REDUCING COST AND IMPROVING PERFORMANCE OF YOUR BLACKBOARD ENVIRONMENT:

INVESTMENTS, RESEARCH AND RESULTS FROM DELL, QUEST, INTEL AND BLACKBOARD

Steve Harris, Area Vice President Higher Education Sales, Dell Inc.
Bryan Wynns, Technical Account Manager, Quest Software
WHAT IF...

...you could improve the performance of your campus’ LMS while reducing cost of ownership?

...you could deliver a learning environment with little or no disruption to your professors and students, 24x7x365?

...one company had the products, partnerships, and services to improve the operational efficiency of your campus’ LMS?
AGENDA

• Dell’s commitment to Education customers

• Transforming availability to match the criticality of the learning management system with Dell | Blackboard | Quest reference architectures built on Intel processors

• Implementing a robust and reliable monitoring reference architecture with Quest Software
COMMITMENT TO EDUCATION

• Dell has a **GLOBAL** focus on Education customers

  – Intense emphasis on expanding our expertise to benefit both teaching & learning and administration

  – Unmatched execution as a consolidated technology provider

  – Solutions designed specifically for Education, such as Blackboard, ANGEL, SunGard Higher Education, and Connected Classroom

• In the US, Dell captures 40% market share in Education, including colleges and universities, K12 public and private schools, with a team of Sales, Marketing, Services and Technical resources over 600 strong
DELL’S EDUCATION SOLUTIONS FOCUS ON:

- Increasing student achievement and developing 21st Century skills
- Improving faculty productivity through meaningful instruction and engaged development
- Providing gains in administrative effectiveness through data-driven decision making
- Delivering technology that offers meaningful impact on research and learning practices
STRATEGIC SOLUTIONS FOR HIED

Academic Computing
Robust hardware platforms and software partnerships to deliver advanced learning, collaboration and assessment tools to students and professors

Research Computing
High performance computing backed by extensive service offerings to allow researchers to drive cutting edge research and results

Administrative Computing
Exclusive x86 testing platform for SunGard Higher Education, allowing administrators to run the business of Hi Ed while conserving campus budget
STRATEGIC SOLUTIONS FOR K-12

Connected Classroom
Stimulate learning on multiple levels with technology to enhance the classroom experience for both teachers and students.

Professional Development
Workshops designed to transfer skills to the classroom and impact instruction. Developed to help teachers understand how to navigate new software, and web tools.

Services
From deployment to service desk to return-to-vendor parts management, Dell has the services K-12 school districts need to efficiently manage IT.
DELL | BLACKBOARD PARTNERSHIP

- Dell provides the platform upon which a Blackboard LMS can provide your campus with the high availability and scalability demanded by your students and faculty

  - Reference architectures completed at Dell’s testing facility in 2007, 2008 and 2009

  - Blackboard Managed Hosting
    - Runs on nearly 2,000 Dell PowerEdge blade servers using Intel® Xeon® processors networked with Dell PowerConnect™ switches in Dell blade enclosures
    - Delivers 99.7% uptime to Blackboard Managed Hosting customers
    - Supports more than 630 customers worldwide
REFERENCE ARCHITECTURES

• **2009**: certification of the Blackboard Academic Suite with Citrix XenServer and the latest Dell R710 with Intel® Nehalem® processors

• **2008**: scaling Blackboard implementation in a cost-effective manner using VMware virtualization software and running Microsoft SQL server on Dell systems

• **2007**: development of Blackboard reference architecture based upon Dell servers with Intel Xeon® processors and Oracle Database 10g® Real Application Clusters®
BLACKBOARD ON WINDOWS AND SQL SERVER ARCHITECTURE

• Optimizing throughput when many active users are simultaneously accessing system

• Tuning SQL database access and defining best practices for deploying SQL Server

• Characterization testing to define an optimized configuration for implementing server virtualization to deliver maximum throughput

• Designing a robust hardware server and storage architecture based on virtualized Dell PowerEdge™ servers and Dell EqualLogic™ iSCSI storage
QUEST MANAGEMENT TOOLS IN WINDOWS/SQL SERVER ARCHITECTURE

- Tools needed to simplify administration, availability management, performance optimization, and capacity planning underlying database and the VMware ESX Server environment

- Management infrastructure provides visibility across all layers of the reference architecture
White paper coming Fall 2009!
QUEST SOFTWARE: STRENGTH & LEADERSHIP

Consistent annual growth

- $735M in '08 revenues
- Nasdaq: QSFT
- 3,500 employees
- 100,000 customers
- $260M cash on hand
- $143M stock buy back from cash on hand

Market Leadership

- #5 IT Management Software Market
  Forrester Research, 2008¹
- #2 Application Management North America
  Gartner, 2008²
- #1 Database Development and Management Tools, Replication
  IDC, 2007³

Strong industry partnerships

Microsoft
ORACLE
SAP
DELL
VMware
accenture
Avanade
Forrester
Gartner
IDC

¹ Forrester Research, 2008
² Gartner, 2008
³ IDC, 2007
⁴ Forrester Research, 2007
• Quest helps manage all aspects of your Blackboard environment from development through production.

• Quest provides tools needed to simplify administration, availability management, performance optimization, and capacity planning of your Blackboard environment.

• Bottom Line: Improve Performance, Reduce Operational Costs, Mitigate Risk, Increase visibility into your Blackboard environment.
QUEST SOFTWARE IN THE REFERENCE ARCHITECTURE

Application Servers

Databases

Web Servers

Quest Collectors

Internet/ WAN
End Users and Transaction
Players

Experience Monitor & Viewer

Quest Web Interface

Quest Management Server

Quest Environment

Switch
# THE SOLUTION

<table>
<thead>
<tr>
<th>Software</th>
<th>Hardware</th>
<th>Services</th>
<th>Other Offerings</th>
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<tbody>
<tr>
<td>Application Server: Blackboard Academic Suite on Windows or Linux</td>
<td>Application Server: 11G two-socket servers (eg. R610/M610 or R710 / M710 – may be virtualized)</td>
<td>Unix to Linux Migration Services</td>
<td>Flexible Computing/ Access</td>
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<tr>
<td></td>
<td>Database Server: Blackboard database on either SQL Server or Oracle</td>
<td>Virtualization Services</td>
<td>Content Management</td>
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<td>Disaster Recovery</td>
<td>Lecture Capture</td>
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<td>Virtual Instruction (Live Meeting)</td>
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Blackboard Managed Hosting Solution
HOW ELSE CAN DELL HELP OPTIMIZE THE LMS ENVIRONMENT

- **UNIX to LINUX Migration**: advice, roadmap planning, assessment of current infrastructure and design through to validation and deployment to help you realize the cost savings of running a Linux operating system on Dell industry standard technology.

- **Virtualization**: reduce IT management requirements and expenses by running multiple applications and operating systems independently on a single server.

- **Disaster Recovery**: expert guidance and proven techniques to help identify the right level of investment to mitigate risks and ensure people, processes, and systems can quickly recover from a disaster.
MAXIMIZE LEARNING MINIMIZE COMPLEXITY

Learning Management Systems

Introduction

Learning management solutions have the potential to greatly enhance communications between students and faculty. Assuming that your campus can take advantage of this innovative technology requires a proven learning management software suite and a reliable backend IT infrastructure. Dell’s partnership with Blackboard, a leading provider of learning management software, provides campus with dynamic resources to help take course and management installations to the next level.

The Blackboard Learn™ platform helps to provide a foundation for engaging and assessing your learners inside and beyond a classroom. The Blackboard Learn platform is comprised of Internet-enabled tools and resources that help colleges and universities of all sizes improve student engagement and, in turn, maximize the learning experience. Dell’s enterprise technology solutions, including PowerEdge™ servers and EqualLogic™ storage, create the ideal technology foundation to support Blackboard Learn. Designed to be cost-effective and maximize the overall learning experience.

Blackboard on-Dell Solutions for your Campus

Dell, Blackboard, and Quest Software recently embarked on a project to optimize Blackboard Academic Suite software for Windows and SQL Server. The joint efforts have resulted in significantly greater scalability as well as simplified management enabling customers to run large campus implementations on a cost-effective infrastructure. Download white paper.

Learn more about how the Dell/Blackboard partnership and technology solutions can help your campus.

www.dell.com/hied/blackboard