Red Hat Performance Briefs

RHEL6 KVM and Cisco VM-FEX Performance with SAP ERP

Performance improvements from RHEL5.5 to RHEL6.1 and use of Cisco VM-FEX

David Dumas, Senior Software Engineer

Version T1.0

April, 2012

1801 Varsity Drive™
Raleigh NC 27606-2072 USA
Phone: +1 919 754 3700
Phone: 888 733 4281
Fax: +1 919 754 3701
PO Box 13588
Research Triangle Park NC 27709 USA

Send feedback to refarch-feedback@redhat.com

Table of Contents

1 Executive Summary

The virtualization of SAP environments to accommodate standardization and easier management is gaining momentum in data centers.

Using a typical enterprise resource planning (ERP) workload as a benchmarking profile, SAP performance in a virtualized environment can be increased by 24 percent when the environment is upgraded from Red Hat Enterprise Linux (RHEL) Release 5.5 to RHEL Release 6.1. Additional performance gains can be attained by employing Cisco Data Center Virtual Machine Fabric Extender (VM-FEX) technology in the Cisco Unified Computing System (Cisco UCS).

Cisco Data Center VM-FEX enables performance gains either in the form of up to 11 percent more users or as reduced database access latency, effectively speeding up user queries by up to 29 percent.

This document shows how you can improve virtualized SAP performance with RHEL and Cisco Data Center VM-FEX.

2 Product Background

2.1 Red Hat Enterprise Linux 6

For nearly a decade, the world-class RHEL platform has had a reputation as a reliable, high-performance, high- value alternative to proprietary UNIX systems. Customers with the most demanding mission-critical requirements have been turning to RHEL as their platform of choice since 2002. As older proprietary systems have declined, Red Hat solutions have provided the next generation of performance and features for enterprise customers throughout the world and in all industries. RHEL powers a wide range of the world's mission-critical, Internet, and high-performance computing (HPC) workloads, as well as the majority of the early cloud environments. Bringing the power of Cisco UCS to these workloads offers customers a long-term platform for deploying powerful computing infrastructure.

2.2 Red Hat Kernel-based Virtual Machine

The Red Hat Kernel-Based Virtual Machine (KVM) is a virtualization package for Linux on the x86 hardware platform created and maintained as open source software. Red Hat KVM uses x86 hardware virtualization extensions (such as Intel VT-x) to implement a hypervisor that hosts virtual machines as user-space processes. Cisco UCS supports Red Hat KVM–based Red Hat Enterprise Virtualization (RHEV) as the hypervisor in a server virtualization system.

2.3 Cisco UCS Concepts and Benefits

The Cisco Unified Computing System is an innovative set of technologies that help meet the challenges and deliver on the requirements of the data center. It is a next-generation data center platform that unites computing, networking, storage access, and virtualization resources into a cohesive system that is managed centrally and designed to reduce total cost of ownership (TCO), improve energy efficiency, and increase business agility and responsiveness.

Cisco UCS is built to meet today's demands while being ready to accommodate future technologies, including more powerful processors and faster Ethernet standards. In addition, its unified architecture uses industry-standard technologies to provide interoperability and investment protection .

Cisco is focused on delivering products and technologies that bridge the goals of virtualization. Cisco UCS provides a flexible and robust infrastructure to meet current and future business needs.

2.4 Cisco Fabric Extender Technology and Data Center VM-FEX

Cisco Fabric Extender Technology (FEX Technology) provides a unified access architecture across any environment: traditional, virtualized, or high-performance computing. It helps enable operational simplicity at scale, with a single point of management and policy enforcement on the access parent switch, across a multitude of 10 Gigabit Ethernet ports.

The Cisco UCS 2100 and 2200 Series Fabric Extenders are an essential part of the Cisco UCS solution and help simplify cabling, management, and diagnostics.

Cisco Data Center VM-FEX is the next step in fabric extender evolution. It extends port expander technology to virtual machines, eliminating the need for hypervisor-embedded Layer 2 software switches and simplifying management and administration by consolidating virtual and physical switching infrastructure into a single switching infrastructure with a single management point.

Cisco Data Center VM-FEX can relieve hypervisor CPU cycles from Layer 2 virtual machine switching. It also can improve performance by making the host CPU cycles available for data processing needs and increase I/O throughput through less latency for network traffic.

Cisco Data Center VM-FEX is implemented by Cisco virtual interface card (VIC) technologies such as the Cisco UCS VIC 1240 and 1280 and the Cisco UCS M81KR VIC, which are converged network adapters (CNAs) designed for both single-OS and virtual machine–based deployments. Cisco UCS VICs support static or dynamic virtualized interfaces, including up to 256 virtual network interface cards (vNICs). Each virtual machine interface is provided with a virtual Peripheral Component Interconnect Express (PCIe) device and a virtual port on a switch.

3 Test Information

3.1 Configuration

3.1.1 Hardware

Server	Cisco UCS B200 M2 Blade Server Intel Xeon X5680 processor 96GB memory
Blade Chassis	Cisco UCS 5100 Series Blade Server Chassis
Storage	NetApp FAS 3270A

3.1.2 Software

Operating System	RHEL 5.5 – kernel 2.6.18-194.el5 RHEL 6.1 – kernel 2.6.32-131.0.15.el6
Application	SAP Enhancement Package 4 for SAP ERP 6.0 – kernel 701 PL37
Database	SAP MaxDB 7.8 – build 009-123-199-949

3.2 Test Methodology

A SAP 2-tier environment was set up consisting of the system under test (SUT) and a load driver running a typical ERP workload (refer to section 3.1 for a list of hardware and software). The Cisco B200 in a UCS 5100 Series Blade Server Chassis along with the workload driver and the Network File System (NFS) attached storage, a NetApp FAS 3270A, all resided in a single rack. Figures 1 and 2 depict the physical setup.

The success criteria was the total number of users with less than one second response time as measured from the users' perspective, and no errors.
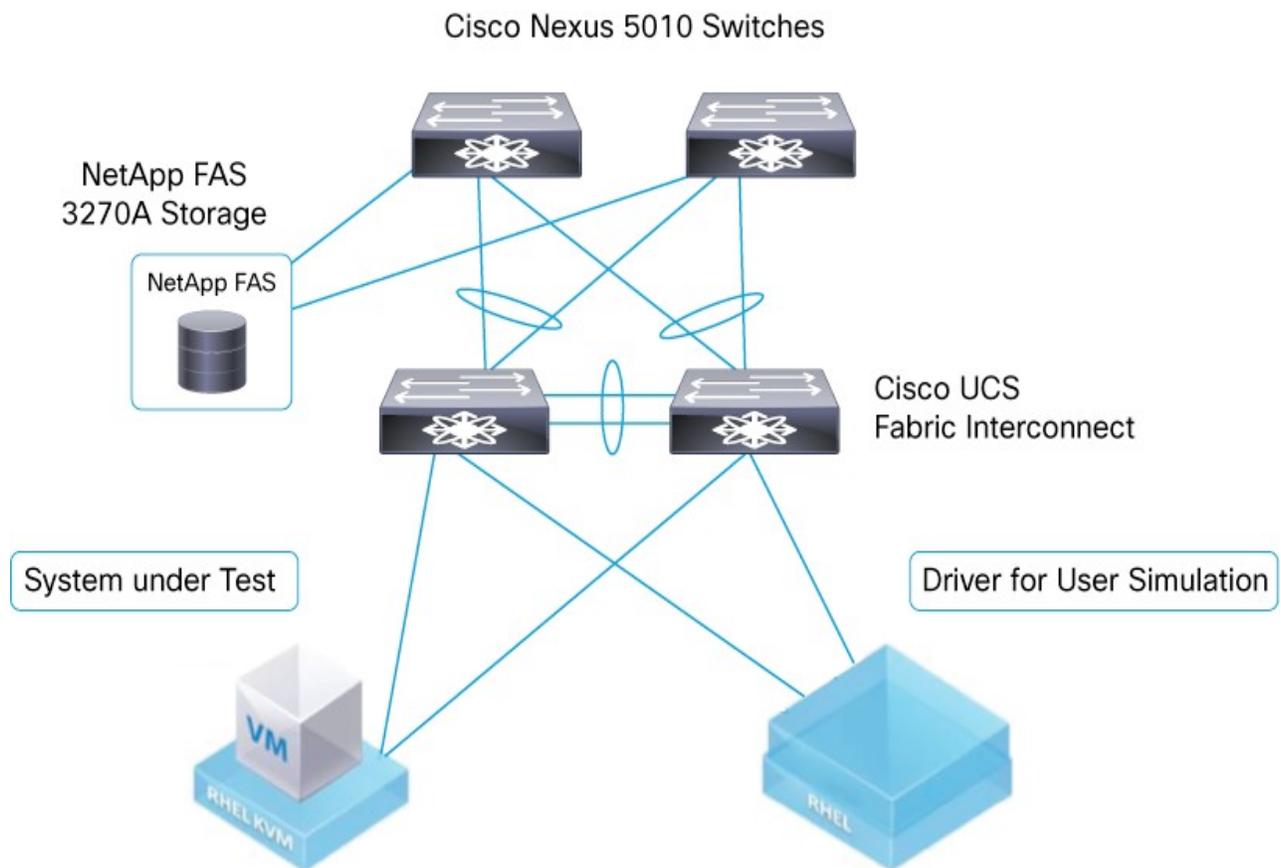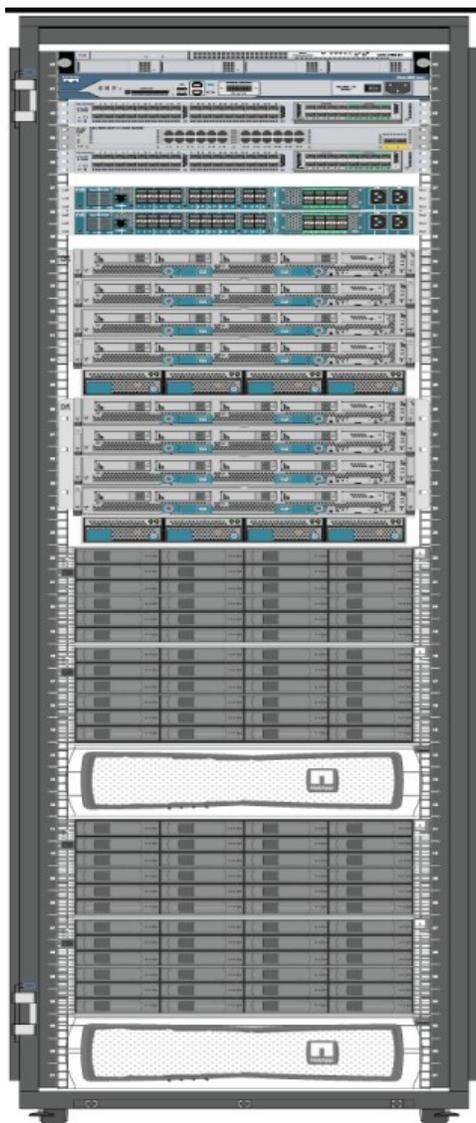
Figure 1 – Simplified System Setup

Figure 2 – Simplified System Setup (cont.)

The performance tests were running on a Cisco FlexPod infrastructure solution.

- System under test: Cisco UCS B200 M2 Blade Server with two Intel Xeon processors X5680, 96 GB of memory, and a Cisco VIC
- Load generator: Cisco UCS B200 M1 Blade Server with two Intel Xeon processors X5570, 48 GB of memory, and a Cisco VIC
- Storage: NetApp FAS 3270A with Fibre Channel and NFS

The SAP system (binaries, configuration, and database) was mounted from the storage using NFS.

- One volume to store the operating system disk image
- One volume for binaries and the database log
- One volume with four qtrees for the database data

There were three major phases to the test.

1. The baseline was established running the configuration outlined in Figures 1 and 2 above, using RHEL 5.5 on both the Host and the KVM guest.
2. Next, the SUT Host and KVM Guest were both upgraded to RHEL 6.1 and the measurement runs were repeated.
3. Finally, the system was reconfigured with Cisco Data Center VM-FEX including hypervisor bypass (refer to Figure 3 below), and the same SAP user load was applied as in Phase 2. The user population was then increased until the response time criteria could no longer be met.

Figure 3 – VM-FEX added to the configuration

Switch port extended over
cascaded Fabric Extenders
to the Virtual Machine
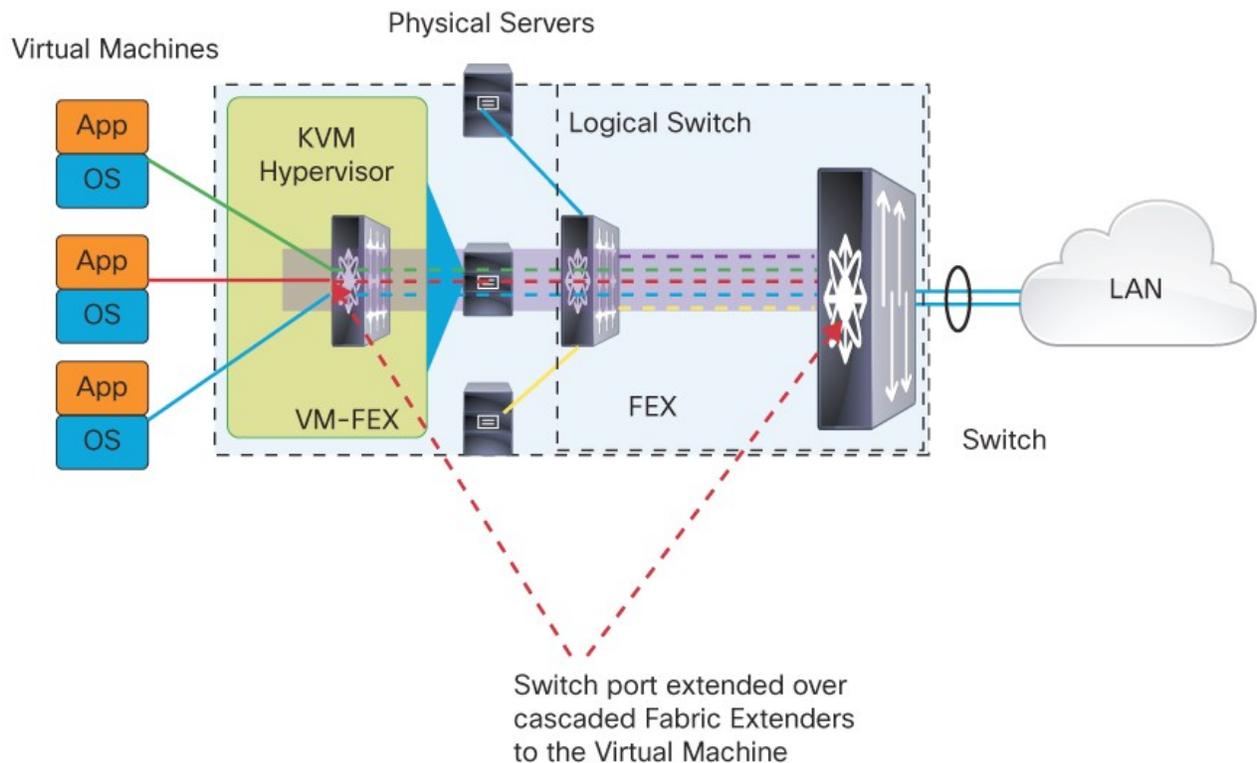
3.3 Results

In Phase 1, a baseline SAP user number of 2900 was reached according to the specified success criteria.

After an upgrade to Red Hat Enterprise Linux 6.1 (Phase 2) the number of users reached was 3600, an increase of 24 percent without any other modification.

Adding Cisco Data Center VM-FEX for Red Hat KVM (Phase 3) and maintaining the user load at 3600, the database request times (latency for database access) decreased from 21 milliseconds (ms) to 15 ms. This 29 percent decrease in latency translates to an improved user experience while working with this system. The SAP system response time, comparable to the response time from the user perspective, drops from 0.9 second to 0.2 seconds, a difference very noticeable from the user side.

In addition, the user load on the test system was able to be increased to 4000 simulated users and still met the success criteria. While sacrificing improved system latency for maximum system load, this result means that 11 percent more users can be supported by the system employing Cisco Data Center VM-FEX without additional hardware expenses .

RHEL Upgrade / VM-FEX Improvements
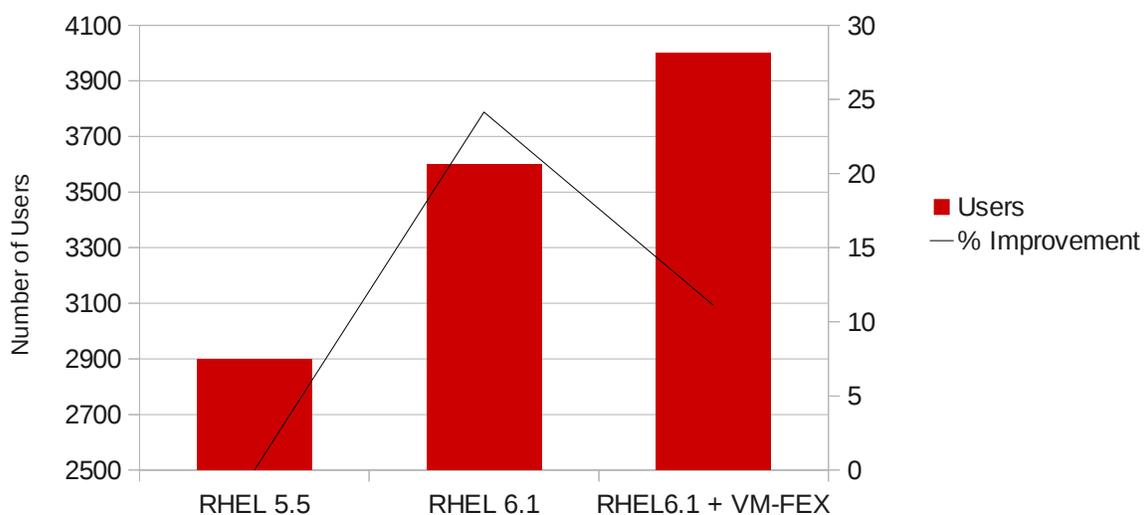
There is a clear boost in numbers from an upgrade to Red Hat Enterprise Linux 6.1 and then the additional headroom you get by employing Cisco Data Center VM-FEX, which can be used for more users and/or faster system response times.

4 Conclusion

The measurements conducted show how Red Hat Enterprise Linux version 6.1 and the adoption of Cisco Data Center VM-FEX technology together improve throughput and latency in today's virtualized SAP environments in the data center. Without upgrading or modifying existing hardware, improvements of up to 35 percent in SAP user numbers are possible, leading to a more economical use of infrastructure or leaving headroom for future growth.

Although this document focuses only on performance aspects, a Red Hat and Cisco Data Center VM-FEX deployment offers additional advantages in such areas as ease of management, quality of service (QoS), and security. These will be discussed in other documents.

4.1 Red Hat and Cisco

In delivering the industry's first unified computing platform, Red Hat and its industry partners, including Cisco, have delivered on the promise of data center virtualization. Red Hat Enterprise Virtualization, Red Hat Enterprise Linux technologies, along with the Cisco Unified Computing System architecture, deliver a more manageable, reliable, flexible, and scalable solution in comparison to alternatives on the market. With a unique systems approach to architecture, technology, partnerships, and services, Cisco UCS streamlines data center resources, scales , service delivery, and radically reduces the number of devices requiring setup, management, power and cooling, and cabling.

4.2 For more information

● For more information about Red Hat KVM, see http://www.linux-kvm.org.

● For more information about RHEL, see the Red Hat Enterprise Virtualization for Servers Installation Guide available at http://www.redhat.com.

● For a complete list of all Cisco UCS B-Series Blade Servers documentation, see the Cisco UCS B-Series Servers documentation roadmap available at http://www.cisco.com/go/unifiedcomputing/b-series-doc.

● Additional documentation describing the configuration limits for Cisco UCS 5100 and 5200 Series Fabric Interconnects running Cisco UCS Manager Release 2.0 is available at http://www.cisco.com/en/US/docs/unified_computing/ucs/sw/configuration_limits/2.0/b_UCS_ Configuration_ Limits_2_0.html.

● For a complete list of all Cisco UCS C-Series Rack-Mount Servers documentation, see the Cisco UCS C- Series Servers documentation roadmap available at http://www.cisco.com/go/unifiedcomputing/c-series- doc.

● For information about how to install and configure the Cisco Data Center VM-FEX components in Cisco UCS with RHEV for Servers, see:

◦http://www.cisco.com/en/US/docs/unified_computing/ucs/sw/vm_fex/kvm/cli/config_guide/b_ CLI_KVM_V M-FEX_UCSM_Configuration_Guide.pdf

Appendix A: Revision History

Revision 1.0   Thursday March 29, 2012   David Dumas

Initial Release