



Running Epic* Systems EpicCare EMR Software on a Linux*-Based Operating System



Cambridge Health Alliance

For a cost-effective solution to meet growing performance and scalability demands, Cambridge Health Alliance (CHA) deployed Epic* Systems software running on the Linux* operating system and latest Intel® Xeon® processor-based blade servers.

Healthcare organizations are moving quickly to implement Electronic Medical Records (EMR) to improve the quality, efficiency, and cost-effectiveness of patient care. Ten years ago, CHA recognized the need to improve patient care at its three hospital campuses and 16 off-site primary and specialty care locations throughout the Boston area.

To accomplish this, CHA determined they needed a scalable and virtualized EMR solution that was both cost-effective and provided no-compromise performance and uptime. As a publicly funded enterprise, CHA placed great importance on finding a solution that could handle their current demands and meet the expectations of future growth, while staying within a budget.

Implementing Linux and Epic Systems for an Affordable and Innovative EMR Solution

Concerned about the high cost of UNIX/RISC architecture, CHA turned to Epic Systems software in 2002 and inquired about running EpicCare EMR

software on Linux. "We chose Epic because there was a feeling they had the most dialed-in and forward-thinking EMR system," says Steve Doherty, Director of Linux Systems at Cambridge Health Alliance.

After consulting with Epic, CHA decided to implement the EpicCare EMR software on Linux and the latest Intel Xeon processor-based blade servers. At the time, CHA needed a server and operating system that was more accessible and competitive. Linux stood out with their availability in a large number of vendor distributions that included integrated support for requirements, such as high availability clustering and advanced monitoring and management. "For us, another key factor was that Linux optimized our distributions for Intel Xeon processor-based blade servers, providing us with critical service and support options," says Doherty.



Improved Performance, Virtualization, and Scalability

More recently, CHA chose HP BladeSystem c7000* Enclosures with HP BL460c G7 blades to provide a scalable hardware infrastructure to support both two-socket and four-socket Intel Xeon processor-based server blades. Considering workload requirements, CHA chose two-socket server blades for their EMR implementation, each configured with the Intel Xeon processor E5649.

The Intel Xeon processor-based blade servers deliver up to 15 times the performance per server¹ of single-core processors that were available just a few years ago providing substantially more computing resources (cores, threads, cache, and system bandwidth). A single four-socket blade server provides up to 40 cores, 80 threads, and 2 TB of memory, allowing a cluster of blades to support the largest EMR demands. These processors also provide an array of advanced reliability features designed specifically for mission-critical environments.

The Intel Xeon processors deliver the perfect combination of performance, advanced features and value to meet CHA's EMR requirements. They are highly adaptable, delivering higher performance for peak workloads without increasing power consumption for lighter workloads, reducing overall power and cooling costs. For large healthcare organizations like CHA, scalability is a crucial component to consider. The ease at which the Intel Xeon processor-based blade servers running Linux can be upgraded, provides a low cost alternative to improve performance and eliminate downtime. "With the Intel Xeon processor-based servers there was no downtime—we just migrate live via our virtual machines, turn off the host, put in the new blade server and turn it back on" says Doherty.

For virtualization of their environment, CHA uses Citrix* Xen Servers pre-configured with Xen Hypervisor software, providing efficient management of their Linux operating system and cost-effective server consolidation. This allows multiple virtual machines (VM) to run on a single Intel Xeon processor-based server. Each VM is isolated from other VMs and is decoupled from the underlying host by Hypervisor, allowing each one of CHA's VMs to run multiple applications with no-hassle live migration.

Designed for Reliability and Future Growth

Today, CHA's hardware environment consists of a single Intel Xeon processor-based blade server with a Linux operating system, running EpicCare EMR software. CHA takes advantage of three blades in one enclosure to run their production environment, while utilizing a separate server for high availability failover. CHA developed their hardware environment to take advantage of the flexibility and scalability that Intel Xeon processor-based blade servers provide, allowing them to maintain operations through a wide array of challenges, such as rapid growth, natural disasters, hardware failures, and power outages.

"This is an important step in helping to make EMR adoption truly widespread."

Steve Doherty, Director of Linux Systems at Cambridge Health Alliance

Since 2002, this proven solution has successfully demonstrated the reliability, performance, and cost savings that CHA was looking for in a virtualized environment. With EpicCare EMR running on the Linux operating system and Intel Xeon processor-based servers, CHA has easily adapted to rapid growth and now handles outpatient, inpatient, and practice management capabilities with this adaptable solution.

Exceeding Test Expectations and Cost Savings

In 2002, CHA ran a series of tests using the Intel Xeon processor-based blade servers, Linux operating system and EpicCare EMR software. "We found that this solution was faster than similar existing offerings at the time," says Doherty. He goes on to add, "In 2008 we ran the scalability testing again with a quad-core Intel Xeon processor running 2500 concurrent users, and we achieved the same results. This is significant because today we only have 900 concurrent users. This demonstrates that we have significant room to grow before we need to consider upgrading our current infrastructure."

During the initial transition to the Intel Xeon processor-based blade servers and Linux operating system, CHA saved USD 1 million. Over the next five years, CHA realized an additional savings of well over USD 1 million. Based on their early adoption and continued success, Doherty believes more organizations will choose the Linux open-source platform in place of costlier UNIX/RISC alternatives. "I think our achievements here at Cambridge Health Alliance presents a new opportunity for healthcare institutions of all sizes. Price and solution have come together, opening the door for hospitals and clinics (no matter what their size) to implement the Epic EMR software running on Intel Xeon processor-based blade servers, using a Linux SUSE open-source operating system to lower costs without sacrificing reliability. This is an important step in helping to make EMR adoption truly widespread."

¹ 15:1 consolidation and 5 month ROI claim estimated based on comparison between 2S Single Core Intel® Xeon® 3.80 with 2M L2 Cache and 2S Intel® Xeon® processor X5680 series-based servers. Calculation includes analysis based on performance, power, cooling, electricity rates, operating system annual license costs and estimated server costs. This assumes 8kW racks, \$0.10 per kWh, cooling costs are 2x the server power consumption costs, operating system license cost of \$900/year per server, per server cost of \$7200 based on estimated list prices and estimated server utilization rates. All dollar figures are approximate. Performance and power comparisons are based on measured server side java benchmark results (Intel Corporation Feb 2010). Platform power was measured during the steady state window of the benchmark run and at idle. Performance gain compared to baseline was 15x. Baseline platform: Intel server platform with two 64-bit Intel® Xeon® processor 3.80 Ghz with 2M L2 Cache, 800 FSB, 8x1GB DDR2-400 memory, 1 hard drive, 1 power supply, Microsoft Windows® Server 2003 Ent. SP1, Oracle JRockit® build P27.4.0-windows-x86_64 run with 2 JVM instances. New platform: Intel server platform with two Intel® Xeon® processor X5680 (12M Cache, 3.33 GHz, 6.40 GT/s Intel® QPI), 24 GB memory (6x4 GB DDR3-1333), 1 SATA 10krpm 150GB hard drive, 1 800w power supply, Microsoft Windows® Server 2008 64 bit SP2, Oracle JRockit® build P28.0.0-29 run with 4 JVM instances. Copyright © 2012 Intel Corporation. All rights reserved. Intel, the Intel logo, Intel Xeon, and Xeon Inside are trademarks of Intel Corporation in the U.S. and other countries.

