OVERCOMING 7 KEY CHALLENGES TO VIRTUALIZATION: HOW DELL- AND F5-BASED IT INFRASTRUCTURES SMOOTH THE WAY

While server virtualization promises significant bottom-line business benefits, it can also add significant burdens to network and storage infrastructures. F5® BIG-IP® application delivery networking systems and F5 ARX® Series intelligent file virtualization devices work with Dell™ server and storage platforms to help organizations cost-effectively prepare to meet the demands of virtualization.

CHALLENGE #1: RESOURCE STARVATION
Running several virtual machines (VMs) on a single physical server can dramatically increase server utilization, but it can also increase the burden on hardware resources. For example, I/O bottlenecks can occur when multiple VMs on a single server share the same network card, especially in I/O-intensive applications. Although many applications optimize their I/O operations for specific hardware platforms, in a virtualized environment those optimizations are lost in the hypervisor translation layer. Unaddressed, this situation can contribute to degraded network performance and increased response-time latency.

F5 BIG-IP LTM systems are designed to reduce resource overload associated with virtualization by offloading processor-intensive I/O processing such as Secure Sockets Layer (SSL) processing, caching, and compression from VMs to a purpose-built appliance. For example, a VM running an I/O-intensive application may have to process hundreds of SSL-encrypted sessions, which can be very demanding on the host server. BIG-IP LTM systems enable SSL operations to be offloaded to a separate device, relieving individual VMs from the burden of performing computationally expensive SSL processing. Furthermore, offloading network processing helps reduce costs and increase VM density on servers by enabling each physical server to support more VMs than it could otherwise. This approach enables significant overall efficiency enhancements in virtualized environments.

Moving to a virtualized environment enables tremendous improvements in data center productivity and flexibility. But virtualization can also burden an IT infrastructure, resulting in decreased performance and availability, compounded by increases in cost and complexity. To help organizations achieve the full benefits of virtualization, F5 Networks offers a range of products designed to prepare network and storage infrastructures for the heightened demands that server virtualization brings—helping to increase availability, enhance performance, and reduce total cost of ownership for virtualized data center environments.

Seven key challenges typically arise when IT organizations migrate to a virtualized environment. By laying the foundation with a suitable network and storage infrastructure, administrators can overcome potential pitfalls and reap bottom-line business benefits. In particular, by facilitating application delivery from storage to application server to Web server to end user, F5 BIG-IP Local Traffic Manager™ (LTM) systems, BIG-IP Global Traffic Manager™ (GTM) systems, and ARX Series intelligent file virtualization devices help organizations enhance data center performance, increase application availability, and reduce the total cost of ownership necessary to support a virtualized environment (see Figure 1). These F5 products are designed to work seamlessly with platforms such as Dell PowerEdge® servers, Dell EqualLogic™ PS Series Internet SCSI (iSCSI) storage area network (SAN) arrays, Dell PowerVault™ storage arrays, and EMC® Celerra® storage arrays.

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APPLICATION AWARENESS

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**CHALLENGE #2: LACK OF APPLICATION AWARENESS**

Because they virtualize only the OS and not the applications themselves, server virtualization platforms lack the application awareness that is often vital for making effective load-balancing decisions and maintaining state for uninterrupted application availability during VM migrations. Because server virtualization software lacks information about application resources such as network, storage, and database usage, it is not well equipped to make intelligent load-balancing or application traffic decisions, which can lead to suboptimal application performance and availability. Also, because server virtualization platforms are not designed to keep track of application state, key application parameters such as shopping cart information may be lost during a VM migration—often bypassing critical application processes as a result.

F5 BIG-IP LTM systems are designed to maintain awareness of critical application information such as state, performance, and resource usage, and can use this information to help make informed load-balancing decisions and help ensure that application state and availability are maintained during VM migrations. For example, if a shopping cart application must be migrated to a new VM, BIG-IP LTM systems can route the connection to another image if a shopping cart application must be migrated to a new VM, BIG-IP LTM systems can route the connection to another image.

**CHALLENGE #3: UNANTICIPATED COSTS**

Virtualization is often implemented to help reduce data center costs by consolidating physical servers, minimizing energy consumption, and enhancing business continuity. However, virtualization can also incur unanticipated hardware and software expenditures to help solve availability, performance, and management problems. For example, when VMs running I/O-intensive applications overwhelm the network cards on physical servers, administrators typically run fewer VMs on each physical server than originally planned—leading to unplanned deployment of additional physical servers. Meanwhile, virtualization increases the demand on storage infrastructures because it requires an enormous amount of capacity to create and store VMware virtual disk (VMDK) images over time. This often requires organizations to purchase unbudgeted storage equipment as well (see the “Challenge #5: Increased storage requirements” section in this article).

Because they are designed to offload most network processing from the server to a specialized device, F5 BIG-IP LTM systems help free servers from the burden of extensive network processing, enabling each server to support additional VMs and thereby helping to reduce the need to purchase unbudgeted hardware.

**CHALLENGE #4: UNUSED VIRTUALIZATION FEATURES**

Although server virtualization platforms offer many advanced capabilities—such as live VM migration, virtual software switching, and support for virtual LAN segmentation—existing network infrastructures may not be equipped to support such features. For example, a virtualized infrastructure environment managed using VMware vCenter Server (formerly VMware VirtualCenter) cannot take advantage of VMware Distributed Resource Scheduler (VMware DRS), VMware High Availability (VMware HA), or VMware vMotion™ features unless the network is equipped to manage application connections, maintain application state, and perform load balancing across servers.

F5 BIG-IP LTM systems are integrated with the VMware vCenter Server application programming interface (API), enabling organizations to take advantage of advanced VMware networking capabilities such as VMware DRS and VMware HA. In particular, BIG-IP LTM devices are designed to send networking and application information directly to vCenter Server, allowing...
VMware DRS and vMotion technology to make decisions based on both computing and network resource data. Also, this integration enables configuration and policy information to be shared between BIG-IP LTM systems and vCenter Server, allowing configuration changes to be passed automatically between the application network and VM platforms.

CHALLENGE #5: INCREASED STORAGE REQUIREMENTS

In non-virtualized environments, OS files often reside on internal or direct attach storage. In virtualized environments, however, OS files are converted to flat VMDK files—which can range from tens to hundreds of gigabytes each—and are often stored on shared file servers. Over time, the proliferation of VMDK files can overwhelm the capacity of existing storage environments.

F5 ARX devices help ease the burden on storage infrastructures and help reduce storage costs in a virtualized environment, which is especially important given today's tight IT budgets. First, ARX devices are designed to dramatically reduce expensive tier 1 storage utilization by saving only the most active and business-critical data on tier 1 storage. This process is designed to occur seamlessly in the background based on administrator-defined management policies, helping increase control over storage growth and spending.

Second, by supporting policy-based data life cycle management across heterogeneous storage arrays, ARX devices are designed to automatically move old data between storage tiers based on enterprise policies. For example, frequently accessed VMDK files can be placed automatically in tier 1 storage, while less frequently used VMDK files can be automatically moved to less expensive tier 2 storage. In addition, ARX devices provide persistent access to these files to help maintain application uptime and avoid business downtime throughout the process. ARX devices also enable file storage to be seamlessly merged into large shared pools with a single global namespace, helping increase aggregate storage utilization.

ARX devices support a range of heterogeneous platforms, including Dell EqualLogic PS Series iSCSI SAN arrays, Dell PowerVault storage arrays, and EMC Celerra storage arrays. By offering the flexibility to utilize best-of-breed storage that is most appropriate to specific needs, ARX devices help organizations increase storage efficiency and performance, simplify data management, and reduce the cost of supporting the storage needs of virtualized environments.

CHALLENGE #6: CONGESTED STORAGE NETWORK

Besides increasing storage utilization, server virtualization can dramatically increase data storage traffic. For example, passing large amounts of data from multiple VMs through one host storage network connection can lead to serious storage traffic congestion. Also, moving large VMDK images over wide area network (WAN) connections can be slow and interfere with other traffic.

F5 ARX devices help ease the burden on storage networks by helping ensure that new VMDK files are stored on tier 1 storage while old VMDK files are migrated to the appropriate storage tiers based on administrator-defined data management policies. This approach helps reduce bottlenecks and increase utilization. In addition, F5 BIG-IP WAN optimization features help compress and de-duplicate the transmission of data such as VMDK files over a WAN, which helps greatly accelerate link performance despite latency and enables organizations to exploit limited bandwidth to best advantage.

CHALLENGE #7: MANAGEMENT COMPLEXITY

Managing a virtualized environment can be one of the most difficult challenges of all. Typical virtualization management tools are designed to provide insight into only the virtualized elements of the environment, not into the data center as a whole. Similarly, existing data center management tools are generally not aware of virtualization components such as hypervisors, VMs, and VM monitors. As a result, administrators must contend with multiple management tools and incomplete information, which can increase the time, cost, and complexity of managing virtualized environments.

F5 BIG-IP LTM systems are designed to integrate directly with both VMware vCenter Server and Microsoft® System Center Operations Manager to help administrators simply and effectively manage their virtualized data center resources. For example, BIG-IP LTM systems are designed to add or remove application connections and make load-balancing decisions based on metadata received from these virtualization management platforms through the F5icontrol® API.

OVERCOMING THE CHALLENGES OF VIRTUALIZATION

Virtualized environments can offer significant improvements in data center productivity and flexibility. But first, administrators must lay the groundwork for making a successful transition. To help organizations achieve the full benefits of virtualization, F5 Networks offers a range of products that equip network and storage infrastructures to handle the extra demands that virtualization can bring. F5 products work seamlessly with Dell PowerEdge server platforms, Dell EqualLogic PS Series iSCSI SANs, Dell PowerVault storage arrays, and EMC Celerra storage arrays to help increase availability, enhance performance, and reduce total cost of ownership for virtualized data center environments.