

WHITE PAPER

# BlackBerry® Enterprise Server Deployment on VMware® ESX at VMware

May 2009

Technical Case Study



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## Executive Summary

This document describes the deployment of BlackBerry® Enterprise Server from Research in Motion, along with its other associated component servers, in virtual machines on VMware® ESX for VMware's own business use. This deployment has been in place for more than two years and now serves the needs of over three thousand BlackBerry users within the company. Since most VMware field sales and technical support people, along with other employees in departments such as marketing and IT, carry a BlackBerry device, a substantial portion of the company is dependent on the virtualized BlackBerry Enterprise Server instances that are housed in the VMware data centers.

## Company Overview

VMware has more than 6,300 employees based in 20 main locations around the world and many more regional sales offices. The VMware data center IT organization is spread across locations in Palo Alto, California, Cork, Ireland and Bangalore, India. The IT organization provides messaging capabilities to support all mail users in the company, including external contractors. The company has more than 9,000 mailboxes in use, and mail traffic can be characterized as "heavy"—this is a very email-intensive environment.

## Business Challenges

IT organizations are under continual pressure to reduce costs and increase service levels to the business. Many companies have met this pressure through the consolidation of physical computing resources onto fewer servers that host equivalent virtual machines. Consolidation allows companies to reduce equipment capital expenditure as well as power, cooling and recurring administrative costs. They also achieve increased flexibility through the ability to move workloads around more easily and to prioritize computing resource allocations to the most important work to be done.

Over the past two years, BlackBerry handheld devices and the servers that support them have become essential components in the VMware environment. BlackBerry Enterprise Server now forms an essential part of VMware corporate communications around the world. The VMware IT organization is responsible for providing a virtualized infrastructure for the messaging system and BlackBerry Enterprise Server processes that meets the company's requirements for availability, performance and cost. IT meets the requirement for continuous availability of the BlackBerry service by rapidly deploying new BlackBerry Enterprise Server instances to meet periods of higher demand, as well as by using the capabilities of VMware® High Availability (HA) to maintain the required service levels across virtualized BlackBerry Enterprise Server instances.

## Technical Challenges

Before implementing BlackBerry Enterprise Server and its helper servers on the VMware® vCenter platform, the VMware IT organization faced some significant technical challenges in maintaining service to end users. The most significant of these technical challenges were:

- The need for a solution that could scale quickly to handle rapid growth in employee numbers
- The need to improve availability of the BlackBerry Enterprise Server application
- The need to quickly test patches and reproduce issues
- The need to reproduce issues without adding new hardware to the existing set

- The need to test new functionality and features in a safe environment without prejudicing the production systems
- The need to reduce physical server count

The VMware virtualization platform was the key enabler in resolving all of these challenges.

## RIM BlackBerry Enterprise Server Overview

BlackBerry Enterprise Server is a component of the BlackBerry® Enterprise Solution. BlackBerry Enterprise Server acts as the centralized link between wireless devices, enterprise applications and wireless networks. Designed to meet the needs of enterprise and government organizations, it provides a proven, secure, open architecture for globally extending wireless communications and corporate data to mobile users.

- **Advanced security features:** BlackBerry Enterprise Server delivers end-to-end Advanced Encryption Standard (AES) or Triple Data Encryption Standard (Triple DES) encryption that helps ensure the confidentiality and integrity of wirelessly transmitted information from behind the company firewall to wireless devices in the field. With support for more than 450 over-the-air wireless IT policies and commands that enable IT administrators to wirelessly enforce security settings, BlackBerry Enterprise Server can be configured to meet the most stringent IT requirements.
- **Simplified deployment and management:** BlackBerry Enterprise Server helps increase IT productivity and reduce administrative overhead by enabling centralized control and management, including role-based and group-based administration capabilities.
- **Applications:** BlackBerry Enterprise Server is the leading wireless platform for wireless email, Personal Information Management (PIM), instant messaging (IM) and other corporate data. With the majority of customers accessing non-email content while in the field, BlackBerry Enterprise Server is now delivering more than email to mobile users.

## VMware® vSphere Overview

VMware provides the most widely deployed software suite for optimizing and managing IT environments through virtualization – from the desktop to the data center. VMware solutions deliver results at more than 130,000 customers of all sizes, where they are used in a wide variety of environments and applications. The VMware vSphere virtualization suite is fully tested and certified for the widest range of hardware, operating systems and software applications allowing for enterprise-wide standardization independent of operating systems and hardware. VMware vSphere provides built-in management, resource optimization, application availability and operational automation capabilities that deliver cost savings as well as increased operational efficiency, flexibility and IT service levels.

Key components of vSphere are classified as either infrastructure services or application services:

**Infrastructure services** are the set of components, including VMware ESX, that comprehensively virtualize server, storage and network resources, aggregate them and allocate them precisely on demand to applications based on business priority.

**Application services** are the set of components that provide built-in service level controls to all applications running on VMware vSphere™, regardless of application type or operating system.

Administration of infrastructure and application services, automation of day-to-day operational tasks with deep visibility into every aspect of large and small VMware vSphere™ environments is provided by VMware vCenter™ Server1.

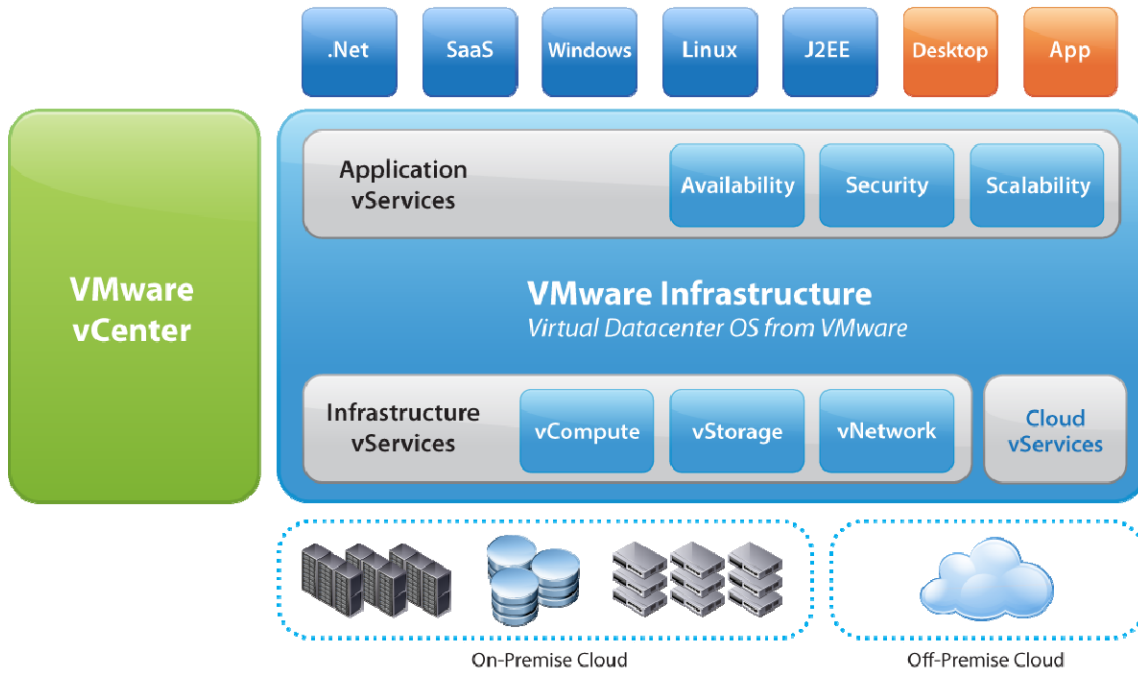


Figure 1. VMware vSphere Outline Architecture

## The Technical Solution

Figure 2 shows the virtual machine layout for the BlackBerry Enterprise Servers and associated servers at the VMware data center. All virtual machines (shown in the top layer of the diagram) containing the BlackBerry Enterprise Server, Attachment server and Configuration database server are housed in one data center currently – but the plan is to expand to other data centers over time.

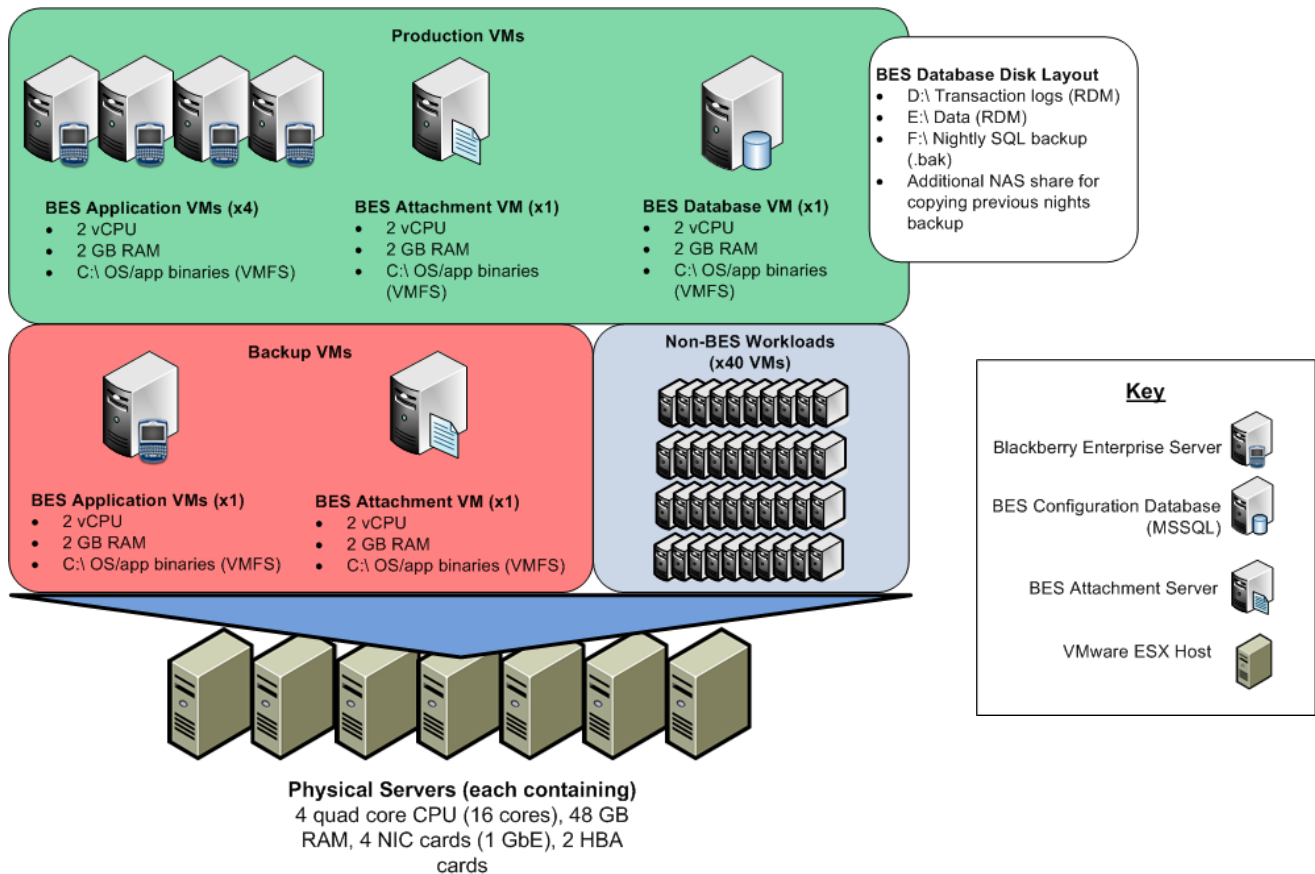


Figure 2. BlackBerry Enterprise Server Architecture Layout in Virtual Machines on ESX at VMware

## Production BlackBerry Enterprise Server Virtual Machines

The core of the BlackBerry system is made up of four concurrently running production virtual machines with the BlackBerry Enterprise Server application software operating in them (named BES1 to BES4), as shown at the top left of Figure 2. The exact software specifications for the contents of those BlackBerry Enterprise Server virtual machines are detailed in the System Software Configurations section below. The BlackBerry Enterprise Server Attachment server and BlackBerry Enterprise Server Configuration Database server are each run in a separate virtual machine of its own alongside the BES1 – BES4 virtual machines.

## Standby Virtual Machines

There are two backup virtual machines as shown in the middle left section of Figure 2.

## Standby BlackBerry Enterprise Server Virtual Machine

The production BlackBerry Enterprise Server systems have a standby BlackBerry Enterprise Server virtual machine with identical specifications. This standby server is used only for testing patches and for reproducing any issues that might occur in production, as long as everything is running smoothly. It is moved into production if needed when a production BlackBerry Enterprise Server instance experiences a

problem. The standby BlackBerry Enterprise Server virtual machine has its own SRP for five users so it can actually connect to RIM's own servers for testing purposes. The SRP is the RIM unique identifier that is required for each server that connects to RIM's systems.

The standby BlackBerry Enterprise Server virtual machine connects to the standby attachment server (Attach2) as required.

## Standby BlackBerry Attachment Server Virtual Machine

A standby BlackBerry Attachment server is used as a backup server for the production attachment server and also as a test system. This virtual machine contains the same configuration as the production BlackBerry Attachment server.

The standby attachment server is powered off during normal operations. When there is a need to troubleshoot a production issue or test a patch, it is powered on and configured to connect to the standby BlackBerry Enterprise Server instance.

## System Software Configurations

This section describes the various software components that are installed and used in each virtual machine as well as configuration details of each BlackBerry Enterprise Server virtual machine.

### BlackBerry Enterprise Server Virtual Machines

Each production BlackBerry Enterprise Server virtual machine (BES1 - BES4) as well as the standby BlackBerry Enterprise Server virtual machine, has the following software installed:

- BlackBerry Enterprise Server 4.1.4 (migrating to 4.1.6 Patch 2 in Q2 2009)
- Windows Server 2003 Standard Edition
- 2 vCPUs and 2GB RAM per BlackBerry Enterprise Server virtual machine
- 1 x 12GB C:\ (VMFS) per virtual machine (OS and binaries)

The BlackBerry Enterprise Server virtual machines share a cluster of five physical ESX host servers that VMware IT uses to host as many as 40 other non-BlackBerry Enterprise Server related workloads at any given time.

### Attachment Server Virtual Machines

There is one attachment server virtual machine for production use and a second for testing and troubleshooting. These virtual machines contain the following software:

- BlackBerry Attachment Server software
- Windows Server 2003 Standard Edition
- 2 vCPUs and 2GB RAM per BlackBerry Enterprise Server virtual machine
- 1 x 12GB C:\ (VMFS) per virtual machine (OS and binaries)

### Production BlackBerry Configuration Database Server

The system includes one production BlackBerry Configuration database server virtual machine. The database server holds only user configurations and preferences, not the actual user mailbox data, which is contained in the mail server's storage. The production database virtual machine has the following software installed:

- Windows Server 2003 Enterprise Edition
- Microsoft SQL 2005 database server
- 2 vCPU and 2 GB RAM
- C:\ drive contains the operating system and application binaries (VMFS)
- D:\ drive contains the transaction logs (raw device mapping – RDM format)
- E:\ drive contains the application data (RDM)
- F:\ drive contains the nightly SQL backup (.bak)
- Additional NAS share for copying previous nights backup

The current database size is 4GB at the time of writing. The production BlackBerry configuration database server is set up as a stand-alone database virtual machine with no Microsoft Server Cluster Service clustering or SQL log shipping. The database is configured to keep two days of log files. An additional Network Attached Storage (NAS) share is configured on this machine, to which previous the night's backup is copied on a daily basis.

## Physical Server Configurations

This section describes the physical servers, storage and network setup for the servers that host the virtual machines described above. All the BlackBerry Enterprise Server virtual machines run on a VMware ESX cluster that has VMware High Availability (HA) enabled.

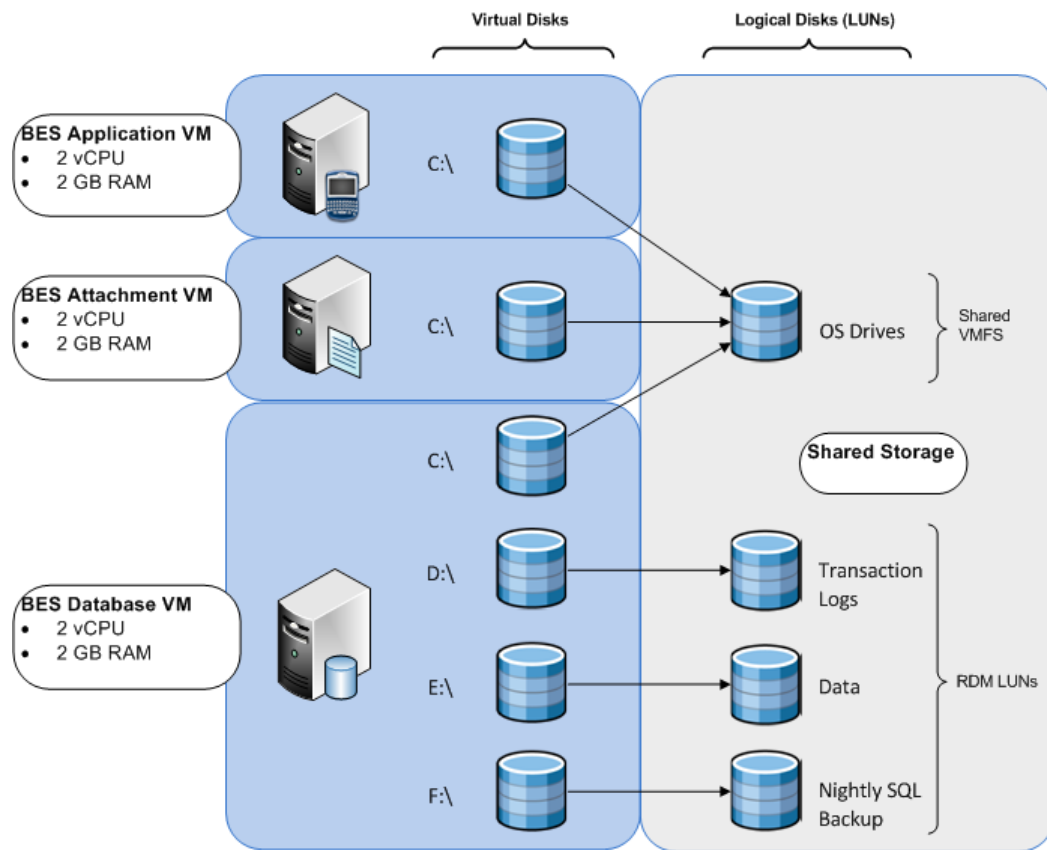
- HP C-class blades
- The virtual machines BES1 and 2 are on separate blades from BES 3 and 4
  - Makes use of anti-affinity rules to keep the above virtual machines on separate ESX hosts
- The eight total BlackBerry Enterprise Server-based virtual machines co-exist with approximately 40 other non-BlackBerry Enterprise Server workloads in the cluster

## Storage Configuration

The EMC CLARiiON fibre channel storage array configuration for the BlackBerry Enterprise Server servers is shown in Figure 3. The BlackBerry Configuration database server uses raw device mapping (RDM) for data files and logs.

## VMFS

Each BlackBerry Enterprise Server virtual machine has a 12GB disk volume configured using VMFS. All the BlackBerry Enterprise Server virtual machines have their system drives (C:\) on shared VMFS storage contained on the SAN.



**Figure 3. Storage Configuration for BlackBerry Enterprise Server Deployment at VMware**

## Operations Support

The current service level agreement (SLA) with the business users of the BlackBerry service is to provide 99.3 percent uptime. When support requests arrive into the VMware IT Help Desk, the VMware IT staff promises a 30 minute initial response time and one hour to problem resolution time.

## High Availability

The BlackBerry Enterprise Server environment relies on VMware HA for high availability. A cluster of ESX host servers is constructed to provide a failover point for resident virtual machines. This setup is straightforward in the vCenter user interface. In VMware's configuration, the BES1 and BES3 server virtual machines reside on server A and BES2 and BES4 reside on server B. Other virtual machines that do not belong to the BlackBerry infrastructure also run on those servers. If one server were to fail unexpectedly, its resident virtual machines would be re-started automatically on the other server. To date, neither an ESX host server nor a BlackBerry Enterprise Server virtual machine failure has occurred.

## Templates

The Windows 2003 Server software is installed and configured in a VMware ESX template along with the most current Windows patches and then sealed with Sysprep. The VMware IT department can deploy a new virtual machine from this template and install and configure BlackBerry Enterprise Server software in less than 15 minutes. The template allows the VMware IT team to deploy a new virtual machine quickly for load-balancing purposes or in case of an issue with an existing virtual machine.

## Operations and Performance Monitoring

A combination of the VMware vCenter and Microsoft Operations Manager tools is used to monitor guest operating system health, virtual machine disk usage and SQL Server health. The Nagios management toolkit is used by VMware's Network Operations Team for more advanced network element and performance monitoring.

## Disaster Recovery (DR)

The current DR plans include the creation of new BlackBerry Enterprise Server virtual machine deployments from templates at a DR facility, should a disaster occur in the primary datacenter. The BlackBerry Enterprise Server configuration database would be recovered from tape. To reduce the Recovery Point Objective (RPO) and Recovery Time Objective (RTO) for the BlackBerry Enterprise Server as it becomes increasingly critical to business operations, VMware IT is in the process of rolling out a new DR solution based on VMware® Site Recovery Manager that will be combined with the Microsoft Exchange server environment.

## Anti-virus Approach

The McAfee VirusScan Enterprise 8.5 software is deployed within the guest operating systems on all virtual machines.

## System Backup Strategy

The BlackBerry Enterprise Server Attachment server and Database server virtual machines all have a nightly system state and c:\ drive backup to disk done by EMC Avamar software. This data is retained for a 90 day period and then discarded. In addition, the BlackBerry Configuration database server has a nightly SQL backup to its f:\ drive. This last backup is copied to a NAS share the following night. This NAS backup has a 30 day retention period.

## Benefits Achieved

- This deployment was one of the easiest virtualized rollouts the VMware IT department has done
- Reduced physical server count
- Increased high availability
- Reduced provisioning times
- Reduced planned downtime with VMotion
- Dynamic load balancing with DRS

## Conclusions

The virtualization of the BlackBerry Enterprise Server configuration at VMware was successful from both a business and technical perspective. Four BlackBerry Enterprise Servers, along with their associated helper servers, are now serving the needs of over 3,000 heavy email users in the company. The deployment was achieved without adding to the number of physical servers in the IT department. The virtualized environment provides a 24/7 level of service for the company and is considered one of the most reliable and easiest to manage IT services provided.

## Appendix A. VMware Software Support for the BlackBerry Enterprise Server

The table below is kept up to date at the RIM BlackBerry website at this location:

[http://www.blackberry.com/btsc/search.do?cmd=displayKC&docType=kc&externalId=KB04405&sliceId=SA L\\_Public&dialogID=31565794&statId=0%200%2031571278](http://www.blackberry.com/btsc/search.do?cmd=displayKC&docType=kc&externalId=KB04405&sliceId=SA L_Public&dialogID=31565794&statId=0%200%2031571278)

**Table 1.**

<b>BlackBerry Enterprise Server software versions</b>	<b>Supported VMware ESX versions</b>
BlackBerry Enterprise Server version 5.0	ESX versions 3.0.2 and 3.5
BlackBerry Enterprise Server version 4.1 Service Pack 6 (4.1.6)	ESX versions 2.5.2, 3.0.0, 3.0.1, 3.0.2, and 3.5
BlackBerry Enterprise Server version 4.1 Service Pack 5 (4.1.5)	ESX versions 2.5.2, 3.0.0, 3.0.1, and 3.0.2
BlackBerry Enterprise Server version 4.1 Service Pack 4 (4.1.4)	ESX versions 2.5.2, 3.0.0, and 3.0.1
BlackBerry® Professional Software version 4.1 Service Pack 4 (4.1.4)	ESX versions 2.5.2, 3.0.0, and 3.0.1
BlackBerry Enterprise Server version 4.1 Service Pack 3 (4.1.3)	ESX versions 2.5.2, 3.0.0, and 3.0.1
BlackBerry Enterprise Server version 4.1 Service Pack 2 (4.1.2)	ESX versions 2.5.2 and 3.0.0



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