qlikview.com/us/explore/resources/whitepapers/qlikview-scalability-benchmark

QlikView in the Cloud
http://www.qlikview.com/us/explore/resources/whitepapers/qlikview-in-the-cloud

QlikView Architecture and System Resource Usage Technical Brief
http://www.qlikview.com/us/explore/resources/technical-briefs?language=english

QlikView Server Memory Management and CPU Utilization
http://www.qlikview.com/us//~/media/Files/resource-library/global-us/direct/datasheets/DS-Technical-Brief-QlikView-Server-Memory-Management-and-CPU-Utilization-EN.ashx'

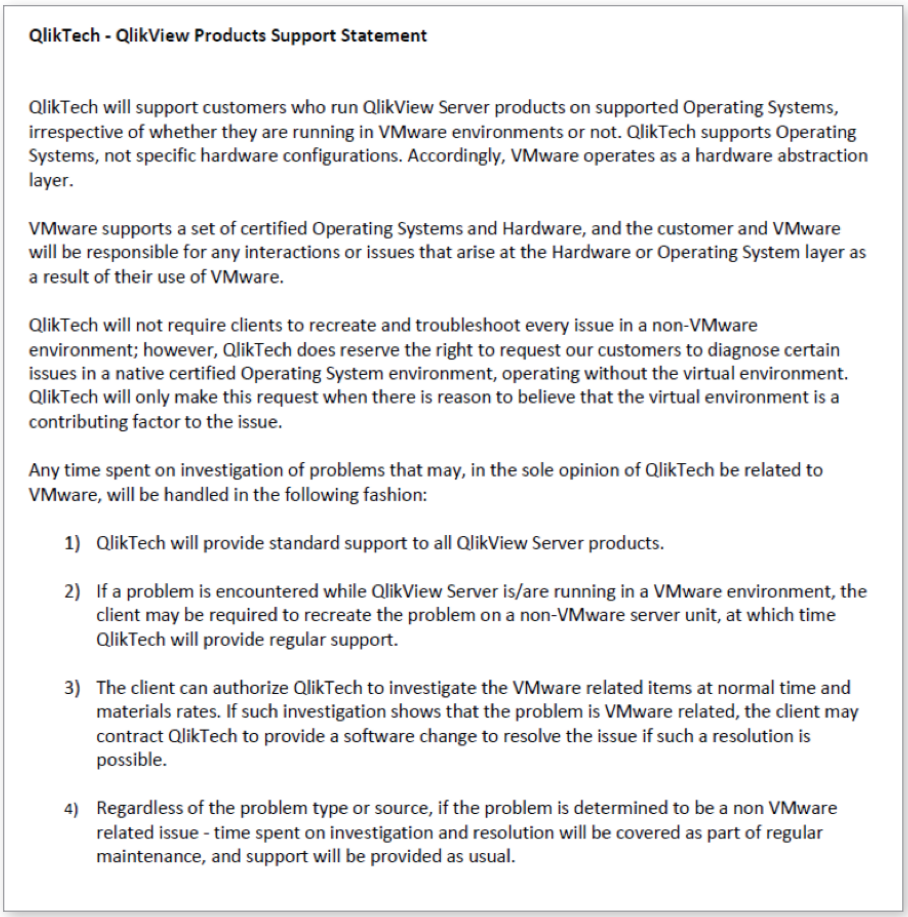
Scaling Up vs. Scaling Out in a QlikView Environment
http://www.qlikview.com/us//~/media/Files/resource-library/global-us/direct/datasheets/DS-Technical-Brief-Scaling-Up-vs-Scaling-Out-EN.ashx

Appendix B: QlikView Virtualization Support

QlikTech supports customers who run QlikView server products on supported operating systems irrespective of whether or not they are running in a virtualized environment.

Although QlikView is fully supported, it is important but not surprising to note that support of any interactions or issues, that arise at the hardware or operating system layer as a result of the use of virtualization, is the responsibility of the customer and/or the hypervisor vendor.

The full support statement can be found on VMWare's website:
http://www.vmware.com/files/pdf/isv/QlikTech_Support_Statement.pdf



QlikTech - QlikView Products Support Statement

QlikTech will support customers who run QlikView Server products on supported Operating Systems, irrespective of whether they are running in VMware environments or not. QlikTech supports Operating Systems, not specific hardware configurations. Accordingly, VMware operates as a hardware abstraction layer.

VMware supports a set of certified Operating Systems and Hardware, and the customer and VMware will be responsible for any interactions or issues that arise at the Hardware or Operating System layer as a result of their use of VMware.

QlikTech will not require clients to recreate and troubleshoot every issue in a non-VMware environment; however, QlikTech does reserve the right to request our customers to diagnose certain issues in a native certified Operating System environment, operating without the virtual environment. QlikTech will only make this request when there is reason to believe that the virtual environment is a contributing factor to the issue.

Any time spent on investigation of problems that may, in the sole opinion of QlikTech be related to VMware, will be handled in the following fashion:

1) QlikTech will provide standard support to all QlikView Server products.

2) If a problem is encountered while QlikView Server is/are running in a VMware environment, the client may be required to recreate the problem on a non-VMware server unit, at which time QlikTech will provide regular support.

3) The client can authorize QlikTech to investigate the VMware related items at normal time and materials rates. If such investigation shows that the problem is VMware related, the client may contract QlikTech to provide a software change to resolve the issue if such a resolution is possible.

4) Regardless of the problem type or source, if the problem is determined to be a non VMware related issue - time spent on investigation and resolution will be covered as part of regular maintenance, and support will be provided as usual.

Appendix C: QlikView Platform Server Components

There are a number of server side components which make up the QlikView platform. For small deployments, any number of these may actually be hosted on a single server. However, enterprise customers will typically deploy each on their own system and in fact, may have multiple instances of each type.

QLIKVIEW ACCESS POINT

Access Point is the web based user portal server which provides front-end access to the published QlikView documents. QlikView contains its own web server or firms can alternately choose to utilize Microsoft IIS (Internet Information Server). The Access Point also handles client authorization against existing directory service providers. (e.g. Microsoft Active Directory, eDirectory).

QLIKVIEW SERVER

The QlikView Server (QVS) is the server-side product that contains the in-memory analytics engine. This is the heart of QlikView's ability to deliver on-the-fly recalculation of QlikView applications as users dynamically explore their data.

The QVS also includes the QlikView Management Console (QMS) for providing administrator access to control all aspects of the server deployment (including security, clustering, distribution etc.)

QLIKVIEW PUBLISHER

The QlikView Publisher is the server-side component that performs a number of functions relating to the loading and distribution of data across one or more QlikView Servers.

(1) loads data from a wide variety of data sources into staging QVW files which are optimized and compressed for rapid loading into memory on the QVS

(2) provides functionality to reduce data sets based on security or other data based rules

(3) distributes data to the appropriate QlikView Server (e.g. by region)

(4) distributes static PDF reports via email if necessary

QLIKVIEW EXPRESSOR

QlikView Expressor is a server-side component which provides a visual interface to prepare and manage data used in QlikView applications. As it is utilized to manage the data flows within a QlikView implementation, QlikView Expressor defines and captures the source, target and business rule metadata along the way. This ensures that data efforts are reusable from project to project, helping to reduce QlikView scripting and to improve consistency of data and calculated values within your QlikView deployment.