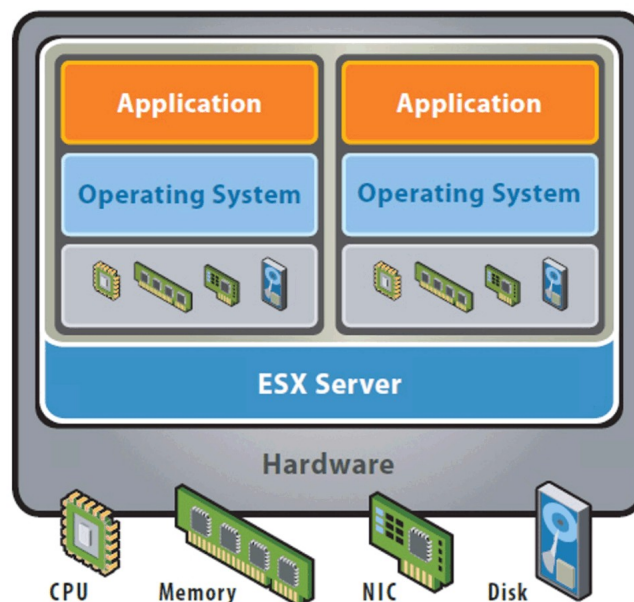




High performance SOA appliances in a virtualized environment

The market demand for SOA appliances is now well established and a range of appliances addressing security, acceleration, data integration and ESB functionality is available from different vendors. The role of such appliances in a virtualized environment is less clear but becoming more important as more companies adopt virtualization strategies. This paper describes the deployment of Dajeil's acceleration technologies in a virtualized environment.



1 Introduction

IBM recently put it in a paper about SOA and virtualisation “From cost management, to regulatory compliance, to shrinking product lifecycles, all businesses face common challenges. For solutions, a growing number of businesses are focused on initiatives that involve a line of business (LoB) and IT in the launch of high quality, value-added services designed to attract and retain customers. To build and deliver applications that support these initiatives, the critical IT methodology of Service Oriented Architecture (SOA) is essential. Just as essential for the optimal implementation of an SOA is the implementation of a dynamic virtualized infrastructure.

“From cost management, to regulatory compliance, to shrinking product lifecycles, all businesses face common challenges.” Successful implementation of any business service initiative rests in a strategy that aligns all vital business resources without allowing key factors for quality service delivery to be isolated in technology silos. All stakeholders of the initiative must understand the issues impacting availability, quality, and security of the service within a full end-to-end context. For that to happen, IT must establish a flexible infrastructure capable of supporting dynamic operations that meet service level agreements and business performance needs. Such an environment can best be obtained through virtualization at both the physical infrastructure layer to improve resource utilization and at the workload layer to improve infrastructure flexibility and responsiveness”.

2 SOA – Appliances & Virtualization

The SOA appliance should be considered first and then its context within a virtualized infrastructure. The benefits of SOA hardware appliances are:

- **Predictable, Secure environment**
The execution environment for the application is predictable and security features not available on a standard operating system can be used to protect from any rogue software.
- **Hardware acceleration** enhances performance
Hardware acceleration is available for crypto and XML processing to offload the CPU intensive processing thus improving throughput and latency.
- **Application Optimised for Platform**
With a known memory, CPU and disk configuration optimal selections can be made in respect of no of threads, memory allocation, file sizes,...etc.
- **Single HW platform / OS - Minimal Test / Support Overheads**
A single hardware platform greatly reduces time for new releases in QA as they needn't be tested in multiple hardware and software environments. Support engineers need only be familiar with the appliance platform supported. As appliance platforms are locked down users can not adversely configure system parameters. Application behaviour variances between different operating systems are eliminated. A single point of contact for support issues makes their resolution easier. In summary, firmware updates, new releases and end-user support can be provided in a timelier manner at a lower cost.
- **Quick and Easy Installation**
Installation issues are largely power and network connectivity.

The reasons why companies have adopted virtualisation include:

- **Server Consolidation**
It is not unusual to achieve 10:1 virtual to physical machine consolidation. This means that ten server applications can be run on a single machine that had required as many physical computers to provide the unique operating system and technical specification environments in order to operate. Server utilization is optimized and legacy software can maintain old OS configurations while new applications are running in VMs with updated

platforms.

Although a server supporting many VMs will probably have more memory, CPUs, and other hardware it will use little or no more power and occupy the same physical space reducing utilities costs and real estate expenditures.

- **Testing and development**

Use of a VM enables rapid deployment by isolating the application in a known and controlled environment. Unknown factors such as mixed libraries caused by numerous installs can be eliminated. Severe crashes that required hours of reinstallation now take moments by simply copying a virtual image.

- **Dynamic Load Balancing and Disaster Recovery**

As server workloads vary, virtualization provides the ability for virtual machines that are over utilizing the resources of a server to be moved to underutilized servers. This dynamic load balancing creates efficient utilization of server resources.

Disaster recovery is a critical component for IT, as system crashes can create huge economic losses. Virtualization technology enables a virtual image on a machine to be instantly re-imaged on another server if a machine failure occurs.

- **Virtual Desktops**

Multinational flexibility provides seamless transitions between different operating systems on a single machine reducing desktop footprint and hardware expenditure.

"...Parallels Desktop for Mac, a virtual machine application. Instead of Boot Camp's dual-boot approach, Parallels Desktop runs Windows XP directly on the Mac OS desktop (in what Parallels calls "near-native performance")--allowing you to run both OSs simultaneously and switch back and forth seamlessly." Daniel A. Begun, CNet: Heresy: Windows XP performance on a Mac.

- **Improved System Reliability and Security**

Virtualization of systems helps prevent system crashes due to memory corruption caused by software like device drivers. VT-d for Directed I/O Architecture provides methods to better control system devices by defining the architecture for DMA and interrupt remapping to ensure improved isolation of I/O resources for greater reliability, security, and availability.

The next section considers the use of SOA appliances in a virtualized environment.

3 Technical challenges of SOA Appliance in a virtualized environment

The most logical and advantageous approach to using SOA appliances in a virtual environment is to separate the appliance firmware from its physical base and construct a virtual appliance. In order to maintain the hardware appliance advantages a number of technical challenges are presented:-

- **Virtual Appliances use virtualised Hardware**

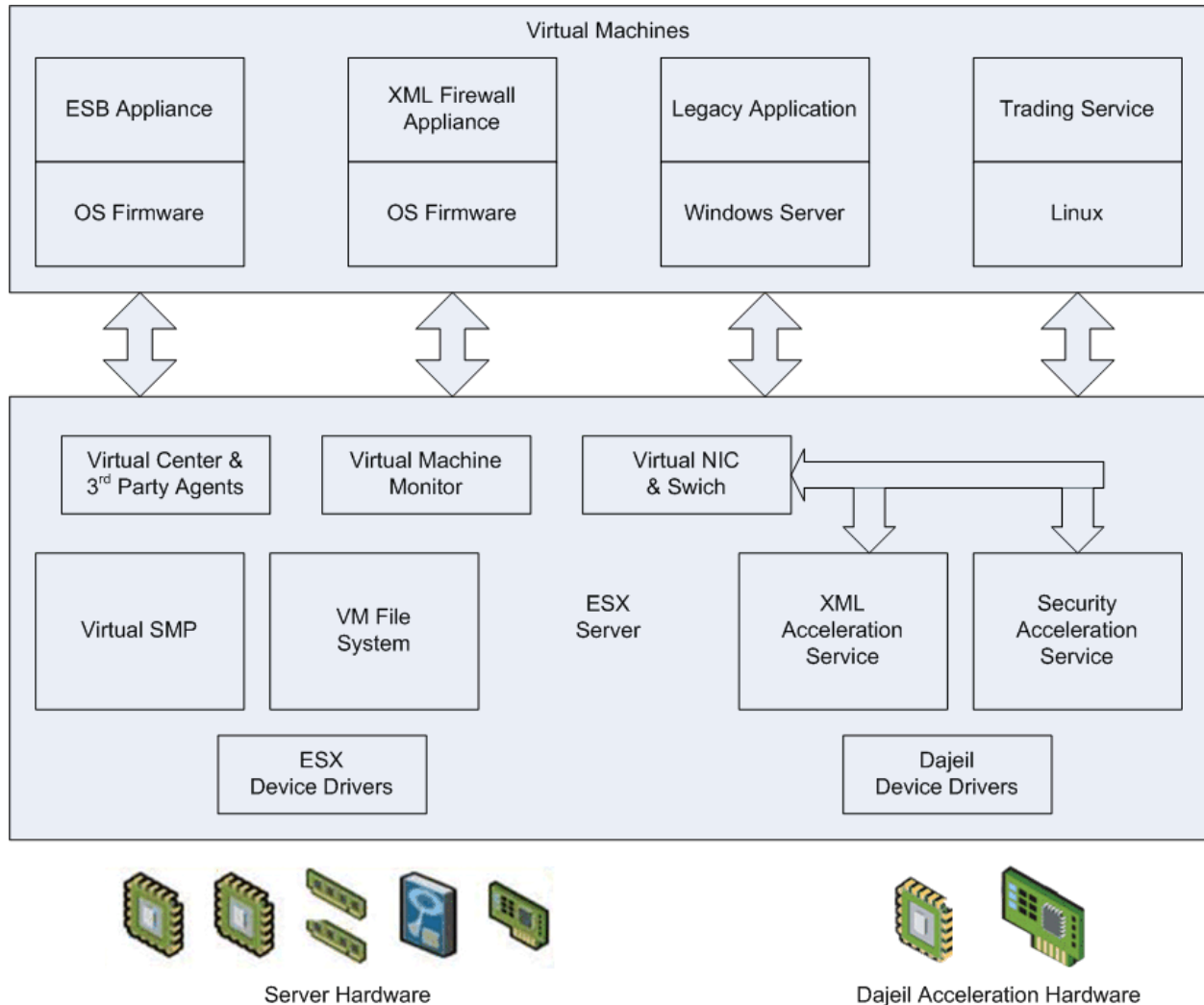
The conversion of appliance firmware to a virtual machine (VM) does not present any significant difficulty. Virtual machines can be configured to offer similar memory, disk and network configurations to their physical equivalents. There is some overhead in mapping and management of virtual to physical hardware.

- **How is Hardware acceleration used?**

Virtual machines do not support specialist hardware. Given that SOA appliances use hardware acceleration to obtain orders of magnitude increases in certain security and XML processing operations, the omission of acceleration hardware would present a deterrent to using virtual appliances. The solution to this dilemma is the delivery of shared access to the acceleration hardware by the VM hosting system. The VM's competing for the use of the hardware can use their standard network interfaces to transfer data to and from the shared acceleration hardware. These communications do not incur the overhead of the complete network stack but rather the virtual networking

software recognises the VM request and passes it directly to the process managing the shared acceleration hardware. This mechanism is more efficient than communicating with a physically connected network device.

The diagram below illustrates the virtualized elements of SOA capable of being hosted on a single hardware platform.



Multiple SOA elements in the VMware environment

4 Conclusion

Having overcome the technical challenges of constructing a virtual SOA appliance the benefits largely include the combined benefits of a specialised appliances and virtualization. In summary, these are a predictable secure environment, hardware acceleration, ease of installation and management, improved hardware utilisation, high availability & load balancing and overall improved system reliability. The co-location of virtual SOA appliances with virtual machines hosting the actual services, on the same physical platform, offers a faster, more energy efficient and cost effective infrastructure solution. As IBM’s Head of Websphere development recently put it *“The synergies derived by implementing an SOA in a virtualized infrastructure environment are profound for the support of service-oriented business initiatives”* or Judith Hurwitz, the CEO of Hurwitz & Associates said about virtualized SOA *“this is the direction for any vendor that is really serious about creating an environment that will allow customers to have the flexibility to leverage their intellectual property across customers, partners, suppliers, and employees”*.