VIRGINIA POLYTECHNIC INSTITUTE & STATE UNIVERSITY  
(VIRGINIA TECH)  
STANDARD CONTRACT AMENDMENT

Contract Number: UCP-VT-BB-0509  
Amendment #5 – Renewal 3 of 5

The above referenced contract is amended this 31st day of May, 2016 by Blackboard Inc., hereinafter called the “Contractor” and Virginia Polytechnic Institute and State University, hereinafter called “Virginia Tech”.

Amendment Action: The parties hereby agree to renew the above referenced contract for an additional one-year renewal period, August 1, 2016 – July 31, 2017. This contract has two remaining optional one-year renewal periods remaining.

All other terms and conditions remain in full force and effect.

The parties agree to execute this Contract Amendment by electronic means, via facsimile/scanned signatures.

By: [Signature]  
Contractor Authorized Signature

By: [Signature]  
Virginia Tech Authorized Signature

IN WITNESS WHEREOF, the parties have caused this Contract Amendment to be duly executed intending to be bound thereby.

Contractor: Blackboard, Inc.  
[Signature]  
Authorized Signature

Bill Jones  
Printed Name

Associate General Counsel  
Title

Virginia Tech  
[Signature]  
Authorized Signature

Jerri L. Kemp  
Printed Name

Assistant Director of Information Technology Acquisitions  
Title

Invent the Future

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY  
An equal opportunity, affirmative action institution
COMMONWEALTH OF VIRGINIA
STANDARD CONTRACT AMENDMENT

Contract Number: UCP-VT-BB-0509
Amendment #4 – Renewal 2 of 5

The above referenced contract is amended this 19th day of June 2015 by Blackboard, Inc. hereinafter called the “Contractor” and the Commonwealth of Virginia, Virginia Polytechnic Institute and State University, hereinafter called “Virginia Tech”.

Amendment Action: The parties hereby agree to renew this contract for the additional one-year period, August 1, 2015 – July 31, 2016. This contract has three optional one-year renewal periods remaining.

All other terms and conditions remain in full force and effect.

The parties agree to execute this Contract Amendment by electronic means, via facsimile/scanned signatures.

By: [Signature] [Signature]
Blackboard Authorized Signature Virginia Tech Authorized Signature

IN WITNESS WHEREOF, the parties have caused this Contract Amendment to be duly executed intending to be bound thereby.

Blackboard:
[Signature]
Tess Frazier
Printed Name
Vice President
Title

Virginia Tech:
[Signature]
John D. Krakian
Printed Name
Director, IT Business and Financial Affairs
Title

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VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
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COMMONWEALTH OF VIRGINIA
STANDARD CONTRACT AMENDMENT

Contract Number: UCP-VT-BB-0509

The above referenced contract is amended this 11th day of March 2014 by Blackboard, Inc. hereinafter called the "Contractor" and the Commonwealth of Virginia, Virginia Polytechnic Institute and State University, hereinafter called "Virginia Tech".

Amendment Action: The parties hereby agree to renew Contract #UCP-VT-BB-0509 until July 31, 2015, in accordance with the terms and conditions of the original contract. This is the first of five optional renewal periods available to both parties.

All other terms and conditions remain in full force and effect.

The parties agree to execute this Contract Amendment by electronic means, via facsimile/scanned signatures.

By: [Signature]
Contractor Authorized Signature

By: [Signature]
Virginia Tech Authorized Signature

IN WITNESS WHEREOF, the parties have caused this Contract Amendment to be duly executed intending to be bound thereby.

Authorized Contractor Representative:

[Signature]

Authorized Virginia Tech Representative:

[Signature]

Printed Name
Tess Frazier

Patricia K. Branscome

Title
Vice President

Director, IT Contract Management

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COMMONWEALTH OF VIRGINIA

CONTRACT MODIFICATION

Contract Number: UCP-VT-BB-0509

Contract Modification Number: 2

Effective Date: January 19, 2012

Contractor: Blackboard, Inc.

Description of Modification: Add new products to the existing offerings set out in the original Contract incorporating Modification #1, Attachment C, after page 49 for new pricing (Pages 2-4 of this Contract Modification #2) and after page 102 for new product descriptions and schedules (Pages 5 – 20 of this Contract Modification #2).

Reason for Modification: Incorporate continuously evolving technology

Contract Modification Document: The Contract Modification shall consist of this Contract Modification document and the Contract UCP-VT-BB-0509 Modification #2 Details attached - all of which documents are incorporated herein.

All other terms and conditions remain in full force and effect.

The parties agree to execute this agreement by electronic means, via facsimile/scanned signatures.

By: _______________ By: __________________
Contractor Authorized Signature Virginia Tech Authorized Signature

In WITNESS WHEREOF, the parties have caused this Contract Modification to be duly executed intending to be bound thereby.

Contractor:

By: __________________
Name: Tess Frasier
Title: Vice President

Virginia Tech:

By: __________________
Name: ________________
Title: Director of IT Acquisitions

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
An equal opportunity, affirmative action institution
## Annual License Pricing

<table>
<thead>
<tr>
<th>Institution FTE Count</th>
<th>Blackboard Analytics for Student Management</th>
<th>Blackboard Analytics for Financials</th>
<th>Blackboard Analytics for Financial Aide</th>
<th>Blackboard Analytics for Advancement</th>
<th>Blackboard Analytics for Human Resources</th>
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<tr>
<td>1 - 2,000</td>
<td>$36,000</td>
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<td>$189,000</td>
<td>$189,000</td>
<td>$142,800</td>
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</tbody>
</table>

**Notes:**

a) This pricing is valid through 12/31/2012

b) Institutions interested in implementation should contact their Blackboard Analytics account representative to determine the scope of consulting services necessary for either a standard and fixed scope, or extended and customized implementation. A separate proposed Statement of Work will be provided upon scope call and request.
**BLACKBOARD COLLABORATE PRICING**
Enterprise Higher Ed - Effective 3/15/11
CONFIDENTIAL - FOR INTERNAL USE ONLY

<table>
<thead>
<tr>
<th>FTE (from HED)</th>
<th>License &amp; Hosting</th>
<th>With Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 500</td>
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<td>25,001 - 50,000</td>
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<td>238,000</td>
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</table>

Above 50,000 is custom

**Hosting Storage**
*(Open Access & Named Moderator Licenses include 5GB of storage with unlimited streaming)*
- 1GB Additional Storage: $100
- 5GB Additional Storage: $400
- 1TB Additional Storage: $24,000

**Step-In Program**
Step-in Program designed for new customers who need ramp-up pricing
Step-in Program ONLY available for Enterprise-wide transactions
**REQUIRES 3-YEAR NON-CANCELABLE AGREEMENT**
Pricing is valid from 3/15/2011 to 3/15/2013 and will not increase more than 10% annually.

Please call Kristian Photopoulos at 401.294.9312 or email Kristian.Photopoulos@Blackboard.com for custom quotes.
BLACKBOARD COLLABORATE PRICING
Enterprise K12 - Effective 3/15/11
CONFIDENTIAL - FOR INTERNAL USE ONLY

BLACKBOARD COLLABORATE
VIRTUAL SCHOOL / EDUCATION MANAGEMENT ORGANIZATION (EMO) PRICING

<table>
<thead>
<tr>
<th>Virtual School Total # of Students &amp; Faculty</th>
<th>License &amp; Hosting</th>
<th>With Services</th>
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<tr>
<td>Above 50,000 is custom</td>
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<td></td>
</tr>
</tbody>
</table>

ENTERPRISE PRICING FOR K12 SCHOOL DISTRICT / TRADITIONAL SCHOOL PRICING
PLATFORMS

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<tr>
<th>Total Number of Teachers / Admin per School/District</th>
<th>Annual Price per K12 user (Teacher/Admin)</th>
<th>Traditional K12 License &amp; Hosting (minimum)</th>
<th>Traditional K12 with Services (minimum)</th>
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<td>7,500+</td>
<td>Custom</td>
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</table>

Hosting Storage
(Open Access & Named Moderator Licenses Include 5GB of storage with unlimited streaming)
1GB Additional Storage $ 100
5GB Additional Storage $ 400
1TB Additional Storage $ 24,000

Step-In Program
Step-In Program designed for new customers who need ramp-up pricing
Step-In Program ONLY available for Enterprise-wide transactions
REQUIRES 3-YEAR NON-CANCELABLE AGREEMENT

Pricing is valid from 3/15/2011 to 3/15/2013 and will not increase more than 10% annually.
This Blackboard Analytics Software Schedule ("Schedule") is made as of the last date indicated below and is an addendum to the Blackboard System Wide Master Terms Agreement between Blackboard and Virginia Polytechnic Institute and State University, "Virginia Tech" on behalf of its member Institutions, entered into August 1, 2009 (the "Agreement"). The Member Institution desires to purchase a license for the Blackboard Software listed herein. The Member Institution is required to adhere to the terms and conditions as set forth in the Blackboard System Wide Master Terms. The System Wide Master Terms are an integral part of this Schedule and are incorporated herein by reference. Capitalized terms used in this Schedule that are not otherwise defined in this Schedule shall have the meanings set forth in the Master Terms. In consideration of the foregoing premises, and other good and valuable consideration, the receipt of which are hereby acknowledged, the parties hereby agree as follows:

1. ADDITIONAL DEFINITIONS
   1.1 "Authorized End User" means any individual who uses the Software for Customer's internal business purposes only.
   1.2 "Application Pack" means the object code software utility release(s) that are designed to work with the Software that may be, in Blackboard's sole discretion, issued in between the issuance of Updates, designated by AP#, and/or later incorporated into Updates or Upgrades.
   1.3 "Corrections" means a change (e.g. a fix, workaround or other modification) made by or for Blackboard which corrects Software Errors in the Software, provided in temporary form such as a patch, and later issued in the permanent form of an Update.
   1.4 "Consulting Support" means consulting, advising, training or answering questions from an Authorized End User, remotely by telephone, email or other remote methods, regarding Software use, design, operation or customization. Consulting Support does not include any custom software development or obligations to design custom enhancements for any Authorized End User.
   1.5 "Customer" means the organization responsible for the operation and use of the Software.
   1.6 "Enhanced Software Support" means optional enhanced support services as described in Exhibit B to this Schedule, which may, if selected, be provided in addition to those services provided through the Standard Software Support option.
   1.7 "Software" means, for purposes of this Schedule only, the Blackboard Analytics Software proprietary software, as identified in Exhibit A to this Schedule.
   1.8 "Software Error" means a failure of any Software materially and substantially to conform to applicable Documentation, provided that such failure can be reproduced and verified by Blackboard using the most recent version (including all available Corrections, Application Packs, Updates, and Upgrades) of such Software made available to Customer, and further provided that Software Errors do not include any nonconformity to applicable Documentation caused by: (i) Customer's or its end users' (as defined and in any manner modified by or on behalf of Blackboard) misuse of the Software; (ii) Customer's or its end users' (as defined and in any manner modified by or on behalf of Blackboard) failure to properly install, configure, or otherwise use the Software; (iii) Customer's or its end users' (as defined and in any manner modified by or on behalf of Blackboard) failure to properly maintain, update, or otherwise use the Software; (iv) Customer's or its end users' (as defined and in any manner modified by or on behalf of Blackboard) failure to comply with applicable laws, statutes, regulations or rules promulgated by governing authorities; (v) any use of the Software other than as expressly authorized in this Schedule; (vi) use on any system other than the operating system specified in the Documentation; (vii) accident, misuse or any other cause which, in Blackboard's reasonable determination, is not inherent in the Software; or (viii) any use of the Software other than as expressly authorized in this Schedule.
   1.9 "Standard Software Support" means standard services as described in Exhibit B to this Schedule, including access to general release versions of the Software and help desk support for problem resolution related to Software operation. Standard Software Support does not include Consulting Support.
   1.10 "Support Times" means the hours of each day and the days of each week set forth in Attachment 2 hereto.
   1.11 "Supported Interface" means the software or content that is modified, enhanced, or otherwise combined with the Software.
   1.12 "Third-Party Software" means the software or content that is integrated with the Software.
   1.13 "Updates" means the object code versions of the Software that have been developed by Blackboard to correct any Software Error and/or provide additional functionality and that have been commercially released with a version number that differs from that of the prior version in the number to the right of the decimal point (e.g., 2.0 vs. 2.1) and that are not marketed as a separate product or solution, including Application Packs.
   1.14 "Upgrades" means the object code versions of the Software that have been customized, enhanced, or otherwise modified by or on behalf of Blackboard, acting in its sole discretion, to include additional functionality and that have been released with a version number that differs from that of the prior version in the number to the left of the decimal point (e.g., 3.0 vs. 2.0) and that are not marketed as a separate product or solution.

2. LICENSE
   2.1 Grant of License. Subject to the terms and conditions of this Schedule and the Master Terms, Blackboard grants Customer a, non-exclusive, non-transferable, non-sublicensable right and license (i) to install and use one (1) production copy and one (1) unsupported Test Copy of the Software for one (1) installation at Customer's Designated Server Site, solely in the form of machine-readable, executable, object code or bytecode, as applicable, and solely in connection with providing access to Customer Content to Customer's Authorized End Users (unless otherwise expressly stated in the special provisions of Exhibit A) and to use the Documentation provided, however, that such Test Copy may be used to the extent required for and for the sole purposes of application clustering and/or load balancing, (a) on a group of production servers, with each server acting as a managed node within such group so that, effectively, the application is deployed on a single logical system host comprised of multiple managed node servers or (b) on multiple managed nodes that are configured and deployed on a single physical host that manages the self contained nodes. Customer acknowledges and understands that, in the event it wishes to use the Software for any purposes other than those expressly permitted by the foregoing, including, without limitation, to provide course materials or other content to any end users who are not Customer's Authorized End Users, Customer will be required to obtain additional license rights from Blackboard pursuant to a separately executed Schedule and payment of additional license fees.
   2.2 General Usage Restrictions. Customer agrees not to use the Software or Documentation for any purposes beyond the scope of the license granted in Section 2.1 or, if applicable, any special provisions set forth in Exhibit A. Without limiting the foregoing, except as expressly contemplated in this Agreement or as otherwise agreed in writing between the Parties, Customer shall not: (i) copy or duplicate the Software or Documentation, provided that, notwithstanding the foregoing, Customer shall be permitted to create one (1) copy for archival, non-productive purposes provided that Customer reproduces on the copy all copyright notices and any other confidential or proprietary legends that are on or encoded in the Software; (ii) decompile, disassemble, reverse engineer or otherwise attempt to obtain or perceive the source code from which the Software is compiled or interpreted, and Customer hereby acknowledges that nothing in this Agreement shall be construed to grant Customer any right to obtain or use such source code; (iii) install or use the Software on any computer, network, system or equipment other than the Designated Server Site, except with the prior written consent of Blackboard; (iv) modify the Software or create any derivative product of the Software, except with the prior written consent of Blackboard, provided that the foregoing shall not be construed to prohibit Customer from configuring the Software to the extent permitted by the Software's standard user interface; (v) sublicense, assign, sell, lease or otherwise transfer or convey, or pledge as security or otherwise encumber, Customer's rights under the license granted in Section 2.1; or (vi) use the Software or Documentation to provide services to third parties other than Authorized End Users in the nature of a service bureau, time sharing arrangement or as an application service provider, as such terms are ordinarily understood within the software industry or for any other reason. Customer will not obscure, remove or alter any of the trademarks, trade names, logos, patent, trademark, or copyright notices or markings to the Software, nor will Customer add any other notices or markings to the Software or any portion thereof except as permitted by the Software standard user interface. Customer shall not use the Software in violation of Blackboard's obligations to any third party incurred prior to the Schedule Effective Date, provided that Blackboard has notified Customer of such obligation. Customer shall not provide access to the Software to anyone other than Authorized End Users without Blackboard's prior written consent; provided, Customer shall ensure that its use of the Software complies with all applicable laws, statutes, regulations or rules promulgated by governing authorities having jurisdiction, and any additional rules, regulations, policies, processes, procedures, and guidelines that are imposed by Blackboard. Customer shall be solely responsible for all expenses associated with the Software, including, without limitation, the restrictions set forth in this Section 2.2. Customer will take appropriate steps to ensure that it and its Authorized End Users do not share access information (including user identification data and passwords) with third parties except as expressly permitted under this Agreement. Under no circumstances shall Customer permit any third party to host the Software.
2.3 Further Restrictions. Customer acknowledges that certain Blackboard Software contains an “Auto Report” feature, which feature provides to Blackboard aggregate usage statistics regarding the Software, and Blackboard represents and warrants that the Auto Report feature does not report individually identifiable use information to Blackboard or any third party. Customer will not disable the Auto Report feature of the Software, or undertake any action which has the effect of preventing such feature from operating correctly or the effect of modifying the information reported thereby.

2.4 Interoperability. To the extent permitted by the specifications as outlined in the Documentation for the Software at http://behind.blackboard.com, if the Customer wishes to achieve interoperability of the Software with another software program and requires interface specifications or other information in order to do so, the Customer should request that information from Blackboard. Nothing in this Section 2.4 authorizes Customer to use any interfaces except the Supported Interfaces for the Software level. Customer may not use any Supported Interface in a manner that is inconsistent with the Documentation.

2.5 Third Party Software/Content. Customer acknowledges that the Software may utilize software and/or content made available to Blackboard by third parties, which shall constitute “Third Party Software.” Pursuant to its agreements with these third parties, Blackboard hereby grants to Customer a non-exclusive, non-transferable license to load and/or operate and use the Third Party Software solely in connection with Customer’s own instructional activities.

2.6 Ownership of Software. Blackboard and its licensors shall be deemed to own and hold all right, title and interest in and to the Software, and Customer acknowledges that it neither owns nor acquires any additional rights in and to the Software not expressly granted by this Agreement, and Customer further acknowledges that Blackboard hereby reserves and retains all rights not expressly granted in this Agreement, including, without limitation, the right to use the Software for any purpose in Blackboard’s sole discretion.

2.7 Expansion of Licensed Use. Blackboard Software is priced annually based upon the number of FTE. If the number of Customer’s FTE expands, additional fees may apply.

2.8 Ordering Procedure. Once this Schedule has been signed, should Customer desire to license additional Software solutions or Equipment from Blackboard, Customer may do so by providing a purchase order to Blackboard. The request for purchase/upgrade shall be made to Blackboard, via fax at (202) 318.2619 and shall include:

(a) A purchase order
(b) Description of the product(s) and/or solution(s) desired
(c) Billing contact information
(d) Support Contact Information
(e) Any other information deemed necessary by Blackboard for the license of the Software.

3. DELIVERY

Unless otherwise agreed by the Parties, as soon as commercially practicable after the Schedule Effective Date, Blackboard will install a copy on Customer’s server, and delivery of the Software shall be deemed complete when Blackboard notifies Customer that the Software is available.

4. FEES

In consideration for the services provided and license(s) granted in this Schedule, Customer shall pay to Blackboard all fees specified in Exhibit A or otherwise required in this Schedule, which fees shall be non-cancelable and non-refundable except as set forth in Section 5.4 of the Master Terms. With respect to each Renewal Term, if any, Customer shall pay to Blackboard the then-current fees for such services and licenses, which amounts shall be due and payable within forty-five (45) days following the beginning of such Renewal Term and forty-five (45) days from the date of Blackboard’s invoice for such Renewal Term. Customer further agrees to reimburse Blackboard for: (i) reasonable travel and living expenses incurred by Blackboard’s employees and subcontractors in connection with the performance of maintenance and support services under this Schedule; provided the travel and per diem rates for lodging and subsistence shall not exceed the maximum amount allowable for such expenses in the Commonwealth of Virginia’s travel regulations as outlined at http://www.doa.virginia.gov/Admin_Services/CAPP/CAPP_Topics/20335.pdf and http://www.doa.virginia.gov/Admin_Services/CAPP/CAPP_Summary.cfm, and (ii) any other expenses described in this Schedule, provided that Blackboard will receive Customer’s prior approval for single expenses greater than $250, and further provided that, upon Customer’s request, Blackboard will provide reasonable documentation indicating that Blackboard incurred such expenses. Except as otherwise required by this paragraph, all amounts payable under this Schedule shall be subject to applicable provisions of the Master Terms.

5. TERM

This Schedule shall become effective (i) when executed by authorized representatives of both Parties (the “Schedule Effective Date”); or (ii) the Effective Date of the Agreement, whichever later occurs, and shall continue and shall continue for one (1) year (“Initial Term”). Upon completion of the Initial Term, this Schedule may renew for successive one (1) year terms (“Renewal Term”), upon notice by Customer of its desire to renew provided to Blackboard not less than thirty (30) days prior to the end of such Initial Term or then-current Renewal Term, as applicable as long as the Commonwealth of Virginia Contract UCP-VT-BB-0509 is in effect. Upon termination of this Schedule, all licenses granted under this Schedule shall immediately cease, and Customer will: (i) immediately discontinue all use of Software licensed under this Schedule; (ii) pay to Blackboard all amounts due and payable hereunder; (iii) remove the Software from its server and provide to Blackboard proof of the destruction of the original copy and any other copies of the Software; and (iv) return all Documentation and related training materials to Blackboard within a reasonable time at Customer’s cost.

6. LIMITED SOFTWARE WARRANTY

Blackboard warrants, solely for the benefit of Customer, that any Software licensed under this Schedule which is manufactured by Blackboard will substantially conform to the applicable Documentation for a period of ninety (90) days after the initial delivery, provided that: (i) Customer has received all amounts owed under this Schedule; (ii) Customer is not in material breach of this Schedule; (iii) Customer has installed any Corrections, Upgrades and Updates made available to Customer; and (iv) Customer has notified Blackboard in writing of any failure of the Software to conform to the foregoing warranty within the warranty period. CUSTOMER ACKNOWLEDGES AND AGREES THAT, TO THE MAXIMUM EXTENT PERMITTED BY LAW, THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES BY BLACKBOARD, AND THAT BLACKBOARD’S SOLE OBLIGATION, AND CUSTOMER’S SOLE REMEDY, WITH RESPECT TO ANY BREACH OF THE FOREGOING WARRANTY, IS REPAIR OR REPLACEMENT (AT BLACKBOARD’S OPTION) OF THE RELEVANT SOFTWARE IN A TIMELY MANNER.

IN WITNESS WHEREOF, the parties hereto have executed this Schedule as of the date written below.

BLACKBOARD INC.

Signature
Tess Frazier, Vice President
Print Name and Title

Date:

CUSTOMER:

Signature

Print Name and Title

Date:
Virginia Polytechnic Institute & State University on behalf of its Member Institutions

EXHIBIT A: SOFTWARE ORDER FORM

Order Date: _______________________

Customer: <Institution>
<contact name>
<address>

The list below itemizes the specific Blackboard Analytics product modules and pricing for the order.

Blackboard Analytics Version Platform: _______________________
Student FTE Tier: _______________________

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<th>Item</th>
<th>License</th>
<th>Order</th>
<th>Amount</th>
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<td>Financial Management</td>
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<td>Human Resources (HR)</td>
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<tr>
<td>Contributor Relations (CR)</td>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Financial Aid</td>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>NCATE</td>
<td></td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>

Modules Previously Purchased (for bundle pricing)

| Individual Module Subtotal                    | 1       | $     | -      |

| License Amount                                |         |       | -      |
| 1st Year Annual Maintenance                   | 20%     | $     | -      |

Total License and 1st Year Annual Maintenance: $-

Note: If the Order column is zero or blank, then any listed product module is not included in the order and is included for current pricing informational purposes only.

Terms and Conditions of the Order

Standard Terms and Conditions
- Billing: invoiced upon Blackboard’s receipt of executed Software Order Form from Customer (Exhibit A) and Blackboard’s execution of such Software Order Form.
- Payment Terms: Payment due to Blackboard net forty-five (45) days from invoice date.
- Requires Customer’s execution and delivery of a Schedule in form and substance satisfactory to Blackboard.
- The pricing above is valid for thirty (30) days from Blackboard’s receipt of Software Order Form executed by Customer, and is deemed accepted by Customer upon Blackboard’s receipt of Customer’s signed acceptance, contained herein.
- Customer understands and agrees that it, and not Blackboard, is responsible for obtaining all third party software licenses necessary and sufficient to enable Customer to utilize, and realize the benefits of the use of, the data warehouse application lawfully and in compliance with all applicable intellectual property and other laws, rules and regulations.
- Blackboard will automatically invoice Standard Software Support or Enhanced Software Support, as applicable each year on the anniversary of the Schedule Effective Date. Additional modules may be subsequently purchased based on Blackboard’s standard pricing at the time of such purchase.

Additional Terms and Conditions
- None

Acceptance of Agreement
Customer accepts the pricing for the product licenses and support described herein and agrees to the terms and conditions outlined above.

Authorized Customer Representative
Name: ___________________________________________
Signature: _______________________________________
Title: ___________________________________________
Date: ___________________________________________

Blackboard Inc.
Name: ___________________________________________
Signature: _______________________________________
Title: ___________________________________________
Date: ___________________________________________
Please Provide Billing, Shipping and Two (2) Technical Support Contacts

<table>
<thead>
<tr>
<th>Billing Information</th>
<th>Shipping Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recipient Name:</td>
<td></td>
</tr>
<tr>
<td>Title:</td>
<td></td>
</tr>
<tr>
<td>Address:</td>
<td></td>
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<tr>
<td>Telephone:</td>
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<tr>
<td>Fax:</td>
<td></td>
</tr>
<tr>
<td>Email:</td>
<td></td>
</tr>
</tbody>
</table>

Technical Support Contact Information:

1) Contact Name: ____________________________
   Title: ____________________________
   E-mail Address: ____________________________
   Telephone: ____________________________
   Address: ____________________________

2) Contact Name: ____________________________
   Title: ____________________________
   E-mail Address: ____________________________
   Telephone: ____________________________
   Address: ____________________________

Designated Server Site: ____________________________
1. **Software Support**

1.1. **Software Support Services.** During the Initial Term and any Renewal Term, Blackboard shall render the software support services set forth in this section to Customer subject to: (i) Customer's selected support specified in Attachment 1 (Standard or Enhanced); (ii) Customer's payment of the support fees described in Section 3; and (iii) Customer's compliance with its obligations set forth in Section 2 and elsewhere in this Agreement. For any future renewal period, Customer may change the support option (Standard vs. Enhanced) by requesting such change in writing within thirty (30) days of the start of the then-current Renewal Term.

1.2. **Standard Software Support Option Services.** The standard software support services to be provided by Blackboard pursuant to this Exhibit are as follows:

1.2.1. **Help Desk for Problem Resolution.** Blackboard will provide Customer with help desk assistance during the Support Times regarding the diagnosis and correction of Software Errors. Customer agrees to follow Blackboard's current policies and procedures for communicating problems and Software Errors. Subject to this Section 1.2.1, Blackboard will attempt to resolve any support problems communicated by Customer. If the problem is determined by Blackboard to be the result of configuration or actions by Customer, Blackboard will communicate such determination to Customer along with a recommendation for resolution. In such case where Customer is determined to have caused the problem or condition, Customer may request in writing for Blackboard to provide time and materials support to be billed at Blackboard's then standard billing rates. Standard Software Support does not include any Consulting Support.

1.2.2. **Access to Software Upgrades.** Blackboard periodically develops new releases to Software, which may include enhancements, bug fixes and optimization. New releases to Software shall be provided to Customer at no additional cost. Blackboard agrees to provide support for at least the latest commercially available version and one (1) prior version of the Software. Blackboard will provide Customer with (i) the most recent general release version of the Software; (ii) installation instructions; and (iii) automated installation scripts for some or all of the new release components. Customer is responsible for the installation, testing and deployment of all new releases. During the development of Software releases, Blackboard, in Blackboard's sole and absolute discretion, may decide to incorporate new third party technologies (including Third-Party Software), new versions and/or features of existing technologies, or discontinue using previously used third party technologies due to obsolescence or vendor support issues regarding such third party products that prevent or make it commercially unreasonable for Blackboard to provide an automated upgrade path for one (1) or more components of such product releases (a “Technology Platform Decision”). In the event of a Technology Platform Decision, Blackboard will notify Customer of any re-installation requirements, service options and additional installation fees for the re-installation of the new version of the Software, and Customer will reimburse Blackboard for any costs in addition to the terms contained in this Agreement, the event of a Technology Platform Decision, Blackboard shall not be required to reinstall any new version of the Software on Customer’s system unless Customer pays Blackboard the additional installation fees charged by Blackboard for such reinstallation.

1.2.3. **Software Error Correction.**

1.2.3.1. **Notification.** To obtain Software Error correction services, Customer must notify Blackboard promptly of any suspected Software Error and must provide Blackboard with reasonable detail of the nature of and circumstances surrounding the Software Error.

1.2.3.2. **Software Error Correction.** Blackboard will use commercially reasonable efforts to correct and resolve Software Errors that Customer reports to Blackboard and which Blackboard is able to reproduce. Blackboard will provide Customer with all information requested by Blackboard to reproduce such Software Errors. For each such Software Error, Blackboard will use commercially reasonable efforts to provide Customer with a software patch, a work-around, or, if Blackboard is unable to provide Customer with either of the foregoing, a specific action plan for addressing the Software Error, including a good faith estimate of the time required to correct and resolve such Software Error.

1.2.4. **Response Times.** Blackboard will use commercially reasonable efforts to respond to Customer, by telephone or e-mail, within the same business day or by the end of the next business day, regarding Software Errors that Customer reports to Blackboard during the Support Times. For purposes of this Exhibit, “respond” means Blackboard's acknowledgment of a Software Error, and does not necessarily mean that a resolution will be achieved.

1.2.5. **Limitations on Blackboard's Support Obligations.** Notwithstanding anything to the contrary elsewhere in this Agreement, Blackboard will have no obligation to provide any support services to Customer if:

1.2.5.1. Such support is related to the use or operation of any third party reporting tools not directly provided by Blackboard;

1.2.5.2. Such support relates to or involves any software, hardware products or data not provided or approved by Blackboard, including performance problems that cannot be specifically attributed to Software;

1.2.5.3. Such support directly relates to problems inherent with third party software licensed from other vendors;

1.2.5.4. Such support directly relates to problems associated with alterations or modifications of the Software by Customer or a third party;

1.2.5.5. Customer has not installed or used the Software in accordance with instructions provided by Blackboard;

1.2.5.6. Customer has failed to replace earlier versions of the Software with a newer release or patch made available to Customer;

1.2.5.7. Blackboard agrees to provide support for at least the latest commercially available version and one (1) prior version of the Software;

1.2.5.8. A party other than Blackboard (or a party authorized by Blackboard) has serviced the Software and the Software is determined to have caused the problem or condition;

1.2.5.9. Customer is not in full compliance with the terms of this Agreement or is not in material compliance with the terms of any other agreement between Blackboard and Customer.

1.3. **Enhanced Software Support Option Services.** If such option is selected in Attachment 1, the Enhanced Software Support services to be provided by Blackboard pursuant to this Exhibit include those Standard Software Support services described in Section 1.2 above, plus the following additional services:

1.3.1. **Consulting Support.** Blackboard will provide Customer with remote advisory consulting services related to the Software. Consulting Support services will be limited to a maximum of two (2) hours per day per module, and twelve (12) hours per month per module.

1.3.1.1. **Consulting Support Scheduling.** Customer agrees to follow Blackboard’s current policies and procedures for requesting Consulting Support services. Blackboard will use commercially reasonable efforts to respond to Customer, by telephone or e-mail, within the same business day or by the end of the next business day, to either provide an initial consultation with respect to Consulting Support or schedule a mutually agreeable time to meet with Customer regarding Customer’s request for Consulting Support services. For purposes of this Exhibit, “respond” means Blackboard’s acknowledgment of a request for Consulting Support services, and does not necessarily mean that Consulting Support will be performed or completed.

1.3.2. **Upgrade Installation Services.** Blackboard will perform up to one (1) upgrade installation per year for each Software product licensed under the Agreement. Customer shall provide Blackboard with remote access to Customer’s computer infrastructure or on-site access at Customer’s premises, should Blackboard prefer to provide the support on-site.

1.3.2.1. **Upgrade Installation Services.** Customer agrees to follow Blackboard’s current policies and procedures for requesting Upgrade installation services. Blackboard and Customer will schedule a mutually agreeable time to perform the Upgrade. Blackboard agrees to complete any Upgrade installation request within eight (8) weeks of receiving the request.
1.4. Additional Services. Upon mutual agreement and written request from Customer (and subject to a Professional Services Agreement Statement of Work) Blackboard may provide Customer with additional support services for the Software not otherwise covered under this section, provided that Customer pays Blackboard for such service at Blackboard's then standard hourly and expense reimbursement rates. Except to the extent specifically otherwise provided in this Exhibit, such support service is not included within the terms of this Agreement.

2. Customer's Obligations.

2.1. Documentation of Problem. During the Initial Term or any Renewal Term, Customer will provide Blackboard with detailed information regarding the problem and assist Blackboard as requested in performing problem resolution actions. All problems will be logged by Customer on the designated web-based support system.

2.2. Access. During the Initial Term or any Renewal Term, Customer will provide Blackboard with reasonable access (via remote telecommunications or on-site access at Customer's premises should Blackboard prefer to provide the support on-site) to Customer's copies of the Software to the extent necessary, in Blackboard's discretion, to enable Blackboard to meet its support obligations as set forth in this Exhibit.

2.3. Support Contact. Customer shall designate one (1) employee and one (1) alternate as its "Support Contacts" to be generally available during the Support Times to confer with Blackboard regarding Software Errors and other support-related issues. Customer's Support Contacts are identified in Attachment 2. Customer shall notify Blackboard promptly of any changes in the persons designated as Support Contacts. Blackboard will provide technical support only to Customer's Support Contacts.

2.4. Product Upgrades. Customer is responsible for the installation of all Upgrades, except for those Upgrade services provided through the Enhanced Software Support option if such option is selected. Blackboard will provide Upgrade installation support services on a time and materials basis subject to a Professional Services Agreement Statement of Work Consulting Services Worker Order or existing services agreement.

3. Fees and Charges.

3.1. General Fees and Charges. Customer shall pay Blackboard the fees and charges set forth in Attachment 1. Blackboard may make adjustments to fees and charges at the beginning of any Renewal Term.

3.2. Payment Procedures. On an annual basis at the start of the Initial Term and any Renewal Term, Blackboard will invoice Customer for all fees and charges incurred by Customer pursuant to this Exhibit.

3.3. Payment Terms. Customer shall pay all invoiced amounts in U.S. dollars within forty-five (45) days of the date of invoice.

4. Term and Termination.

4.1. Term. The term of this Exhibit will commence on the Schedule Effective Date, and continue in effect during the Initial Term. This Exhibit will renew for successive, one (1) year Renewal Term pursuant to Section 5 of the Schedule.

4.2. Termination Upon Termination of Schedule. This Exhibit shall immediately and automatically terminate upon the termination of the Schedule.
Support Option Election (check one):

_____ Standard Software Support:
    - Included with payment of License Amount in Exhibit A

_____ Enhanced Software Support:
    - Annual fee shall be 35% of License Amount in Exhibit A

Note: If neither of the above support options is checked, the Standard Software Support option shall apply.
Support Times
The Support Times are as follows:
- Online Support – 24 hour access for Customer to log support cases.
- Support Staff Office Hours:
  Monday through Friday, 8:00 a.m. through 6:00 p.m. (Eastern Daylight Time), excluding official Blackboard company holidays.

Support Contacts
Customer's Support Contacts (as required by Section 2.3), and his/her address, telephone number, fax number, and e-mail address at Customer's location are as follows:

Primary
Name: __________________________________________________________
Mailing Address: ________________________________________________
Telephone Number: ________________________________
Fax Number: __________________________________________________
Email Address: ________________________________________________

Alternate
Name: __________________________________________________________
Mailing Address: ________________________________________________
Telephone Number: ________________________________
Fax Number: __________________________________________________
Email Address: ________________________________________________
Virginia Polytechnic Institute & State University on behalf of its Member Institutions

BLACKBOARD COLLABORATE™ SCHEDULE

This Software/ASP Schedule ("Schedule") is made as of the last date indicated below and is an addendum to the Blackboard System Wide Master Terms Agreement between Blackboard and Virginia Polytechnic Institute and State University, "Virginia Tech" on behalf of its Member Institutions, entered into August 1, 2009. The Member Institution, ("Customer") desires to purchase a license for the Blackboard Software listed herein. The Member Institution is required to adhere to the terms and conditions as set forth in the Blackboard System Wide Master Terms. The System Wide Master Terms are an integral part of this Schedule and are incorporated herein by reference. Capitalized terms used in this Schedule that are not otherwise defined in this Schedule shall have the meanings set forth in the Master Terms. In consideration of the foregoing promises, and other good and valuable consideration, the receipt of which are hereby acknowledged, the parties hereby agree as follows:

1. SOFTWARE/PRODUCT/SERVICE

<table>
<thead>
<tr>
<th>Customer</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Contact Name</td>
<td>Customer Telephone</td>
</tr>
<tr>
<td>Blackboard Contact Name</td>
<td>Blackboard Contact E-mail</td>
</tr>
<tr>
<td>Blackboard Contact Telephone</td>
<td>Blackboard Contact E-mail</td>
</tr>
<tr>
<td>Software Version</td>
<td>License period</td>
</tr>
<tr>
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<td>Support Email</td>
</tr>
<tr>
<td>Customer Telephone</td>
<td>Support Contact Name</td>
</tr>
</tbody>
</table>

2. GRANT OF LICENSE.

(a) Grant. Subject to the provisions of this Schedule and the Master Terms, in consideration of payment of the License Fee and all other fees payable by Customer under this Schedule, Blackboard hereby grants Customer for the License Period a non-exclusive, non-transferable, worldwide license, without the right to sublicense, to use the Software, including the Software, in object code format only, and the accompanying Documentation, solely for the purposes of creating, presenting, hosting, analyzing, viewing and delivering Events to End Users, subject to any limitation of Seats specified above.

Customer acknowledge that this license is restricted to use only by Customer’s employees in connection with Events unless otherwise set forth above or a subsequent agreement signed in writing by both parties; provided, that the foregoing shall not restrict use of the Service by End Users and guest presenters of Events for the purpose of presenting, participating in or viewing an Event, but in no case shall any non-employee have administrative access to the Service.

(b) Restrictions on Customer.

(i) Customer may not: (x) remove, alter or conceal any Marks on the Service or any component parts; (y) copy, modify, translate, reverse engineer, decrypt, decompile or disassemble (except to the extent expressly permitted by applicable law) or otherwise seek to discover the source code for the Service or create derivative works based on the Service, nor may Customer permit any third party to do any of the foregoing.

(ii) Customer may not use the Service or any part thereof except as specifically provided and permitted by this Schedule and the Master Terms and, without limiting the generality of the foregoing, specifically, Customer may not: (v) sell, license or otherwise transfer, or permit any third party (including any subsidiary, parent, or affiliate not expressly licensed under this Agreement) to use (except as expressly permitted by this Agreement), sell, license or otherwise transfer, the Service or any part thereof; (w) rebrand with Marks other than Blackboard's Marks any part of the Service; (x) resell or distribute the Service, or use it on a timeshare or service bureau basis, or use it to operate a website; (y) attach any of Customer’s Marks in or to any part of the Service other than in or on Customer’s Content files or as otherwise approved in advance by Blackboard; or (z) in any other way use the Service to provide a service directly competitive with Blackboard or seek to gain economic advantage from the Non-permitted Use of the Service.

3. DEFINITIONS.

For the purpose of this Schedule, the following defined terms will mean:

“End User” means any employee, client, customer, potential customer, contractor or recipient of an Event run by Customer.

“Event” means a single live broadcast event transmitted over the Service created and/or sponsored in whole or substantial part by Customer or Customer’s employees that is branded under Customer’s name. The term “Events” shall include both live and archived Events.

“Service” means the current version of the Software, the Documentation and the associated services.

“License Period” means the period specified above.

“Limited Warranty” means the warranty described in Section 8 of this Schedule.

“Marks” means a party's icons, logos, trade marks, trade names, trade dress or other identifying materials used to promote or assert intellectual property rights in the products or business of that party.

“New Version” means any release, option or future product of the Software that Blackboard licenses separately.

“Non-permitted Use” means any use of the Service prohibited by Section 2.

“Seat” means each End User served by a Service in the Service and shall include an End User’s access to live Events and archived Events but does not include an access to a downloaded archived Event. A limitation on a number of Seats limits the number of unique End Users of the Service.

“Stream” means the stream of digitally encoded data that delivers an Event to an End User.

“Upgrades” means linear improvements in functionality, amendments, enhancements, or changes (but not New Versions) of the Software or the Documentation issued by Blackboard and made available to Customer during the License Period.

4. PAYMENT.

In consideration for the license granted by Blackboard under this Schedule, Customer shall pay to Blackboard the fees (the “Fees”) set forth above, along with any applicable tax, in accordance with the terms set forth therein. Fees for additional services requested by Customer after the date of this Schedule shall be billed monthly and due 30 days following receipt of invoice. Except as otherwise required by this paragraph, all amounts payable under this Schedule shall be subject to applicable provisions of the Master Terms.
5. TRAINING AND SUPPORT.
Blackboard will provide training and support as set forth above during the hours and at the rates specified above. Unless otherwise specified above, training will be online live training.

6. UPGRADES AND NEW VERSIONS.
Blackboard will make available to Customer for the Service (i) free of charge (other than reasonable implementation fees), as they become available, all Upgrades and (ii) for the fee to be determined by Blackboard upon issue, any New Versions of the Service. Nothing in this Schedule will obligate Blackboard to maintain the Service in the version covered by this Schedule indefinitely. If during the License Period (i) Blackboard introduces a New Version and (ii) elects not to maintain the version covered by this Schedule, Blackboard will make the New Version available to Customer free of charge for the balance of the License Period but not any renewals thereof.

7. THIRD PARTY SOFTWARE AND PUBLICITY.
(a) The Service incorporates software, components and other intellectual property licensed from third party licensors. Blackboard is required to, and Customer agree that Customer will also, comply with the applicable terms of any Blackboard third party license of which Customer have been notified by Blackboard.

8. LIMITED WARRANTY.
Blackboard warrants for Customer’s benefit alone that, for the License Period, the Service will perform substantially in accordance with the Documentation, provided that: (i) Blackboard has received all amounts owed under this Schedule; (ii) Customer is not in material breach of this Schedule; (iii) Customer has installed any Corrections, Upgrades and Updates made available to Customer; and (iv) Customer has notified Blackboard in writing of any failure of the Software to conform to the foregoing warranty within the warranty period. All other hardware, software and accompanying materials are provided “AS IS” without warranty of any kind, either express or implied; provided that Blackboard will indemnify Customer in connection with claims with respect to third party software to the extent Blackboard is indemnified under the relevant third party software license agreement for Customer’s claim. The complete risk as to quality and performance of any non-warranted hardware or software and accompanying material is on Customer. Blackboard will not be responsible for any defect that results from Customer’s Non-permitted Use, abuse or other misconduct or conditions outside the control of Blackboard. Blackboard makes no representations or warranty that the Service or the information or functions contained therein will meet Customer’s requirements or that its operation will be uninterrupted, error-free or secure. The Limited Warranty shall not apply and shall immediately be terminated if (i) Customer engage in any Non-permitted Use; (ii) the Service is subjected to abuse, accident or improper use; or (iii) the Software is used on or in conjunction with hardware or software other than the unmodified version of the Software with which the Software was designed to be used, as described in the Documentation; or (iv) Customer violate the terms of this Schedule or the Master Terms in any material respect.

9. CONTENT.
Blackboard does not routinely, and has no obligation to, monitor Content used on the Service. However, Blackboard reserves the right to remove Content which it deems, in its sole discretion, will subject it to liability or to be dangerous, offensive, pornographic, or in violation of law or regulations currently in effect, the Master Terms or any other provision of this Schedule or of any on-line terms of service located on the Blackboard website. Such removal may be immediate and without notice.

10. TERM; TERMINATION.
(a) Unless this is a perpetual license, the License Period as specified above may be renewed for a further one (1) year term upon notice by Customer of its desire to renew provided to Blackboard not less than ninety (90) days prior to the end of the License Period as applicable as long as the Commonwealth of Virginia Contract UCP-VT-BB-0509 is in effect.

(b) This Schedule will terminate (i) immediately if Customer violate the provisions of the Master Terms, this Schedule, or engage in any Non-permitted Use and such breach remains unremedied for 72 hours after receipt of notice of the breach and (ii) within ten (10) business days of receiving a demand for payment or other notice from Blackboard if Customer fail to pay any and all amounts payable hereunder or fail to comply with any other term hereof.

(c) Upon any termination of this Schedule, all Blackboard customer support and other services will immediately terminate and Customer’s use of the Service shall immediately terminate (except for Customer’s use of the version licensed to Customer under a perpetual license). If Customer have a perpetual license and this Schedule is terminated, Customer may request that Blackboard download, at Customer’s expense, the Software and Documentation for the Service covered by this Schedule and Customer’s Content to hardware provided by Blackboard at Customer’s expense. Blackboard will bill Customer at the rate specified above for Customer Support Hours for the estimated time to be spent by Blackboard personnel to download such Software, Documentation and Content, which amount will be paid by Customer prior to the download and, if there is a difference greater than fifteen minutes more or less Customer will pay, or Blackboard will reimburse, the difference within thirty days after such download. Customer’s obligations under the Master Terms and Sections 2, 4, 8, 9, and 10 and to pay any accrued charges shall survive any termination of this Schedule.

IN WITNESS WHEREOF, the parties hereto have executed this Schedule as of the date first written below.

BLACKBOARD COLLABORATE INC.

Signature

Tess Frazier, Vice President

Print Name and Title

Date:

CUSTOMER:

Signature

Print Name and Title

Date:
The Blackboard Prepaid Campus Card Services Schedule is a license that can be purchased under the Blackboard System Wide Master Terms Agreement between Blackboard and Virginia Polytechnic Institute and State University, entered into on August 1, 2009.

Member Institutions shall request from Blackboard the Prepaid Campus Card Services Schedule and will separately and individually negotiate terms and conditions.
COMMONWEALTH OF VIRGINIA
CONTRACT MODIFICATION

Contract Number: UCP-VT-BB-0509
Contract Modification Number: 1
Effective Date: December 2, 2010
Contractor: Blackboard, Inc.

Description of Modification: Add new products to the existing offerings, original Contract, Attachment C, after page 44 for new pricing (Pages 3-7 of this Contract Modification #1) and after page 84 for new product descriptions and schedules (Pages 8-25 of this Contract Modification #1). Also modify contract Statewide Ordering Procedure, original Contract, Attachment C, page 2 (Page 2 of this Contract Modification #1).

Reason for Modification: Incorporate continuously evolving technology, new ordering contact

Contract Modification Document: The Contract Modification shall consist of this Contract Modification document and the Contract UCP-VT-BB-0509 Modification #1 Details attached - all of which documents are incorporated herein.

All other terms and conditions remain in full force and effect.

The parties agree to execute this agreement by electronic means, via facsimile/scanned signatures.

By: [Contractor Authorized Signature] [Virginia Tech Authorized Signature]

In WITNESS WHEREOF, the parties have caused this Contract Modification to be duly executed intending to be bound thereby.

Contractor:

By: [Signature]
Name: Tessa Frasier
Title: Vice President

Virginia Tech:

By: [Signature]
Name: John D. Krallman
Title: Director of IT Acquisitions

Invent the Future
VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
An equal opportunity, affirmative action institution
AMENDMENT
TO THE COMMONWEALTH OF VIRGINIA LEARNING MANAGEMENT SYSTEM CONTRACT NO. UCP-VT-BB-0509 DATED
DECEMBER 18, 2009 BETWEEN BLACKBOARD INC. AND COMMONWEALTH OF VIRGINIA, VIRGINIA POLYTECHNIC
INSTITUTE AND STATE UNIVERSITY

This Amendment to the Commonwealth of Virginia Learning Management System Contract No. UCP-VT-BB-0509 dated December 18, 2009 ("Agreement") between Blackboard Inc. ("Blackboard") and Commonwealth of Virginia, Virginia Polytechnic Institute and State University ("Customer") is made as of the last signature date below ("Amendment").

The purpose of this Amendment is to update the Blackboard contact in the ordering procedure.

The parties hereby agree to the following terms regarding the use of the Blackboard Software by Customer. The following sections of the Agreement are modified as follows:

1. Attachment C to UCP-VT-BB-0509, entitled Blackboard System Wide Master Terms, Section 1.4 Ordering Procedure, second sentence which reads:

"The request for purchase shall be faxed to Alex Moghtader at 202-318-2619 against this system wide agreement..."

Is hereby modified and shall read as follows:

"The request for purchase shall be faxed to Blackboard at 202-318-2619 against this system wide agreement..."

All other terms and conditions remain in full force and effect.
Blackboard Transact Pricing for Virginia State Schools

This pricing is good through June 30, 2015 and its purpose is to establish (1) a pricing model for state school purchases of Blackboard Transact products, software licenses and consulting services without a request for proposal requirement and (2) to deliver a state wide benefit to those state schools that already license the Blackboard Transaction System platform. This agreement would apply to all Virginia State Colleges, Universities and Community Colleges Blackboard Transact will extend all applicable VA schools a 10% discount on all Blackboard manufactured readers:

- Access Readers
- Activity Readers
- Copier Readers (including harnesses)
- Door Access Readers
- Laundry Controllers and peripherals (including harnesses)
- Payment In Location (PHIL) self service account station
- Vending Readers
- IP Converters

Blackboard Transact will extend all applicable VA schools a 3%, 5% or 10% discount on third party manufactured hardware products resold by Blackboard:

- NCR Point-Of-Sale Terminals and peripherals 10%
- Pharos Omega Hardware 10%
- Datacard Digital Imaging Equipment 10%
- Axis CCTV cameras and peripherals 5%
- Micros Point-Of-Sale Terminals and peripherals (Micros manufactured) 5%
- Ingersoll Rand Wireless Door Access Readers/Locks 5%
- Sequoia Hand Held Terminals and Printers 5%
- Dell Servers 5%
- Sequoia Point-Of-Sale Terminals (IBM) and peripherals 3%
- Sequoia Kiosks 3%

The Blackboard licenses available include the following:

- Bb Transaction System 3 One card functionality
- Bb Door Access Integrated door access scheduling and management
- Bb Video Surveillance Integrated video surveillance
- Bb eCard Web based deposits

Blackboard’s TIA’s (transaction integration agents) and DIA’s (data integration agents) for such interfaces as bookstore systems or student information systems are licensed in either manner listed below:

Option 1 - Threshold Pricing
Refer to Table 1. The customer integration count, for Threshold Pricing is a total of TIA and DIA installations. The Threshold Discount Fee calculates and applies during software maintenance renewal. Fees are subject to the annual Bb software increase.

Option 2 - Card Holder Count [CHC] Band Pricing
Refer to Table 2. The Bb Card Holder Count [CHC] Band determines the annual integration fee. The Integration Fee includes initial installation and annual maintenance for a limitless number of
Third-Party Transaction [TIA] and Data Integrations [DIA]. Fees are subject to the annual Bb software increase.

Exceptions - The following Third-Party TIAs do not change from their contracted structure and do not count toward either option:
- Aramark
- Sodexo
- USA-FlexVend [$0 TIA for customer].

Option 1 - Threshold Pricing

<table>
<thead>
<tr>
<th>Type of Fee</th>
<th>Number of Integration Installations</th>
<th>Annual Maintenance Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Integration Fee</td>
<td>1 - 3 Integrations</td>
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</tr>
<tr>
<td>Threshold Discount Fee</td>
<td>4+ Integrations</td>
<td>$345</td>
</tr>
</tbody>
</table>

Option 2 - Card Holder Count [CHC] Band Fee

<table>
<thead>
<tr>
<th>CHC Band</th>
<th>CHC</th>
<th>Annual Maintenance Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 - 1,999</td>
<td>$7,500</td>
</tr>
<tr>
<td>2</td>
<td>2,000 - 3,999</td>
<td>$7,500</td>
</tr>
<tr>
<td>3</td>
<td>4,000 - 7,999</td>
<td>$9,000</td>
</tr>
<tr>
<td>4</td>
<td>8,000 - 14,999</td>
<td>$9,000</td>
</tr>
<tr>
<td>5</td>
<td>15,000 - 24,999</td>
<td>$10,500</td>
</tr>
<tr>
<td>6</td>
<td>25,000 - 49,999</td>
<td>$10,500</td>
</tr>
<tr>
<td>7</td>
<td>50,000 - 74,999</td>
<td>$12,000</td>
</tr>
<tr>
<td>8</td>
<td>75,000 - 99,999</td>
<td>$12,000</td>
</tr>
</tbody>
</table>

Blackboard Transact will extend all applicable VA schools a discount, where available, on third party licensed software products resold by Blackboard as follows:
- Pharos Off-The-Glass 10%
- Pharos Uniprint 10%
- LaundryView 5%
- Datacard License 5%
- Sequoia Handheld Application 3%
- Sequoia Point-Of-Sale 3%
- Micros 3700 or 9700 Applications 3%
• Datacard upgrades/SMA support (no discount available)
• Micros support/SEL/help desk licenses (no discount available)
• Sequoia ePOS (for eCommerce transactions) (no discount available)
• Oracle or SQL licenses (no discount available)

For new Blackboard clients not holding a current Blackboard Transaction System license Blackboard will apply the following licensing structure:

• The standard license schedule is from July 1st through June 30th
• Cardholder Bands are calculated as follows: for schools installing their initial system anytime between July 1st, 2010 and June 30th, 2015 the cardholder band for a new institution shall be based upon 65% of the total previous fall academic semester student head count (i.e., FTE) or Blackboard and Customer shall mutually agree upon a best efforts calculation.

For current Blackboard clients with executed Blackboard Transaction System licenses, Blackboard will apply the following licensing structure:

• No more than a 6% annual increase on Blackboard software license for the term of this agreement.
• If a client already has a multi-year agreement in place, they can opt in to extend their contract terms with the stipulations above.
• Blackboard will provide a test transaction system license upon request for free for the sole purpose of non-production testing and evaluation. The campus is responsible for the cost of the server and consulting services required to make that test transaction system license operational. The initial implementation of the test transaction system license requires a 12 hour billable support engagement. Blackboard will only bill for the actual hours spent working on the project. Ongoing support and/or upgrades of the test transaction system license are provided on a billable basis too.
• 10% discount on all platinum support agreements

Blackboard Consulting Services will also be adjusted

• $175/Hour rate (reduced from the standard $190/Hour rate) for services
• 5% discount on all Bb provided installation services (direct or via Bb partner subcontractors)
## NA Higher Ed Pricing

**Mobile CENTRAL**

<table>
<thead>
<tr>
<th>Product Code</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOBILE-SU-HENA</td>
<td>$7,500</td>
</tr>
</tbody>
</table>

### Sold Alone - 3 Year Commitment

<table>
<thead>
<tr>
<th>Product Code</th>
<th>List</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOBILE-SU-HENA</td>
<td>$7,500</td>
<td>$7,500</td>
<td>$7,500</td>
<td>$7,500</td>
</tr>
</tbody>
</table>

### Sold with Community - 1 Year Commitment

<table>
<thead>
<tr>
<th>Product Code</th>
<th>List</th>
<th>Year 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOBILE-SU-HENA</td>
<td>$7,500</td>
<td>$7,500</td>
</tr>
</tbody>
</table>

### Sold with Community - 3 Year Commitment

<table>
<thead>
<tr>
<th>Product Code</th>
<th>List</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOBILE-SU-HENA</td>
<td>$7,500</td>
<td>$7,500</td>
<td>$7,500</td>
<td>$7,500</td>
</tr>
</tbody>
</table>

Discounts available for clients acquiring Mobile Central; set up fee to be charged in 2010; no discounts on set up fee.

Price increases may occur later in the year.

## Mobile LEARN

**Mobile LEARN (US, Puerto Rico, some ProEd)**

<table>
<thead>
<tr>
<th>Product ID</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOB-LRN-HENA01</td>
<td>$36,520</td>
</tr>
<tr>
<td>MOB-LRN-HENA02</td>
<td>$41,500</td>
</tr>
<tr>
<td>MOB-LRN-HENA03</td>
<td>$46,480</td>
</tr>
<tr>
<td>MOB-LRN-HENA04</td>
<td>$53,120</td>
</tr>
<tr>
<td>MOB-LRN-HENA05</td>
<td>$59,760</td>
</tr>
<tr>
<td>MOB-LRN-HENA06</td>
<td>$66,400</td>
</tr>
</tbody>
</table>

**Mobile LEARN (Canada)**

<table>
<thead>
<tr>
<th>Product ID</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOB-LRN-HET101</td>
<td>$22,000</td>
</tr>
<tr>
<td>MOB-LRN-HET102</td>
<td>$25,000</td>
</tr>
<tr>
<td>MOB-LRN-HET103</td>
<td>$28,000</td>
</tr>
<tr>
<td>MOB-LRN-HET104</td>
<td>$32,000</td>
</tr>
<tr>
<td>MOB-LRN-HET105</td>
<td>$36,000</td>
</tr>
<tr>
<td>MOB-LRN-HET106</td>
<td>$40,000</td>
</tr>
</tbody>
</table>

Additional FTE bands of 25,000

*For each band*

**Mobile LEARN**

<table>
<thead>
<tr>
<th>Product Code</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOBILE-SU-HENA</td>
<td>$7,500</td>
</tr>
</tbody>
</table>

**Set Up**

<table>
<thead>
<tr>
<th>Product Code</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOB-LRN-SU-HET1</td>
<td>$7,500</td>
</tr>
</tbody>
</table>

**Non Sprint exclusive option**

<table>
<thead>
<tr>
<th>Product Code</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOB-LRN-HENA01</td>
<td>$36,520</td>
</tr>
<tr>
<td>MOB-LRN-HENA02</td>
<td>$41,500</td>
</tr>
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<td>$59,760</td>
</tr>
<tr>
<td>MOB-LRN-HENA06</td>
<td>$66,400</td>
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<table>
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<td>MOB-LRN-HET101</td>
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<tr>
<td>MOB-LRN-HET104</td>
<td>$32,000</td>
</tr>
<tr>
<td>MOB-LRN-HET105</td>
<td>$36,000</td>
</tr>
<tr>
<td>MOB-LRN-HET106</td>
<td>$40,000</td>
</tr>
</tbody>
</table>

**Additional FTE bands of 25,000**

*For each band*
No charge Sprint option not available in Canada

Separate pricing for clients in Canada (~ International HE pricing, Tier 1) if they can access the free wifi version but not free Blackberry or Android apps (so lower price).

Select ProEd clients are eligible for NAHE pricing; see Olivia Spain/Finance Ops for list of clients they can access free wifi with no cost option.

Clients who contract for Mobile Learn will have a branded app that requires authentication to login.

If you are Sprint eligible, those apps will only be available to Sprint users on the Android and Blackberry app stores.

If client is Sprint eligible, institution will be enabled in list for end users to select from. To license full version, go thru sales channels.

Select ProEd clients are eligible for NAHE pricing; see Olivia Spain/Finance Ops for list of clients.
This Blackboard Transact™ Software Schedule (the "Schedule") is made as of the last date indicated below and is an addendum to the Blackboard System Wide Master Terms Agreement between Blackboard and Virginia Polytechnic Institute and State University, "Virginia Tech" on behalf of its Member Institutions, entered into August 1, 2009. The Member Institution ___________________________ ("Customer") desires to purchase a license for the Blackboard Software listed herein. The Member Institution is required to adhere to the terms and conditions as set forth in the Blackboard System Wide Master Terms. The System Wide Master Terms are an integral part of this Schedule and are incorporated herein by reference. Capitalized terms used in this Schedule that are not otherwise defined in this Schedule shall have the meaning set forth in the Master Terms.

1. ADDITIONAL DEFINITIONS

1.1 "Application Pack" means the object code software utility release(s) that are designed to work with the Software that may be, in Blackboard's sole discretion, issued in between Upgrades, designated by API, and/or later incorporated into Upgrades.

1.2 "Corrections" means a change (e.g., fixes, workarounds and other modifications) made by or for Blackboard which corrects Software Errors in the Software, provided in temporary form such as a patch, and later issued in the permanent form of an Update.

1.3 "Designated Server Site" means the physical location where the Software will be installed as identified in the Pricing Summary.

1.4 "Pricing Summary" means the pricing attributable to the software and services provided pursuant to the Schedule as set forth on the cover page to this Agreement.

1.5 "Software" means, for purposes of this Schedule only, the Blackboard Transact™ proprietary software, including Updates, Upgrades, Corrections, and Application Packs thereto.

1.6 "Software Error" means a failure of any Software materially and substantially to conform to applicable Documentation, provided that such failure can be reproduced and verified by Blackboard using the most recent version (including all available Corrections, Application Packs, Updates, and Upgrades) of such Software made available to Customer, and further provided that Software Errors do not include any nonconformity to applicable Documentation caused by: (i) Customer's or its end users' negligence; (ii) any modification or alteration to the Software not made by Blackboard; (iii) data that does not conform to Blackboard's specified data formats; (iv) use on any system other than the operating system specified in the Documentation; (v) Documented limitations; (vi) Customer's or end users' acts or omissions; (vii) accident, misuse or any other cause which, in Blackboard's reasonable determination, is not inherent in the Software; or (viii) any use of the Software other than expressly authorized in this Schedule.

1.7 "Supported Interface" means application-based interfaces (API) provided pursuant to the Blackboard Building Blocks® program, network protocols, data formats, database schemas, and file formats available for use in the Software as expressly specified in the Documentation.

1.8 "Third-Party Software" means the software or content manufactured or created by third parties that has been incorporated by Blackboard into the Software or that has been shipped with the Software.

1.9 "Updates" means the object code versions of the Software that have been developed by Blackboard to correct any Software Error and/or provide additional functionality that has been commercially made available as a separate product or module, including Application Packs.

1.10 "Upgrades" means the object code versions of the Software that have been customized, enhanced, or otherwise modified by or on behalf of Blackboard, acting in its sole discretion, to include additional functionality and that have been released with a version number that differs from that of the prior version in the number to the left of the decimal point (e.g., 2.0 vs. 2.1) and that are not marketed as a separate product or module, including Application Packs.

2. LICENSE

2.1 Grant of License. Subject to the terms and conditions of this Schedule and the Master Terms, Blackboard grants Customer a limited, non-exclusive, nontransferable, right and license to (i) use one (1) production copy of the Software and one (1) unsupported Test Copy at Customer's site and on the server(s) designated by Customer hereunder, provided, that such Test Copy may be used to the extent required for and for the sole purposes of application clustering and/or load balancing, (a) on a group of production servers, with each server acting as a managed node within such group so that, effectively, the application is deployed on a single logical system host comprised of multiple managed node servers or (b) on multiple managed nodes that are configured and deployed on a single physical host that manages the self contained nodes, and for the Blackboard Transact™ software, solely with the number of workstations, point-of-sale devices or other Equipment identified on the attached Equipment Schedule (as such amended) that are covered by the limited warranty in Section 7.1 of the Master Terms or maintenance and support services; and to use the Documentation [(OPTION [IF PURCHASED]) and if indicated on the Pricing Summary, (ii) use one (1) additional supported Test Copy of the Software on a single computer server at Customer's Designated Server Site, solely in the form of machine-readable, executable, object code or bytecode, as applicable, and solely for non-production testing purposes]. An install copy of the Software is "made available" to the Customer either (i) on the date on which Blackboard has notified Customer that an install copy of the Software is available for download; or (ii) the date on which the Software was made available for installation via diagnostic modems. The download site will be made available to Customer for a period of thirty (30) days and Customer shall download the Software within this thirty day period. Customer acknowledges and understands that, in the event it wishes to use the Software for any purposes other than those expressly permitted by the foregoing, Customer will be required to obtain additional license rights from Blackboard pursuant to a separately executed Schedule and payment of additional license fees.

2.2 General Usage Restrictions. Customer agrees not to use the Software or Documentation for any purposes beyond the scope of the license granted in Section 2.1. Without limiting the foregoing, except as expressly contemplated in this Agreement or as otherwise agreed in writing between the Parties, Customer shall not: (i) copy or duplicate the Software or Documentation, provided that, notwithstanding the foregoing, Customer shall be permitted to create one (1) copy of the Software for archival, non-productive purposes provided that Customer reproduces on the copy all copyright notices and any other confidential or proprietary legends that are on or encoded in the Software; (ii) install or use the Software on any computer/network, system or equipment other than the Designated Server Site, except with the prior written consent of Blackboard; (iii) modify the Software or create any derivative product of the Software, except with the prior written consent of Blackboard, provided that the foregoing shall not be construed to prohibit Customer from configuring the Software to the extent permitted by the Software's standard user interface; (iv) sublicense, assign, sell or otherwise transfer or convey, or pledge as security or otherwise encumber, Customer's rights under the license granted in Section 2.1; or (vi) use the Software or Documentation to provide services to third parties other than Authorized End Users in the nature of a service bureau, time sharing arrangement or as an application service provider, as such terms are ordinarily understood within the software industry or for any other reason. Customer will not obscure, remove or alter any of the trademarks, trade names, logos, patent, trademark, or copyright notices or markings to the Software, nor will Customer add any other notices or markings to the Software or any portion thereof except as permitted by the Software standard user interface. Customer shall not use the Software in violation of Blackboard's obligations to any third party incurred prior to the Effective Date, provided that Blackboard has notified Customer of such obligation. Customer shall not provide access to the Software to any other person not Authorized End Users without Blackboard's prior written consent. Provided, however, that Customer may provide access to Blackboard Building Blocks® partners that are subject to a valid Blackboard developer's license agreement for the limited purpose of installing, maintaining and supporting their Blackboard Building Blocks® applications. Customer shall ensure that its use of the Software complies with all applicable laws, statutes, regulations or rules promulgated by governing authorities having jurisdiction over the Parties or the Software. Customer warrants that its Authorized End Users will comply with the provisions of this Schedule in all respects, including, without limitation, the restrictions set forth in this Section 2.2. Customer will take appropriate steps to ensure that it and its Authorized End Users do not share access information (including user identification data and passwords) with third parties except as expressly permitted under this Agreement. Under no circumstances shall Customer permit any third party to host the Software.
Virginia Polytechnic Institute & State University on behalf of its Member Institutions

2.3 Further Restrictions. Customer acknowledges that certain Blackboard Software contains an “Auto Report” feature, which feature provides to Blackboard aggregate usage statistics regarding the Software and Blackboard represents and warrants that the Auto Report feature does not report individually identifiable use information to Blackboard or any third party. Customer will not disable the Auto Report feature of the Software, or undertake any action which has the effect of preventing such feature from operating correctly or the effect of modifying the information reported thereby.

2.4 Interoperability. To the extent permitted by the specifications as outlined in the Documentation for the Software at http://behind.blackboard.com, if the Customer wishes to achieve interoperability of the Software with another software program and requires interface specifications or other information in order to do so, the Customer should request that information from Blackboard. Nothing in this Section 2.4 authorizes Customer to use any interfaces except the Supported Interfaces for the Software level. Customer may not use any Supported Interface in a manner that is inconsistent with the Documentation.

2.5 Third Party Software/Content. Customer acknowledges that the Software may utilize Third Party Software. Pursuant to its agreements with these third parties, Blackboard hereby grants to Customer a non-exclusive, non-transferable license or sublicense, as applicable, to load and/or operate and use the Third Party Software solely in connection with the Software and Customer’s own instructional activities.

2.6 Ownership of Software. Blackboard and its licensors shall be deemed to own and hold all right, title and interest in and to the Software and Documentation, and Customer acknowledges that it neither owns nor acquires any additional rights in and to the Software and Documentation not expressly granted by this Agreement, and Customer further acknowledges that Blackboard hereby reserves and retains all rights not expressly granted in this Agreement, including, without limitation, the right to use the Software or Documentation for any purpose in Blackboard’s sole discretion.

2.7 License to Load and Operate. The Software is priced annually based upon Blackboard User Bands. Blackboard User Bands are comprised of the number of cardholders. A cardholder will be defined as any individual associated with a licensing institution that can reasonably be anticipated to use a card, or perform a transaction, or utilize a privilege/event in the Blackboard Transaction™, within the forward licensing period (12 months). A cardholder may include, but is not inclusive of, a stored value charge in any module, regular applied Board transaction, guest applied Board transaction, cash equivalence charge, regular event entry, and guest event entry.

Prior to a Renewal Term, Blackboard may conduct an audit in accordance with the Master Terms, to determine the number of cardholders (as defined above) in the current licensing period. Blackboard shall utilize the current number of cardholders determined in such audit and any information that may be supplied by Customer to reasonably determine the number of cardholders for the forward licensing period (12 months).

For the Software on this Schedule, Customer’s license for the Software on this Schedule may be expanded in increments as indicated below:

<table>
<thead>
<tr>
<th>Cardholder Ranges</th>
<th>Pricing Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1999 cardholders</td>
<td></td>
</tr>
<tr>
<td>2000-3999 cardholders</td>
<td></td>
</tr>
<tr>
<td>4000-7999 cardholders</td>
<td></td>
</tr>
<tr>
<td>8000-14999 cardholders</td>
<td></td>
</tr>
<tr>
<td>15000-24999 cardholders</td>
<td></td>
</tr>
<tr>
<td>25000-49999 cardholders</td>
<td></td>
</tr>
</tbody>
</table>

Additional bands of 25,000 cardholders will be priced separately.

Blackboard’s assessment of additional license fees will be in accordance with Blackboard’s then-current pricing. In the event of growth related to a Customer merger or acquisition, Blackboard’s assessment of additional license fees will be in accordance with Blackboards then-current pricing.

OPTIONAL

2.8 Escrow of Source Code. Blackboard agrees to annually deposit the source code for the most recent version of the Software in an escrow account giving Customer, provided Customer has paid all fees due hereunder, the right to withdraw the source code upon the occurrence of: (i) failure of a trustee or Blackboard in any bankruptcy case hereafter filed by or against Blackboard either to assume this Agreement within sixty (60) days after the filing of the initial bankruptcy petition or to perform this Agreement within the meaning of Section 365(a)(4)(B) of Title 11 of the United States Code; or (ii) the termination of substantially all of Blackboard’s, or its successors, ongoing business operations relating to the Software. The custodian for the escrow shall be Iron Mountain Escrow Services, Inc (“Iron Mountain”). Customer shall be responsible for any costs associated with maintaining the source code in escrow. Subject to the terms of a standard source code escrow agreement with Iron Mountain, Customer shall be entitled to access, use, copy and modify the source code for the purposes of continuing the rights under this Agreement, and for the purposes of maintaining and updating the Software, provided that Customer shall be obligated to pay continuing License Fees to Blackboard or its successor, unless and until such license is terminated by Customer and the source code, with all modifications is returned. Customer shall not have the right to sublicense, disclose or provide access to the source code to any third party.

2.9 Other Rights. Customer hereby grants to Blackboard the limited right to use Customer’s name and logo for the sole purpose of listing Customer as a user of the Software in Blackboard’s promotional materials. Blackboard agrees to discontinue such use within fourteen (14) days of Customer’s written request.

3. DELIVERY

Unless otherwise agreed by the Parties, as soon as commercially practicable after the Schedule Effective Date, Blackboard will make available a copy of the Software for downloading from the Internet by Customer for purposes of installation by Customer, and delivery of the Software shall be deemed complete when Blackboard notifies Customer that the Software is available for download. Customer acknowledges that the download site will be made available to Customer for a period not longer than thirty (30) days from the date of such notice, and Customer will have no right to download the Software after this thirty (30)-day period. Upon Customer’s request, Blackboard will deliver to Customer a CD containing a backup copy of the Software.

4. FEES

In consideration for the services provided and license(s) granted in this Schedule with respect to the Initial Term (as defined below), Customer shall pay to Blackboard all fees specified in the Pricing Summary or otherwise required in this Schedule, which fees shall be non-cancelable and non-refundable, except as set forth in Section 54 of the Master Terms. With respect to each Renewal Term (as defined below), if any, Customer shall pay to Blackboard the then-current fees for such services and licenses, which amounts shall be due and payable thirty (30) days of the date of Blackboard’s invoice for such Renewal Term. Customer further agrees to reimburse Blackboard for: (i) reasonable travel and living expenses incurred by Blackboard’s employees and subcontractors in connection with the performance of maintenance and support services under this Schedule, provided the travel and per diem rates for lodging and subsistence shall not exceed the maximum amount allowable for such expenses in the Commonwealth of Virginia’s travel regulations as outlined at http://www.doa.virginia.gov/Slow_Services/CAPP/CAPP_Topic/202335.pdf and http://www.doa.virginia.gov/Admin_Services/CAPP/CAPP_Summary.cfm and, (ii) any other expenses described in this Schedule, provided that Blackboard will receive Customer’s prior approval for single expenses greater than $250, and further provided that upon Customer’s request, Blackboard will provide reasonable documentation indicating that Blackboard incurred such expenses. Except as otherwise required by this paragraph, all amounts payable under this Schedule shall be subject to applicable provisions of the Master Terms.
5. TERM
This Schedule shall become effective (i) when executed by authorized representatives of both Parties (the “Schedule Effective Date”); or (ii) the Effective Date of the Agreement, whichever later occurs, and shall continue in effect for a period of one (1) year (the “Initial Term”), unless earlier terminated. Thereafter, the Schedule may renew for successive one (1)-year periods (each, a “Renewal Term”), upon notice by Customer of its desire to renew provided to Blackboard not less than thirty (30) days prior to the end of the Initial Term or then-current Renewal Term, as applicable as long as the Commonwealth of Virginia Contract UCP-VT-BB-0509 is in effect. Upon termination of this Schedule, all licenses granted under this Schedule shall immediately cease, and Customer will: (i) immediately discontinue all use of Software licensed under this Schedule; (ii) pay to Blackboard all amounts due and payable hereunder; (iii) remove the Software from its server and provide to Blackboard proof of the destruction of the original copy and any other copies of the Software; and (iv) return all Documentation and related training materials to Blackboard within a reasonable time at Customer’s cost.

6. LIMITED SOFTWARE WARRANTY
Blackboard warrants, solely for the benefit of Customer, that any Software licensed under this Schedule which is manufactured by Blackboard will substantially conform to applicable Documentation for a period of ninety (90) days after the relevant Available Date, provided that: (i) Blackboard has received all amounts owed under this Agreement; (ii) Customer is not in material breach of this Agreement; (iii) Customer has installed any Corrections, Upgrades and Updates made available to Customer; and (iv) Customer has notified Blackboard in writing of any failure of the Software to conform to the foregoing warranty within the warranty period. Customer acknowledges that the product is not fault tolerant and is not designed, manufactured or intended by Blackboard for use in hazardous, dangerous to life or potentially hazardous to property, or environmental damage. CUSTOMER ACKNOWLEDGES AND AGREES THAT, TO THE MAXIMUM EXTENT PERMITTED BY LAW, THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES BY BLACKBOARD, AND THAT BLACKBOARD’S SOLE OBLIGATION, AND CUSTOMER’S SOLE REMEDY, WITH RESPECT TO ANY BREACH OF THE FOREGOING WARRANTY, IS REPAIR OR REPLACEMENT (AT BLACKBOARD’S OPTION) OF THE RELEVANT SOFTWARE IN A TIMELY MANNER.

7. SUPPORT AND MAINTENANCE
7.1 Maintenance. Blackboard will provide Customer with Upgrades, Corrections and Updates to the Software as they are made generally available from time to time. Software declared by Blackboard to be a general release (“General Release”) shall be installed within ninety (90) days of being made generally available by Blackboard. Blackboard reserves the right to terminate this Schedule upon thirty (30) days prior written notice, provided, Customer has not installed such Software. Notwithstanding any other provision of this Schedule, Blackboard shall provide maintenance and support only with respect to the then-current generally available version(s) and/or General Release version.

7.2 Installation and Assistance. Blackboard will install Software provided pursuant to this Schedule during the Coverage Hours as defined in Blackboard Transaction Service Schedule and Support Schedule, provided, Blackboard has not deemed Software to be customer installable. In the event Software is deemed by Blackboard to be customer installable, Blackboard will provide telephone assistance during Coverage Hours. In either instance, Customer will schedule in advance with Blackboard for such telephone assistance or installation of Software.

7.3 Purchase of Maintenance and Support Services. Customer may purchase maintenance and support services in accordance with the applicable Schedule.

7.4 Additional Services. Any time or expense incurred by Blackboard in diagnosing or fixing problems that are not caused by the Software or are not covered by the maintenance and support services are billable to Customer at Blackboard’s then-existing rates, with a minimum charge of $175.00 per call. If Customer desires such additional services, it must execute a copy of Blackboard’s Professional Services Agreement and applicable Schedule(s) for the services.

7.5 Initial Technical Contacts. Customer’s initial technical contacts are as follows:

<table>
<thead>
<tr>
<th>Name</th>
<th>TITLE</th>
<th>EMAIL</th>
<th>PHONE</th>
</tr>
</thead>
</table>

8. FINANCIAL MATTERS
8.1 Card Processor. In the event that Customer uses the functionality incorporated into the Software enabling the capture of consumer or commercial payment card data, such as branded credit/debit cards or ACH clearing information, Blackboard provides connectivity with such payment processors, at the levels designated, set forth in the Documentation (“Processors”) for the purpose of authorization and settlement of transactions via the Blackboard Payment Gateway. Customer shall establish a merchant account with a financial institution that processes credit card or ACH transactions with one of the Processors Blackboard has established relationships with prior to deployment of the Software. Modifications required to support changes of Customer’s bank, accepted Customer payment methods, payment processor of Customer’s bank, or communication interfaces with the payment processor will be chargeable to Customer and performed on a timely basis upon written notice to Blackboard. Changes required to the Software to enable Customer to change payment processors or communication interfaces to a payment processor will be subject to a one-time charge for labor and licensing of software, to be determined by Blackboard at the time of the change request.

8.2 Fiscal responsibility. Customer retains responsibility for compliance with all rules and regulations of any bank, card association, card processor and other entities related to issuance, acceptance, and settlement and clearing of payment transactions conducted through the Software. In the event Customer fails to comply and continues such failure for 30 days after notice from Blackboard, Blackboard may suspend connectivity under this Section 8 without any further liability or obligation to Customer, until such time as Customer provides documented evidence of full compliance. Customer acknowledges that as a condition of providing connectivity under this Section 8, Blackboard may be obligated by its Processors to pay fines and audit costs for security breaches that appear to arise from Customer and Blackboard’s systems. In the event that Blackboard is fined or audited due to an alleged security breach of systems within Customer’s control, Customer shall (1) pay all fines or audit fees incurred due to such security breach or (2) solely if applicable state law does not permit Customer to pay fines or audit fees, permit Blackboard to implement an annual security fee, to be assessed based on the Customer’s then-current security situation and the likelihood of future fines or audits. Failure to consent to one of the two options above in this Section 8.2 shall mean that Blackboard may, in its sole discretion, refuse to provide Customer with connectivity to any Processors in connection with the Software.

8.3 Financial Privacy. Blackboard hereby agrees that it shall comply with all cease, redisclosure or other customer information handling, processing, security, and protection requirements that are specifically required of a non-affiliated third-party processor or servicer (or subcontractor) under the Federal Trade Commission’s Privacy of Consumer Financial Information; Financial Rule (16 CFR 313) implementing Title V of the Gramm-Leach-Bliley Act, Public Law 106-102 (the “GLB Requirements”) and other applicable federal and state consumer privacy laws, rules, and regulations. Without limiting the foregoing, Blackboard agrees that it is prohibited from disclosing or using any nonpublic personal information (as defined in the GLB Requirements) disclosed to it by Customer, except solely to carry out the purposes for which it was disclosed, including use under an exception contained in Section 315.14 or 315.15, as applicable, of the GLB Requirements in the ordinary course of business to carry out those purposes.
8.4. **Risk Management.** Blackboard provides the ability for Customer to effectively manage their electronic transactions. This includes the ability to accept or reject electronic transactions captured and originating from Blackboard licensed software and processed by the Blackboard Payment Gateway. Blackboard does not "own" any electronic transactions processed on the Customer’s behalf and simply provides a service for the authorization, management, and settlement of transactions destined for the Customer’s bank (aka merchant acquirer) via the Processor.

IN WITNESS WHEREOF, the parties hereto have executed this Schedule as of the date hereof.

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Date: Date:
Virginia Polytechnic Institute & State University on behalf of its Member Institutions

BLACKBOARD TRANSACT™ MAINTENANCE AND SUPPORT SCHEDULE

This Blackboard Transact™ Maintenance And Support Schedule ("Schedule") is made as of the last date indicated below and is an addendum to the Blackboard System Wide Master Terms Agreement between Blackboard and Virginia Polytechnic Institute and State University, "Virginia Tech" on behalf of its Member Institutions, entered into August 1, 2009. The Member Institution ("Customer") desires to purchase the maintenance and support listed herein. The Member Institution is required to adhere to the terms and conditions as set forth in the Blackboard System Wide Master Terms. The System Wide Master Terms are an integral part of this Schedule and are incorporated herein by reference. Capitalized terms used in this Schedule that are not otherwise defined in this Schedule shall have the meaning set forth in the Master Terms.

1. SCOPE
1.1 After the initial warranty period for the applicable Software or Equipment, Blackboard will provide Customer with the maintenance and support services for the applicable Blackboard Transact™ Software and Equipment covered by this Schedule and attached Exhibits in accordance with Blackboard’s then-current maintenance and support policies. Blackboard shall determine in its sole discretion, based on its policies, the most appropriate manner in which to provide maintenance and support. To the extent that Customer has purchased Silver or Platinum level service, such additional services are covered by the applicable exhibit to this Schedule.

1.2 In order to provide these services in a timely, efficient and effective manner, Blackboard may require the Customer’s reasonable cooperation, at no cost to Blackboard. For the purposes of providing the support and maintenance services under this Schedule, and upon Blackboard’s request, Customer shall provide Blackboard service personnel with full, free, safe, and timely access to all System components covered by this Schedule or components which materially affect the operation of System components covered by this Schedule.

1.3 Blackboard’s access to the Software may include, as Blackboard recommends, but is not limited to, dial-in access to the diagnostic modem on the applications and/or host computer or workstations and physical access to the Customer premises.

1.4 Solely to permit Blackboard to provide maintenance and support services, Customer shall maintain: (i) Internet access protocols as agreed with Blackboard; or (ii) a diagnostic dial-up modem attached to the applications and/or host computer. Customer shall also maintain and run, on its applications and/or host computer, a fully licensed copy of the remote system management communication software recommended by Blackboard. If Customer requires Blackboard to notify System Administrator prior to initiating dial-in access, Customer may disable dial-in access during periods when scheduled access is not required or requested. Customer may request that Blackboard provide the modem and communication software to Software Maintenance customers for a nominal yearly maintenance fee. Such modem and communication software shall be returned to Blackboard upon the termination of this Schedule or Customer will pay Blackboard the then current retail price of the modem and communication software.

1.5 If reasonable access is not provided upon reasonable request, Customer shall be deemed to have waived Blackboard’s performance of the maintenance and support services until such access is provided. Blackboard shall have no liability for such inability to perform maintenance and support services in such event.

1.6 Customer shall identify a System Administrator to be trained and certified through Blackboard Learning Center. Blackboard reserves the right to add a surcharge to annual maintenance and support service fees in the event that a certified System Administrator is not provided. Blackboard shall not be held responsible for any costs incurred by the Customer in providing a certified System Operator. Customer shall provide time for the System Administrator to diagnose, troubleshoot, and replace components as necessary.

2. EXCLUSIONS.
2.1 If problems or defects with the System or any of its components result from a Force Majeure Event (as defined in the Master Terms) or Customer misuse or abuse, Blackboard shall charge Customer, and Customer shall pay Blackboard, its then current hourly repair rates and any related charges then in effect for maintenance services.

2.2 Blackboard shall only provide on-site maintenance when and in accordance with its standard procedures. Prior to Blackboard providing any on-site maintenance, Blackboard shall provide Customer with, and Customer shall perform the appropriate test and verification analysis on the applicable Software and/or Equipment in accordance with routines, documentation and instructions provided by Blackboard. Customer shall promptly inform Blackboard of the results of these tests. Customer shall provide Blackboard with troubleshooting assistance.

2.3. Any on-site maintenance service not covered by the applicable maintenance and support services schedules provided by Blackboard shall be subject to a minimum charge of eight (8) hours. Such items excluded from maintenance and support services include (but are not limited to): (a) The resolution of any problems due to inspection, service, relocation, tampering, configuration changes, installation of additional feature, functions, or software not provided, authorized or installed by Blackboard (b) Software or Equipment not manufactured by Blackboard and not covered by this Schedule, including, but not limited to Hewlett Packard, Datacard, Microsoft Windows®, etc. (c) The resolution of any problems due to or caused by knowing disregard for System Administration procedures as outlined in the current version of the Blackboard System Administration Guide or other relevant documentation.

2.4) Computer viruses and any damage caused by such viruses.

3. CUSTOMER SUPPORT
3.1 Coverage Hours. Blackboard shall provide Customer with customer support services available 6:00 a.m. to 6:00 p.m. MST, five (5) days a week, Monday through Friday, excluding US Federal and Arizona State holidays ("Coverage Hours"). Outside of the Coverage Hours, Blackboard shall make available to Customer access to on-call personnel for support services, deemed by Blackboard to be an emergency.

3.2 LIMITS. Customer support is limited to questions on product configuration, usage and notification of defects and is available by calling or notifying Blackboard. Upon receipt of a call or notification by Blackboard approved methods, Blackboard will determine whether an error is related to or directly caused by the Software or Equipment. If so, Blackboard will (a) create an error report, (b) assign a Severity Code and (c) attempt to resolve the error in accordance with the procedures below.

4. ERROR RESOLUTION
(a) Severity Code 1. Severity Code 1 implies that the System is not functioning. Some examples of Severity Code 1 System Errors are as follows: (i) System is down and will not restart; (ii) System is generating a data corruption condition. Blackboard will use its commercially reasonable efforts to resolve Severity Code 1 System Error reports on a twenty-four (24) hour basis. When a Severity Code 1 System Error is reported, Blackboard will assign resources necessary to correct the System Error. If access to the System is required, Customer will provide a contact available to Blackboard and access to Customer’s system and other software for the duration of the error correction procedures.

(b) Severity Code 2. Severity Code 2 implies that the System is running but that Customer is unable to use major parts of the System. Some examples of Severity Code 2 System Errors are as follows: (i) intermittent System Error and (ii) major functional component is unavailable. Severity Code 1 System Errors will take priority over Severity Code 2 System Errors. Blackboard will assign appropriate technical resources to Severity Code 2 System Errors as long as there are no Severity Code 1 System Errors awaiting resolutions.

(c) Severity Code 3. Severity Code 3 implies that the System is operating but there is a non-critical System Error. Severity Code 3 System Errors may be fixed in the next scheduled Upgrade or Update or made available on Blackboard’s Web site. Blackboard will research Severity Code 3 System Errors after Severity Code 1 and Severity Code 2 System Errors. Blackboard may correct Severity Code 3 System Errors in the next scheduled Upgrade or Update or make corrections available to Customer on Blackboard’s Web site.
Virginia Polytechnic Institute & State University on behalf of its Member Institutions

4. EQUIPMENT MAINTENANCE AND SUPPORT SERVICES

4.1 Upon payment of the applicable annual Equipment maintenance fees, Blackboard will provide the following:

(i.) Reader and peripheral Equipment to the System may be supported by e-mail and telephone support to assist Customer in diagnosing Equipment problems during Coverage Hours.

(ii.) Reader and peripheral Equipment manufactured by Blackboard is supported by way of depot repair. At Blackboard's sole discretion, such Equipment shall be repaired or replaced. Customer shall request a Return Material Authorization (RMA) number from Blackboard and return such reader and/or peripheral Equipment to the factory for repair. Repaired or replaced Equipment will be returned to the customer within 5 business days using standard shipping methods.

(iii.) Reader and peripheral Equipment manufactured by a third party vendor is supported by way of depot repair. At Blackboard's sole discretion, such Equipment shall be repaired or replaced. Customer shall request a Return Material Authorization (RMA) number from Blackboard and return such reader and/or peripheral Equipment to Blackboard for repair. Repaired or replaced Equipment will be returned to the Customer within 10 business days unless said Equipment is deemed by Blackboard to require repair or replacement by the manufacturer or its authorized repair facility. In the event said Equipment requires repair or replacement by manufacturer or authorized repair facility, Equipment will be sent to the manufacturer by Blackboard within 2 business days of receipt from Customer and repaired or replaced Equipment will be returned to Customer, using standard shipping methods, within 3 business days of return to Blackboard from manufacturer or authorized repair facility.

(iv.) Equipment including, but not limited to, NCR, Dell, Compaq, and Gateway are supported by onsite third party repair.

(v.) If at Blackboard's reasonable discretion, a piece of Equipment is no longer capable of being maintained in good operating condition, including, but not limited to, normal wear and tear, non-support of Equipment due to discontinuance of support from the manufacturer or its authorized repair facility, or the non-availability of repair components, Blackboard will provide to Customer an estimate of Blackboard's refurbishment charges, if any, for such equipment in accordance with Blackboard's then-current charges and policies. Should Customer fail to have Blackboard refurbish the equipment within 60 days of notification or if refurbishment is not available, said Equipment will no longer be maintained under this Agreement and if provided, such estimate will be considered null and void. A credit will be issued for the prorated balance of maintenance fees paid to Blackboard for the Equipment during the current term.

5. TIME AND MATERIALS SERVICES

5.1 At Blackboard's sole discretion, repair or maintenance and support services may be made available to Customer at Blackboard's then current fees and applicable hourly minimums for Software and/or Equipment which Customer has not paid the applicable maintenance and support fees or Blackboard has excluded in accordance with this Schedule.

5.2 Blackboard will provide Customer with an estimate for the provision of such services. Blackboard, at its sole discretion, will require either a Purchase Order or written approval for the estimated fees prior to providing any repairs or maintenance and support services in accordance with this section.

6. FEES

6.1 Software basic maintenance and support services are covered under the Customer's annual license fee for the Software. To the extent Customer has purchased Platinum level Software maintenance and support services, Customer shall pay annually for such additional fees related to such services. Customer shall pay an annual Equipment maintenance and support fee (the "Annual Equipment Maintenance and Support Fee") to Blackboard for the services provided hereunder related to the Equipment. To the extent Customer has purchased Silver level Equipment maintenance and support services, Customer shall pay annually for such additional fees related to such services. If Customer fails to pay the Annual Equipment Maintenance Fee in accordance with this Schedule and the Master Terms, Blackboard may suspend any and all Equipment maintenance and support and Customer. Blackboard reserves the right to modify the Annual Maintenance and Support Fee for each Renewal Term.

7. TERM

7.1 This Schedule shall become effective (i) when executed by authorized representatives of both Parties (the "Schedule Effective Date"); or (ii) the Effective Date of the Agreement, whichever later occurs, and shall continue in effect for a period of one (1) year (the "Initial Term"), unless suspended as provided for in Section 7.

7.2 Thereafter, this Schedule may renew upon the Renewal Date (as defined below) for successive one (1) year terms or as mutually agreed (each a "Renewal Term"), upon notice by Customer of its desire to renew provided to Blackboard not less than thirty (30) prior to the end of the Initial Term or then-current Renewal Term.

Customer shall remit the applicable Maintenance and Support specifications within thirty (30) days of the Renewal Date. The Renewal Date ("Renewal Date") means a period of time commencing on the 1st day after the conclusion of the Initial Term and continuing for a period of twelve (12) months, unless otherwise agreed upon by the Parties or as applicable as long as the Commonwealth of Virginia Contract UCP-VT-BB-0509 is in effect. Upon termination of this Schedule, all Maintenance and Support granted under this Schedule shall immediately cease, and Customer will (i) pay to Blackboard all amounts due and payable hereunder and (ii) return all Documentation and related training materials to Blackboard within a reasonable time at Customer's cost.

IN WITNESS WHEREOF, the parties hereto have executed this Schedule as of the date hereof.

BLACKBOARD

Signature

TESS FRAZIER-VICE PRESIDENT

Print Name and Title

Date:

CUSTOMER:

Signature

PRINT NAME AND TITLE

Date:
OPTIONAL PURCHASE
EXHIBIT A TO SCHEDULE
BLACKBOARD TRANSACT SOFTWARE PLATINUM COVERAGE™

1. MAINTENANCE
1.1 Basic Obligations. Upon payment of applicable fees, Blackboard shall provide Customer with maintenance and support services in accordance with the terms and conditions of the Blackboard Transact Maintenance and Support Schedule and the Master Terms and its then-current maintenance and support policy. In addition to the Basic coverage, the items described in the sections below are included in Platinum coverage.

1.2 System Administration and Technical Services
Blackboard will travel to Customer site to review software configurations, conduct refresher training and discuss future implementation plans. Trips (i) may be scheduled May through September, (ii) scheduled dates must be mutually agreed upon by Customer and Blackboard, and (iii) must be scheduled twenty-four (24) days in advance. This work may include remote diagnostic services onsite or remote system administration assistance, reader activation services, or installation training and assistance to not exceed twenty-four (24) hours or three (3) business days. This work may not include installation training and assistance or reader activation services for modules and associated hardware readers of a type not previously installed on Customer's site. This is limited to one business trip and may not be split into multiple trips. Travel and living expenses shall be at the Customer's expense, provided the travel and per diem rates for lodging and subsistence shall not exceed the maximum amount allowable for such expenses in the Commonwealth of Virginia's travel regulations as outlined at http://www.doa.virginia.gov/Admin_Services/CAPP/CAPP_Topics/20335.pdf and http://www.doa.virginia.gov/Admin_Services/CAPP/CAPP_Summary.cfm. At Blackboard's sole discretion these services may be included with additional services provided by Blackboard to Customer under a separate Professional Services Agreement and the applicable Statement of Work.

1.3 Network Reader Coverage
1.3.1 Blackboard, with the assistance of Customer, will diagnosis a reader problem and determine if the problem is related to Equipment or communication protocols.
1.3.2 If the problem is with Equipment, the current maintenance options will prevail. If the problem is with the communication protocols, the Customer will be advised to take steps to address the issue. It is up to the Customer to solve all on-campus communication problems. Blackboard is not responsible for campus communication problems.

1.4 Emergency Onsite Assistance
In the event of a Network Processor failure (UNIX Edition) or Server failure (Windows Edition), Customer may choose to have a Blackboard employee travel to customer site to assist with Network Processor replacement or Server restoration. Travel and living expenses shall be at the Customer's expense, provided the travel and per diem rates for lodging and subsistence shall not exceed the maximum amount allowable for such expenses in the Commonwealth of Virginia's travel regulations as outlined at http://www.doa.virginia.gov/Admin_Services/CAPP/CAPP_Topics/20335.pdf and http://www.doa.virginia.gov/Admin_Services/CAPP/CAPP_Summary.cfm.

1.5 Application Restoration
In the event of a host hardware failure, Blackboard will perform the following services remotely:
(i) Blackboard will install both Application Software and Operating System software from backup media.
(ii) Blackboard will configure partitions for new reader (if necessary)
(iii) Blackboard will analyze and resolve database corruption (if necessary)
(iv) Blackboard will start the application processes
(v) Blackboard will confirm readers are online and processing transactions

1.6 24/7 Product Support
Blackboard will provide Customer Support 24/7 troubleshooting assistance on Software problems (does not include upgrade support). During non-standard office hours, calls are responded to within 60 minutes.

1.7 Off-hour Upgrade Support
Provided Customer has scheduled a Software upgrade twenty (20) business days in advance with Blackboard and Customer will have a person onsite at the server on which the Software upgrade is being installed during the entire upgrade process, Blackboard will provide Customer support in migrating to new versions of the Software for up to three (3) hours before or after Blackboard's standard support hours, or from 9AM to 4PM Mountain Standard Time on Saturdays. Blackboard and Customer will determine how long the upgrade will take, and agree to an upgrade schedule. Supported migrations may only be scheduled with Blackboard's agreement to either commence three (3) hours before the start of Blackboard's standard support hours, or, within three (3) hours after the end of Blackboard's standard support hours, or during the listed hours on Saturdays.

1.8 Disaster Recovery and Business Resumption
1.8.1 Blackboard will maintain a recovery system to include a Network Processor (where applicable) and Server (the "Recovery System") with suitable capacity, tested and ready for shipment within forty-eight (48) hours of written notification from Customer that a disaster has occurred. A disaster is defined as a disastrous loss of Customer's UNIX or Windows Edition system ("Disaster") for purposes of this Exhibit.
1.8.2 A reasonable number of Recovery Systems, as determined by Blackboard, will be allocated to our inventory for Disaster Recovery and Business Resumption. In the unlikely event a Disaster occurs to more than one Customer at the same time, the first written request received by Blackboard will prevail for each Recovery System available.
1.8.3 In the event of a Disaster and upon receipt of written notification from Customer, Blackboard will make a Recovery System available for a maximum of sixty (60) calendar days. If Customer has not shipped the Recovery System to Blackboard within the sixty (60) day period, a penalty of $10,000 will be charged for each additional thirty (30) day period, or portion thereof.
1.8.4 If on-site assistance is required to set-up the Recovery System and/or subsequent replacement system, a Blackboard technician's labor will be provided at no charge to Customer. However, travel and living expenses shall be at Customer's expense, provided the travel and per diem rates for lodging and subsistence shall not exceed the maximum amount allowable for such expenses in the Commonwealth of Virginia's travel regulations as outlined at http://www.doa.virginia.gov/Admin_Services/CAPP/CAPP_Topics/20335.pdf and http://www.doa.virginia.gov/Admin_Services/CAPP/CAPP_Summary.cfm.
1.8.5 Shipping costs for the Recovery System from Blackboard to Customer and from Customer to Blackboard shall be at Customer's expense. Customer must return the Recovery System to Blackboard's Phoenix facility by the same shipping method as received.
1.8.6 Customer is responsible for providing current back-up tapes to be used in restoring full system functionality utilizing the Recovery System and subsequent replacement system.

1.9 Participation in Product Release Conference Calls. From time to time, Blackboard may invite Customer to participate in a conference call discussion with Blackboard's Software product development team during which Customer may ask questions. Upon such invitation, Blackboard shall notify Customer in advance of the dates and times of such conference calls. The discussions and answers provided in such conference calls are Confidential Information.
1. MAINTENANCE

1.1 Basic Obligations. Upon payment of applicable fees, Blackboard shall provide Customer with maintenance and support services in accordance with the terms and conditions of Blackboard Transact Maintenance and Support Schedule and the Master Terms and its then-current maintenance and support policy. In addition to the Basic coverage, the following items are included in the Silver Equipment Coverage:

1.2 Reader On-Site Technical Training
Blackboard will travel to Customer site to conduct Reader Installation Training and/or Reader Communication training. Trips may not be scheduled June through September and scheduled dates must be mutually agreed upon by Customer and Blackboard and be scheduled twenty-four (24) days in advance. This work may include remote Reader training not to exceed twenty-four (24) hours or three (3) Business days. This is limited to one business trip and may not be split into multiple trips. Travel and living expenses shall be at the Customer’s expense, provided the travel and per diem rates for lodging and subsistence shall not exceed the maximum amount allowable for such expenses in the Commonwealth of Virginia’s travel regulations as outlined at http://www.doa.virginia.gov/Admin_Services/CAPP/CAPP_Topics/20335.pdf and http://www.doa.virginia.gov/Admin_Services/CAPP/CAPP_Summary.cfm.

1.3 Replacement of Worn components
Blackboard will replace Equipment components if at their discretion the component is showing wear and tear. This includes but is not limited to reader faceplates, read heads and card slots.

1.4 Expedited Shipping (Overnight shipping)
Blackboard will return repaired or replacement Equipment to Customer using overnight shipping methods.

1.5 Temporary Replacement Availability
1.5.1 When requested by Customer and Equipment is available, Blackboard will provide Customer with a temporary replacement for Equipment that is defective or not functioning properly. Blackboard will use its commercially reasonable efforts to ensure that such temporary replacement Equipment is shipped within twenty-four (24) hours of receipt of notice from Customer and/or Blackboard’s acknowledgement of defective or non-functioning Equipment. Temporary replacement equipment not received by Blackboard within twenty days (20) of Customer’s receipt of the repaired component will be billed to Customer at the then current retail price.

1.5.2 At Blackboard’s sole discretion, Blackboard may provide Customer with replacement Equipment. Blackboard will use its commercially reasonable efforts to ensure that such replacement Equipment is shipped within twenty-four (24) hours of Blackboard’s acknowledgement of defective or non-functioning Equipment. Customer will send to Blackboard the defective or non-functioning Equipment within five (5) business days after receipt of the temporary replacement unit. Temporary replacement equipment not received by Blackboard within twenty days (20) of the Customer’s receipt of replacement Equipment will be billed to Customer at the then current retail price.
Virginia Polytechnic Institute & State University on behalf of its Member Institutions

EQUIPMENT PURCHASE SCHEDULE

This EQUIPMENT PURCHASE SCHEDULE ("Schedule") is made as of the last date indicated below and is an addendum to the Blackboard System Wide Master Terms Agreement between Blackboard and Virginia Polytechnic Institute and State University, "Virginia Tech" on behalf of its Member Institutions, entered into August 1, 2009. The Member Institution "Customer" desires to purchase equipment available hereunder. The Member Institution is required to adhere to the terms and conditions as set forth in the Blackboard System Wide Master Terms. The System Wide Master Terms are an integral part of this Schedule and are incorporated herein by reference. Capitalized terms used in this Schedule that are not otherwise defined in this Schedule shall have the meaning set forth in the Master Terms. In consideration of the foregoing promises, and other good and valuable consideration, the receipt of which are hereby acknowledged, the parties hereby agree as follows:

1. ORDERING AND DELIVERY OF EQUIPMENT

1.1 Order and Purchase Process. For so long as this Equipment Purchase Schedule remains in effect, Customer may order any Equipment set forth on Blackboard's then-standard price list, or any Equipment with respect to which Blackboard has otherwise provided a price quote, by submitting to Blackboard either a written purchase order or an authorized Blackboard price quote accompanied by payment for such equipment in the form of check or valid authorization to charge Customer’s credit card account. Blackboard agrees to sell to Customer the Equipment set forth and requested in any purchase order accepted in writing by Blackboard, provided that no purchase order will be binding upon Blackboard until Blackboard accepts such purchase order in writing, and further provided that Blackboard will have no liability to Customer with respect to any purchase orders that are not accepted. No partial shipment of equipment requested pursuant to any purchase order shall constitute acceptance of the entire purchase order. Customer acknowledges that no provision of any purchase order or other similar documentation will be deemed to modify, add to, or supersede any provision of this Agreement.

1.2 Cancellation. Customer may not cancel a purchase order executed concurrently with the execution of this Agreement. However, Customer may cancel any subsequent purchase order by providing written notice to Blackboard not less than thirty (30) days prior to the relevant requested shipment date; provided that Customer first pays Blackboard a cancellation charge equaling fifteen percent (15%) of the total price of the affected purchase order.

1.3 Warranties. For so long as this Equipment Purchase Schedule remains in effect, Customer shall be provided with any applicable warranty provided by Blackboard on the Equipment purchased by Customer through Blackboard with the specifications as identified on the Equipment Configuration form. In configuring such Equipment, Blackboard will install the applicable Software and related components on the Equipment prior to shipment. The related components are limited to those necessary for the Software to function on the Equipment. Blackboard is not responsible for installing the most up to date related components if they might, in Blackboard's determination, impair the Software's ability to function.

1.4 Shipment and Delivery Terms. Upon acceptance of any purchase order, Blackboard will establish a shipping date for the relevant Equipment as close as practicable to Customer’s requested date, subject to Blackboard's available inventory and then-current lead time requirements, and provided that Blackboard shall be permitted to allocate its then-current inventory and other resources in its discretion. Notwithstanding the foregoing, if Blackboard is to configure the Equipment pursuant to Section 1.3, Blackboard shall endeavor to ship the Equipment within seven (7) business days of Blackboard's receipt of the Equipment. Blackboard shall not be liable for any damage or penalty arising from delay in delivery or from failure to give notice of any delay. Blackboard agrees to exercise reasonable efforts to expedite particular shipments of Equipment when so requested by Customer, provided that Customer will be charged an additional fee equal to 10 percent (10%) of the total purchase price for the item being so shipped. The Equipment is made available to the Customer on the date Blackboard ships the Equipment to Customer.

2. CONSIDERATION FOR EQUIPMENT.

2.1 Equipment Prices; Payments. In consideration for any Equipment sold to Customer pursuant to this Schedule, Customer agrees to pay to Blackboard the applicable price(s) set forth in Blackboard's then-standard price list, or such other price(s) as may have been provided by Blackboard to Customer in an authorized Blackboard price quote with respect to such Equipment. Customer shall additionally pay, prior to shipment of the relevant Equipment, all freight charges, insurance, and other shipping expenses applicable to delivery of such Equipment, as well as expenses for any special packing requested by Customer, all of which amounts shall be due and payable within thirty (30) days following receipt of an invoice with respect thereto. Customer shall remain responsible for all payments under this Agreement and any other agreement with Blackboard, regardless of any financing arrangements by Customer. Customer shall pay to Blackboard the amount set forth in the Purchase Order for the Equipment in accordance with the payment provisions of the Agreement.

2.2 Charges in Fees. Blackboard reserves the right to amend its Equipment price lists at any time in its discretion, provided that any increase in such prices shall not affect the amounts payable under any purchase orders accepted by Blackboard prior to the implementation of such new prices. All purchase orders submitted by Customer after implementation of any announced price increase but before the date such price increase is effective, shall be priced as if the increase were in effect. Any decrease in applicable prices shall be effective immediately upon publication by Blackboard and shall be applicable to all outstanding purchase orders accepted by Blackboard.

3. TITLE AND RISK.

3.1 Passing of Title. Title to Equipment shall not pass to Customer until Blackboard has received in full (in cash or cleared funds) all sums due to it in respect of such Equipment. Notwithstanding the foregoing, the Equipment shall be deemed sold and payment will be owed thereon upon arrival of Equipment at Customer’s delivery address.

3.2 Customer Obligations. Until title to Equipment has passed to Customer, Customer shall: (i) hold such Equipment on a fiduciary basis as Blackboard's bailee; (ii) store such Equipment (at no cost to Blackboard) separately from all other equipment of Customer or any third party in such a way that it remains readily identifiable as Blackboard's property; and (iii) insure such Equipment and produce a copy of the policy of insurance upon Blackboard's request.

3.3 Termination of Right of Possession. Customer's right to possession of Equipment owned by Blackboard shall terminate immediately if: (i) it becomes insolvent or makes an arrangement with its creditors generally or has a liquidator or a receiver appointed over a substantial part of its business or assets or commences to be wound up (other than for the purposes of a solvent amalgamation or reconstruction); or (ii) it pledges or in any way charges by way of security for any indebtedness any Equipment which is the property of Blackboard.

3.4 License to Enter. With advanced notification by Blackboard and subject to any legal remedy available to Customer, Customer grants Blackboard, its agents and employees, an irrevocable license at any time to enter any premises where the Equipment is or may be stored in order to inspect it, or, where Customer’s right to possession has terminated, to recover it.

3.5 Passing of Risk. Risk of loss or damage to any Equipment shall pass to Customer upon shipment of the Equipment.
4. LIMITED WARRANTY AND EXCLUSIONS.

4.1 Limited Warranty. Subject to Section 4.2 of this Schedule and to Article 7 of the Master Terms, Blackboard warrants, solely for the benefit of Customer, that any Equipment manufactured by Blackboard and/or sold by Blackboard which is sold to Customer under this Schedule will substantially conform to applicable Documentation for a period of twelve (12) months after the relevant Available Date, provided that: (i) Blackboard has received all amounts owed under this Agreement; and (ii) Customer is not in material breach of this Agreement; and (iii) Customer has notified Blackboard in writing of any failure of the Equipment to conform to the foregoing warranty within the warranty period. BLACKBOARD'S SOLE OBLIGATION, AND CUSTOMER'S SOLE REMEDY, WITH RESPECT TO ANY BREACH OF THE FOREGOING WARRANTY, IS REPAIR OR REPLACEMENT (AT BLACKBOARD'S OPTION) OF THE RELEVANT EQUIPMENT IN A TIMELY MANNER.

4.2 Equipment Warranty Exclusion. Unless otherwise specified in the Agreement, Blackboard does not warrant or provide support for any third-party Equipment sold by Blackboard. However, Blackboard shall pass through any warranty terms that it receives from such third-parties to the Customer. Customer acknowledges that it must contact the third-party Equipment manufacturer directly for any warranty or support issues related to such third-party Equipment.

5. TERM. This Schedule shall become effective (i) when executed by authorized representatives of both Parties (the “Schedule Effective Date”); or (ii) the Effective Date of the Agreement, whichever later occurs, and shall continue in effect as long as the Commonwealth of Virginia Contract UCP-VT-BB-0509 is in effect or unless terminated.

IN WITNESS WHEREOF, the parties hereto have executed this Schedule as of the date hereof.

BLACKBOARD

Signature
TESS FRAZIER- VICE PRESIDENT

Print Name and Title 

Date:

CUSTOMER:

Signature

PRINT NAME AND TITLE

Date:
Virginia Polytechnic Institute & State University on behalf of its Member Institutions

CARDS AND SUPPLIES PURCHASE SCHEDULE

This CARDS AND SUPPLIES PURCHASE SCHEDULE ("Schedule") is made as of the last date indicated below and is an addendum to the Blackboard System Wide Master Terms Agreement between Blackboard and Virginia Polytechnic Institute and State University, "Virginia Tech" on behalf of its Member Institutions, entered into August 1, 2009. The Member Institution also desires to purchase the cards and supplies listed herein. The Member Institution is required to adhere to the terms and conditions as set forth in the Blackboard System Wide Master Terms. The System Wide Master Terms are an integral part of this Schedule and are incorporated herein by reference. Capitalized terms used in this Schedule that are not otherwise defined in this Schedule shall have the meaning set forth in the Master Terms. In consideration of the foregoing promises, and other good and valuable consideration, the receipt of which are hereby acknowledged, the parties hereby agree as follows:

1. ORDERING AND DELIVERY OF EQUIPMENT
   1.1 Order and Purchase Process. While this Schedule remains in effect, Customer may order any cards and/or Equipment supplies set forth on Blackboard's then-standard price list, or any cards and/or Equipment supplies with respect to which Blackboard has otherwise provided a price quote, by submitting to Blackboard either a written purchase order or an approved Blackboard price quote by payment for such equipment supplies or cards in the form of check or valid credit card account. Blackboard agrees to sell to Customer the cards and/or Equipment supplies set forth and requested in any purchase order accepted by Blackboard. Provided that no purchase order will be binding upon Blackboard until Blackboard accepts such purchase order in writing. Further provided that Blackboard will have no liability to Customer with respect to any purchase orders that are not accepted. No partial shipment of cards and/or Equipment supplies requested pursuant to any purchase order shall constitute acceptance of the entire purchase order. Customer acknowledges that no provision of any purchase order or other similar documentation will be deemed to modify, add to, or supersede any provision of this Agreement.

   1.2 Cancellation. Customer may not cancel a purchase order executed concurrently with the execution of this Agreement. However, Customer may cancel any subsequent purchase order by providing written notice to Blackboard not less than forty-five (45) days prior to the relevant requested shipment date; provided that Customer first pays Blackboard a cancellation charge equaling fifteen percent (15%) of the total price of the affected purchase order.

   1.3 Shipment and Delivery Terms. Upon acceptance of any purchase order, Blackboard will establish a shipping date for the relevant cards and/or Equipment Supplies as close as practicable to Customer's requested date, subject to Blackboard's available inventory and then-current lead time requirements, and provided that Blackboard shall be permitted to allocate its then-current inventory and other resources in its discretion. Blackboard will not be liable for any damage or penalty arising from delay in delivery or from failure to give notice of any delay. Blackboard agrees to exercise reasonable efforts to expedite particular shipments of Equipment supplies or cards when requested by Customer, provided that Customer will be charged an additional fee equal to 10 percent (10%) of the total purchase price for the item being so shipped.

2. CONSIDERATION FOR EQUIPMENT.
   2.1 Cards and/or Supplies Prices; Payments. In consideration for any cards and/or Equipment supplies sold to Customer pursuant to this Schedule, Customer agrees to pay to Blackboard the applicable prices set forth in Blackboard's then-standard price list, or such other price(s) as may have been provided by Blackboard to Customer in an authorized Blackboard price quote with respect to such Equipment. Customer shall additionally pay, prior to shipment of the relevant cards and/or Equipment Supplies, all freight charges, insurance, and any other shipping expenses applicable to delivery of such cards and/or Equipment supplies, as well as expenses for any special packing requested by Customer, all of which amounts shall be due and payable within thirty (30) days following receipt of an invoice with respect thereto. The standard quantity variation on custom-printed cards is +/- 10 percent. Blackboard will invoice for the quantity shipped. In the event additional services are requested by Customer, including but not limited to, artwork, design, typesetting and proof charges, fees for these additional services will be in accordance with Blackboard's then current rates such additional services. Customer shall remain responsible for all payments under this Agreement and any other agreement with Blackboard, regardless of any financing arrangements by Customer. Customer shall pay to Blackboard the amount set forth in the Purchase Order for the cards and/or Equipment supplies in accordance with the payment provisions of the Agreement.

   2.2 Changes in Fees. Blackboard reserves the right to amend its cards and/or Equipment supplies price lists at any time in its discretion, provided that any increase in such prices shall not affect the amounts payable under any purchase orders accepted by Blackboard prior to the implementation of such new prices. All purchase orders submitted by Customer after implementation of any price increase but before the date such price increase is effective, shall be, by the Purchase Order's terms, for delivery no later than ninety (90) days after the date such price increase is effective, unless otherwise agreed by Blackboard. Any decrease in applicable prices shall be effective immediately upon publication by Blackboard and shall be applicable to all outstanding purchase orders accepted by Blackboard.

3. TITLE AND RISK
   3.1 Passing of Title. Title to cards and/or Equipment supplies shall not pass to Customer until Blackboard has received in full (in cash or cleared funds) all sums due to it in respect of such cards and/or Equipment supplies.

   3.2 Passing of Risk. Risk of loss or damage to any cards and/or Equipment supplies shall pass to Customer upon shipment of the cards and/or Equipment supplies.

4. LIMITED WARRANTY.
   Blackboard warrants that each card and Equipment supplies shall be substantially free from manufacturer defects and if applicable, substantially conformed to relevant ABA and ISO card standards in effect at the time of shipment to Customer, provided Blackboard has received all amounts owed under the Blackboard System Wide Master Terms Agreement and its Schedule(s) for the Member Institution indicated above, and Customer is not in default of any part of the Agreement. Blackboard's sole obligation is limited to replacement or credit to Customer's account for the defective cards or Equipment supplies, at Blackboard's discretion, provided that Customer notifies Blackboard of the deficiency within thirty (30) days of receipt of a card or Equipment supplies. THE ABOVE WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES BY BLACKBOARD, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE.

5. TERM.
   This Schedule shall become effective (i) when executed by authorized representatives of both Parties (the "Schedule Effective Date"); or (ii) the Effective Date of the Agreement, whichever later occurs, and shall continue in effect as long as the Commonwealth of Virginia Contract UCP-VT-BB-0039 is in effect or unless terminated.

IN WITNESS WHEREOF, the parties hereto have executed this Schedule as of the date hereof.

BLACKBOARD

Signature

TESS FRAZIER-VICE PRESIDENT

Print Name and Title

Date:

CUSTOMER

Signature

PRINT NAME AND TITLE

Date:

Contract UCP-VT-BB-0509 Modification #1 Details
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Virginia Polytechnic Institute & State University on behalf of its Member Institutions

The BBOne® Services Schedule is a license that can be purchased under the Blackboard System Wide Master Terms Agreement between Blackboard and Virginia Polytechnic Institute and State University, entered into on August 1, 2009.

Member Institutions shall request from Blackboard the BBONE® Services Schedule and will separately and individually negotiate terms and conditions.
This Blackboard Video Surveillance Software Schedule is made as of the last date indicated below and is an addendum to the Blackboard System Wide Master Terms Agreement between Blackboard and Virginia Polytechnic Institute and State University, “Virginia Tech” on behalf of its Member Institutions, entered into August 1, 2009. The Member Institution (“Customer”) desires to purchase a license for the Blackboard Software listed herein. The Member Institution is required to adhere to the terms and conditions as set forth in the Blackboard System Wide Master Terms. The System Wide Master Terms are an integral part of this Schedule and are incorporated herein by reference. Capitalized terms used in this Schedule that are not otherwise defined in this Schedule shall have the meaning set forth in the Master Terms.

In consideration of the foregoing promises, and other good and valuable consideration, the receipt of which are hereby acknowledged, the parties hereby agree as follows:

1. ADDITIONAL DEFINITIONS
1.1 “Application Pack” means the object code software utility release(s) that are designed to work with the Software that may be, in Blackboard’s sole discretion, issued in between Upgrades, designated by APW, and/or later incorporated into Upgrades.
1.2 “Corrections” means a change (e.g., fixes, workarounds, etc.) made by or for Blackboard which corrects Software Errors in the Software, provided it is in temporary form such as a patch, and later issued in the permanent form of an Update.
1.3 “Designated Server Site” means the physical location where the Software will be installed as identified in the Pricing Summary.
1.4 “Pricing Summary” means the pricing attributable to the software and services provided pursuant to the Schedule as set forth on the cover page of the Agreement.
1.5 “Software” means, for purposes of this Schedule only, the Blackboard Video Surveillance proprietary software, including Updates, Upgrades, Corrections, and Application Packs therefor.
1.6 “Software Error” means a failure of any Software material and substantially to conform to applicable Documentation, provided that such failure can be reproduced and verified by Blackboard using the most recent version (including all available Corrections, Application Packs, Updates, and Upgrades) of such Software made available to Customer, and further provided that Software Errors do not include any nonconformity to applicable Documentation caused by: (i) Customer’s or its end users’ negligence; (ii) any modification or alteration to the Software not made by Blackboard; (iii) data that does not conform to Blackboard’s specified data format; (iv) operator errors; (v) use on any system other than the operating system specified in the Documentation; (vi) accident, misuse or any other cause which, in Blackboard’s reasonable determination, is not inherent in the Software; or (vii) any use of the Software other than expressly authorized in this Schedule.
1.7 “Supported Interface” means application-based interfaces (API) provided pursuant to the Blackboard Building Blocks® program, network protocols, data formats, databases, schemas, and file formats for use in the Software as expressly specified in the Documentation.
1.8 “Third-Party Software” means the software or content manufactured or created by third parties that has been incorporated by Blackboard into the Software or that has been shipped Software.
1.9 “Updates” means the object code versions of the Software that have been developed by Blackboard to correct any Software Error and/or provide additional functionality and that have been commercially released with a version number that differs from that of the prior version in the number to the right of the decimal point (e.g., 2.0 vs. 2.1) and that are not marketed as a separate product or module, including Application Packs.
1.10 “Upgrades” means the object code versions of the Software that have been customized, enhanced, or otherwise modified by or on behalf of Blackboard, acting in its sole discretion, to include additional functionality and that have been released with a version number that differs from that of the prior version in the number to the left of the decimal point (e.g., 3.0 vs. 2.0) and that are not marketed as a separate product or module.

2. LICENSE
2.1 Grant of License. Subject to the terms and conditions of this Schedule and the Master Terms, Blackboard grants Customer a limited, non-exclusive, nontransferable, right and license to: (i) use one (1) production copy of the Software and one (1) unsupported Test Copy at Customer’s site and on the server(s) designated provided, however, that such Test Copy may be used to the extent required for and for the sole purposes of application clustering and/or load balancing, (a) on a group of production servers, with each server acting as a managed node within such group so that, effectively, the application is deployed on a single logical system host comprised of multiple managed node servers or (b) on multiple managed nodes that are configured and deployed on a single physical host that manages the self-contained nodes, and for the Blackboard Video Surveillance software, solely with the number of workstations, personal computers, or other equivalent devices identified on the attached Equipment Schedule (as such may be amended) that are covered by the limited warranty in Section 7.1 of the Master Terms or maintenance and support services; and to use the Documentation ([OPTIONAL IF PURCHASED] and if indicated on the Pricing Summary, (ii) use one (1) additional supported Test Copy of the Software on a single computer at a Customer’s Designated Server Site, solely in the form of machine-readable, executable, object code or bytecode, as applicable, and solely for non-production, testing purposes.) An install copy of the Software is “made available” to the Customer either (i) on the date on which Blackboard has notified Customer that an install copy of the Software is available for download; or (ii) the date on which the Software made available for installation via diagnosis and/or download to Customer for a period of thirty (30) days and Customer shall download the Software within this thirty day period.
Customer acknowledges and understands that, in the event it wishes to use the Software for any purposes other than those expressly permitted by the foregoing, Customer will be required to obtain additional license rights from Blackboard pursuant to a separately executed Schedule and payment of additional license fees.
2.2 General Usage Restrictions. Customer agrees not to use the Software or Documentation for any purposes beyond the scope of the license granted in Section 2.1. Without limiting the foregoing, except as expressly contemplated in this Agreement or as otherwise agreed in writing between the Parties, Customer shall not: (i) copy or duplicate the Software or Documentation, provided that, notwithstanding the foregoing, Customer shall be permitted to create one (1) copy of the Software for archival, non-productive purposes provided that Customer reproduces on the copy all copyright notices and any other proprietary legends that are on or encoded in the Software; (ii) decompile, disassemble, reverse engineer or otherwise attempt to obtain or perceive the source code from which the Software is compiled or interpreted, and Customer hereby acknowledges that nothing in this Agreement shall be construed to grant Customer any right to obtain or use such source code; (iii) install or use the Software on any computer, network, system or equipment other than the Designated Server Site, except with the prior written consent of Blackboard; (iv) modify the Software or create any derivative product of the Software, except with the prior written consent of Blackboard, provided that the foregoing shall not be construed to prohibit Customer from configuring the Software to the extent permitted by the Software’s standard user interface; (v) sublicense, assign, sell, lease or otherwise transfer or convey, or pledge as security or otherwise encumber, Customer’s rights under the license granted in Section 2.1. or (vi) use the Software or Documentation to provide services to third parties other than Cardholders (as defined below) in the nature of a service bureau, time sharing arrangement or as an application service provider, such as terms that are generally understood within the industry or by any other reason. Customer will not obtain or alter or any of the trademarks, trade names, logos, patent, trademark, or copyright notices or markings to the Software, nor will Customer add any other notices or markings to the Software or any portion thereof except as permitted by the Software standard user interface. Customer shall not use the Software in violation of Blackboard’s obligations to any third party incurred prior to the Effective Date, provided that Blackboard has notified Customer of such obligation. Customer shall not provide access to the Software to anyone other than Cardholders without Blackboard’s prior written consent; provided, however, that Customer may provide access to Blackboard Building Blocks® partners that are subject to a valid Blackboard developer’s license agreement for the limited purpose of installing, maintaining and supporting Blackboard Building Blocks® applications. Customer shall ensure that its use of the Software complies with all applicable laws, statutes, regulations or rules promulgated by governing authorities having jurisdiction over such distributions, including without limitation, the restrictions set forth in this Section 2.2. Customer will take appropriate steps to ensure that it and its
Cardholders do not share access information (including user identification data and passwords) with third parties except as expressly permitted under this Agreement. Under no circumstances shall Customer permit any third party to host the Software.

2.3 **Further Restrictions.** Customer acknowledges that certain Blackboard Software contains an "Auto Report" feature, which feature provides to Blackboard aggregate usage statistics regarding the Software and Blackboard represents and warrants that the Auto Report feature does not report individually identifiable information to Blackboard or any third party. Customer will not disable the Auto Report feature of the Software, or undertake any action which has the effect of preventing such feature from operating correctly or the effect of modifying the information reported thereby.

2.4 **Interoperability.** To the extent permitted by the specifications as outlined in the Documentation for the Software at http://behind.blackboard.com, if the Customer wishes to achieve interoperability of the Software with another software program and requires interface specifications or other information in order to do so, the Customer should request that information from Blackboard. Nothing in this Section 2.4 authorizes Customer to use any interfaces except the Supported Interfaces for the Software level. Customer may not use any Supported Interface in a manner that is inconsistent with the Documentation.

2.5 **Third Party Software/Content.** Customer acknowledges that the Software may utilize Third Party Software. Pursuant to its agreements with these third parties, Blackboard hereby grants to Customer a non-exclusive, non-transferable license or sublicense, as applicable, to load and/or operate and use the Third Party Software solely in connection with the Software and Customer’s own instructional activities.

2.6 **Ownership of Software.** Blackboard and its licensors shall be deemed to own and hold all right, title and interest in and to the Software and Documentation, and Customer acknowledges that it neither owns nor acquires any additional rights in and to the Software and Documentation not expressly granted by this Agreement. Customer further acknowledges that Blackboard hereby reserves and retains all rights not expressly granted in this Agreement, including, without limitation, the right to use the Software or Documentation for any purpose in Blackboard’s sole discretion.

2.7 **Expansion of Licensed Use.** The Software is priced annually based upon Blackboard User Bands. Blackboard User Bands are comprised of the number of Cardholders. A Cardholder will be defined as any individual associated with a licensing institution that can reasonably be anticipated to use a card, or perform a transaction, or utilize a privilege/event in the Blackboard Video Surveillance™, within the forward licensing period (12 months). A Cardholder may include, but is not inclusive of, a stored value charge in any module, regular applied board transaction, guest applied board transaction, cash equivalent charge, regular event entry, and guest event entry.

Prior to a Renewal Term, Blackboard may conduct an audit in accordance with the Master Terms, to determine the number of Cardholders (as defined above) in the current licensing period. Blackboard shall utilize the current number of Cardholders determined in such audit and any information that may be supplied by Customer to reasonably determine the number of Cardholders for the forward licensing period (12 months).

For the Software on this Schedule, Customer’s license for the Software on this Schedule may be expanded in increments as indicated below:

<table>
<thead>
<tr>
<th>Cardholder Ranges</th>
<th>1-1999 Cardholders</th>
<th>2000-3999 Cardholders</th>
<th>4000-7999 Cardholders</th>
<th>8000-14999 Cardholders</th>
<th>15000-24999 Cardholders</th>
<th>25000-49999 Cardholders</th>
</tr>
</thead>
</table>

Additional bands of 25,000 Cardholders will be priced separately.

Blackboard’s assessment of additional license fees will be in accordance with Blackboard’s then-current pricing. In the event of growth related to a Customer merger or acquisition, Blackboard’s assessment of additional license fees will be in accordance with Blackboards then-current pricing.

**OPTIONAL PURCHASE**

2.8 **Escrow of Source Code.** Blackboard agrees to annually deposit the source code for the most recent version of the Software in an escrow account giving Customer, provided Customer has paid all fees due hereunder, the right to withdraw the source code upon the occurrence of: (i) failure of a trustee or Blackboard in any bankruptcy case hereafter filed by or against Blackboard either to assume this Agreement within sixty (60) days after the filing of the initial bankruptcy petition or to perform this Agreement within the meaning of Section 365(a)(4)(J) of Title 11 of the United States Code; or (ii) the termination of substantially all of Blackboard’s, (or its successors, if applicable) ongoing business operations relating to the Software. The custodian for the escrow shall be Iron Mountain Escrow Services, Inc. ("Iron Mountain"). Customer shall be responsible for any costs associated with maintaining the source code in escrow. Subject to the terms of a standard source code escrow agreement with Iron Mountain, Customer shall be entitled to access, use, copy and modify the source code for the purposes of continuing the rights under this Agreement, and for the purposes of maintaining and updating the Software, provided that Customer shall be obligated to pay continuing License Fees to Blackboard or its successor, unless and until such license is terminated by Customer and the source code, with all modifications is returned. Customer shall not have the right to sublicense, disclose or provide access to the source code to any third party.

2.9 **Other Rights.** Customer hereby grants to Blackboard the limited right to use Customer’s name and logo for the sole purpose of listing Customer as a user of the Software in Blackboard’s promotional materials. Blackboard agrees to discontinue such use within fourteen (14) days of Customer’s written request.

3. **DELIVERY**

Unless otherwise agreed by the Parties, as soon as commercially practicable after the Schedule Effective Date, Blackboard will make available a copy of the Software for downloading from the Internet by Customer for purposes of installation by Customer, and delivery of the Software shall be deemed complete when Blackboard notifies Customer that the Software is available for download. Customer acknowledges that the download site will be made available to Customer for a period not longer than thirty (30) days from the date of such notice, and Customer will have no right to download the Software after this thirty (30)-day period.

4. **REFS**

In consideration for the services provided and license granted in this Schedule with respect to the Initial Term (as defined below), Customer shall pay to Blackboard all fees specified in the Pricing Summary or otherwise required in this Schedule, which fees shall be non-cancelable and non-refundable, except as set forth in Section 5.4 of the Master Terms. With respect to each Renewal Term (as defined below), if any, Customer shall pay to Blackboard the then-current fees for such services and licenses, which amounts shall be due and payable within thirty (30) days of the date of Blackboard’s invoice for such Renewal Term. Customer further agrees to reimburse Blackboard for: (i) reasonable travel and living expenses incurred by Blackboard’s employees and subcontractors in connection with the performance of maintenance and support services under this Schedule, provided the travel and per diem rates for lodging and subsistence shall not exceed the maximum amount allowable for such expenses in the Commonwealth of Virginia’s travel regulations as outlined at http://www.doa.virginia.gov/Admin_Services/CAPP/CAPP_Terms/20335.pdf and http://www.doa.virginia.gov/Admin_Services/CAPP/CAPP_Summary.cfm; and (ii) any other expenses described in this Schedule, provided that Blackboard will receive Customer’s prior approval for single expenses greater than $250, and further provided that, upon Customer’s request, Blackboard will provide reasonable documentation indicating that Blackboard incurred such expenses. Except as otherwise required by this paragraph, all amounts payable under this Schedule shall be subject to applicable provisions of the Master Terms.

5. **TERM**

This Schedule shall become effective (i) when executed by authorized representatives of both Parties (the “Schedule Effective Date”); or (ii) the Effective Date of the Agreement, whichever later occurs, and shall continue in effect for a period of one (1) year (the “Initial Term”). Thereafter, the Schedule may renew for successive one (1)-year periods (each, a “Renewal Term”), upon notice by Customer of its desire to renew provided to Blackboard not less than thirty (30) days prior to the end of

Contract UCP-VT-BB-0509 Modification #1 Details

107765_CSPv4(111910)
the Initial Term or then-current Renewal Term, as applicable as long as the Commonwealth of Virginia Contract UCP-VT-BB-0509 is in effect. Upon termination of this Schedule, all licenses granted under this Schedule shall immediately cease, and Customer will: (i) immediately discontinue all use of Software licensed under this Schedule; (ii) pay to Blackboard all amounts due and payable hereunder; (iii) remove the Software from its server and provide to Blackboard proof of the destruction of the original copy and any other copies of the Software; and (iv) return all Documentation and related training materials to Blackboard within a reasonable time at Customer’s cost.

6. LIMITED SOFTWARE WARRANTY

Blackboard warrants, solely for the benefit of Customer, that any Software licensed under this Schedule which is manufactured by Blackboard will substantially conform to applicable Documentation for a period of ninety (90) days after the initial Available Date, provided that: (i) Blackboard has received all amounts owed under this Agreement; (ii) Customer is not in material breach of this Agreement; (iii) Customer has installed any Corrections, Upgrades and Updates made available to Customer; and (iv) Customer has notified Blackboard in writing of any failure of the Software to conform to the foregoing warranty within the warranty period. Customer acknowledges that the product is not fault tolerant and is not designed, manufactured or intended by Blackboard for use in hazardous, dangerous to life or potentially life-threatening environments requiring fail-safe performance in which the failure of products could lead directly to death, personal injury or severe physical or environmental damage. CUSTOMER ACKNOWLEDGES AND AGREES THAT, EXCEPT TO THE EXTENT REQUIRED BY LAW, BLACKBOARD MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH RESPECT TO THIRD PARTY SOFTWARE, INCLUDING WITHOUT LIMITATION (i) ANY WARRANTY OF FITNESS FOR ANY INTENDED PURPOSE OR (ii) ANY WARRANTY OR REPRESENTATION WITH RESPECT TO THE PERFORMANCE, FUNCTIONALITY OR RELIABILITY OF THE THIRD PARTY SOFTWARE USED IN CONNECTION WITH THE SOFTWARE, NOTWITHSTANDING ANY COMMUNICATIONS OUTSIDE OF THIS AGREEMENT TO THE CONTRARY. CUSTOMER FURTHER ACKNOWLEDGES AND AGREES THAT, TO THE MAXIMUM EXTENT PERMITTED BY LAW, THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES BY BLACKBOARD, AND THAT BLACKBOARD’S SOLE OBLIGATION, AND CUSTOMER’S SOLE REMEDY, WITH RESPECT TO ANY BREACH OF THE FOREGOING WARRANTY, IS REPAIR OR REPLACEMENT (AT BLACKBOARD’S OPTION) OF THE RELEVANT SOFTWARE IN A TIMELY MANNER.

7. SUPPORT AND MAINTENANCE

7.1 Maintenance. Blackboard will provide Customer with Upgrades, Corrections and Updates to the Software as they are made generally available from time to time. Software declared by Blackboard to be a general release (“General Release”) shall be installed within ninety (90) days of being made generally available by Blackboard. Blackboard reserves the right to terminate this Schedule upon thirty (30) days prior written notice, provided, Customer has not installed such Software. Notwithstanding any other provision of this Schedule, Blackboard shall provide maintenance and support only with respect to the then current generally available version(s) and/or General Release version.

7.2 Installation and Assistance. Blackboard will install Software provided pursuant to this Schedule during the Coverage Hours as defined in Blackboard Commerce Suite Maintenance and Support Schedule, provided, Blackboard has not deemed Software to be customer installable. In the event Software is deemed by Blackboard to be customer installable, Blackboard will provide telephone assistance during Coverage Hours. In either instance, Customer will schedule in advance with Blackboard for such telephone assistance or installation of Software.

7.3 Purchase of Maintenance and Support Services. Customer may purchase maintenance and support services in accordance with the applicable Schedule, which may include the Platinum or Silver Coverage.

7.4 Additional Services. Any time or expense incurred by Blackboard in diagnosing or fixing problems that are not caused by the Software or are not covered by the maintenance and support services are billable to Customer at Blackboard’s then-existing rates, with a minimum charge of $175.00 per call. If Customer desires such additional services, it must execute a copy of Blackboard’s Professional Services Agreement and applicable Schedule(s) for the services.

7.5 Initial Technical Contacts. Customer’s initial Technical Contacts are as follows:

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Email</th>
<th>Phone</th>
</tr>
</thead>
</table>

IN WITNESS WHEREOF, the parties hereto have executed this Schedule as of the date hereof.

BLACKBOARD

Signature
TESS FRAZIER—VICE PRESIDENT
Print Name and Title
Date:

CUSTOMER:

Signature
Print Name and Title
Date:
Virginia Polytechnic Institute & State University on behalf of its Member Institutions

BLACKBOARD MOBILE SCHEDULE

This Blackboard Mobile Schedule ("Schedule") is made as of the last date indicated below and is an addendum to the Blackboard System Wide Master Terms Agreement between Blackboard and Virginia Polytechnic Institute and State University, "Virginia Tech" on behalf of its Member Institutions, entered into August 1, 2009. The Member Institution ("Customer") desires to purchase the Mobile Services listed herein. The Member Institution is required to adhere to the terms and conditions as set forth in the Blackboard System Wide Master Terms. The System Wide Master Terms are an integral part of this Schedule and are incorporated herein by reference. Capitalized terms used in this Schedule that are not otherwise defined in this Schedule shall have the meaning set forth in the Master Terms. In consideration of the foregoing promises, and other good and valuable consideration, the receipt of which are hereby acknowledged, the parties agree as follows:

1. BLACKBOARD MOBILE SERVICE

1.1 Service. In consideration for the applicable fees, Blackboard shall provide the Customer with the use of the selected Blackboard Mobile Service(s) for Customer’s institution. Upon execution of this Schedule, Blackboard shall provide Customer’s designated representative with access to one or more of the Blackboard Mobile service team members who will be responsible for providing Customer with the support services (the “Support Services”) associated with the selected Blackboard Mobile Services.

1.2 Requirement of User Software. Subject to the terms and conditions of this Schedule and the Master Terms, Blackboard grants Customer a limited, non-exclusive, non-transferable, right during the Term to distribute any User Software produced through the Support Services to be used in conjunction with the Central Service for non-commercial use. Promotion and distribution of the User Software is the responsibility of Customer. Distribution of the User Software by Customer to its end users shall be pursuant to a license agreement which is reasonably satisfactory to Blackboard; provided, however, that the standard distribution terms utilized by Apple Inc. to distribute applications through its Apple App Store shall be deemed satisfactory unless Blackboard otherwise notifies Customer in writing.

1.3 Customers Obligations. Customer is responsible for promptly providing and maintaining Customer Data feeds to the Central Service for each of the Licensed Modules which Customer has selected for the User Software in formats which are compatible with the Central Service. Customer is responsible for maintaining Customer Applications, Customer Systems and Customer Data and promoting and distributing Customer Applications, User Software, Updates and Upgrades to End Users via Customer’s distribution channels such as Customer’s Apple App Store page. Customer will designate a qualified individual to serve as Customer’s support contact with Blackboard for maintenance and support issues, requests and inquiries ("Site Administrator"). Customer may change its Site Administrator at any time by providing written notice to Blackboard. Customer and its End Users will be solely responsible for acquiring and maintaining all telecommunications and Internet services and other hardware and software required to access and use each Blackboard Mobile Service, including, without limitation, any and all costs, fees, expenses and taxes of any kind related to the foregoing. Blackboard will not be responsible for any loss or corruption of data, lost communications, or any other loss or damage of any kind arising from any such telecommunications and Internet services.

1.4 Effective Date. This Schedule shall become effective when executed by authorized representatives of both Parties (the "Schedule Effective Date"); and shall continue in effect for the initial term stated in the applicable Order Form (the "Initial Term"), unless earlier terminated in accordance with the termination provisions of the Agreement. Thereafter, the applicable Order Form may renew for successive one (1)-year periods (each, a "Renewal Term"), upon notice by Customer of its desire to renew provided to Blackboard not less than thirty (30) days prior to the end of the Initial Term or then-current Renewal Term, as applicable as long as the Commonwealth of Virginia Contract UCP-VT-BB-0509 is in effect. Upon termination of this Schedule, the Blackboard Mobile Services shall cease and all licenses granted under this Schedule shall immediately cease, and Customer will: (i) immediately discontinue use of the Blackboard Mobile Services; (ii) pay to Blackboard all amounts due and payable hereunder; (iii) delete any copies of the User Software from its server or other locations such as the Customer’s Apple App Store page, and provide to Blackboard proof of the destruction of the original copy and any other copies of the User Software; and (iv) return all documentation and related training materials to Blackboard within a reasonable time at Blackboard’s cost.

1.5 Fees. In consideration for the services provided and license(s) granted in this Schedule with respect to the Initial Term, Customer shall pay to Blackboard all fees specified in each applicable Order Form, which fees shall be non-cancelable and non-refundable, except as set forth in Section 5.4 of the Master Terms. With respect to each Renewal Term, if any, Customer shall pay to Blackboard the then-current fees for such services and licenses, which amounts shall be due and payable within thirty (30) days of the date of Blackboard’s invoice for such Renewal Term. Customer further agrees to reimburse Blackboard for: (i) reasonable travel and living expenses incurred by Blackboard’s employees and subcontractors in connection with the performance of maintenance and support services under this Schedule, provided the travel and per diem rates for lodging and subsistence shall not exceed the maximum amount allowable for such expenses in the Commonwealth of Virginia travel regulations as outlined at http://www.doa.virginia.gov/Admin_Services/CAPP/CAPP_Summary_cfr and http://www.doa.virginia.gov/Admin_Services/CAPP/CAPP_Trainen20035.pdf and (ii) any other expenses described in this Schedule, provided that Blackboard will receive Customer’s prior approval for single expenses greater than $250, and further provided that, upon Customer’s request, Blackboard will provide reasonable documentation indicating that Blackboard incurred such expenses. Except as otherwise required by this paragraph, all amounts payable under this Schedule shall be subject to applicable provisions of the Master Terms.

1.6 Expansion of Licensed Use. The Blackboard Mobile Services are priced annually based upon Customer’s FTE. Customer represents and warrants that the FTE provided to Blackboard and set forth on any Order Form is correct and accurate to the best of its knowledge and agrees that it will inform Blackboard of any increase in its FTE prior to the beginning of any Renewal Term (as defined below) Blackboard will assess additional fees for increases in Customer’s FTE beyond the subscribed level.

Blackboard Band
1-2000
2,001 to 4,000
4,001 to 8,000
ADDITIONAL bands of 25,000 will be priced separately

"FTE" or "Full Time Equivalent" is defined as the number of full-time students plus half of the part-time students.

1.7 Additional Services. In the event that Customer desires additional Blackboard Mobile products or services not on the initial Order Form, such additional products and services may be added via an Order Form executed by both parties stipulating as to the additional products and services ordered and the applicable fees. This Schedule shall apply to any such additional Order Forms.

2. GENERAL TERMS

2.1 General Usage Terms. Customer agrees not to use the User Software or Central Service for any purposes beyond the scope of the license granted in this Schedule. Without limiting the foregoing, Customer shall not: (i) use the User Software or Central Service to provide commercial services; (ii) develop, utilize or distribute any software application that accesses the Central Service, or allow any third party software application to access the Central Service other than with Blackboard’s prior approval; (iii) decompile, disassemble, reverse engineer or otherwise attempt to obtain or perceive the source code from which the User Software or Central Service is compiled or interpreted, and Customer hereby acknowledges that nothing in this Agreement shall be construed to grant Customer any right to obtain or use such source code; (iv) modify the User Software or Central Service or create any derivative product of the User Software or Central Service, except with the prior written consent of Blackboard; (v) obscure, remove or alter any of the trademarks, trade names, logos, patent, trademark, or copyright notices or markings on the User Software; or (vi) Customer shall not use or distribute the User Software in violation of any obligations relating to any Third Party Software, provided that Blackboard has notified Customer of such obligation. Customer shall be responsible for ensuring that the use of the User Software is in compliance with all applicable laws, statutes, regulations and also understands that the Licensed Modules may operate differently on different Licensed Platforms and on different mobile devices within the same Licensed Platforms, and certain Licensed Modules may not be offered on all Licensed Platforms.

Contract UCP-VT-BB-0509 Modification #1 Details
107765_CSPv4(111910)
2.2 **Third Party Software/Content.** The Blackboard Mobile Services may contain Third Party Software and Blackboard reserves the right to modify the Blackboard Mobile Services to maintain compliance with the license terms of Third Party Software. Customer acknowledges that in the case of distribution of User Software for certain third party platforms, such as the Apple iPhone platform, Customer’s distribution of User Software will be subject to such third party’s program terms and conditions and may require such third party’s approval. In the event that Customer opts to enroll in any Third Party Programs, Customer shall be responsible for compliance with the terms and conditions of such Third Party Programs. In order to distribute any User Software for the iPhone platform, Customer is required to enroll in the Apple Developer Program or any successor program; such program enrollment is between Customer and Apple directly.

2.3 **Certain Rights.** Customer shall be deemed to own and hold all right, title and interest to the Customer Data and Customer’s logos. Blackboard and its licensors shall be deemed to own and hold all right, title and interest in and to the Blackboard Mobile Services, and Customer acknowledges that it neither owns nor acquires any additional rights in and to the Blackboard Mobile Services not expressly granted by this Agreement, and Customer further acknowledges that Blackboard hereby reserves and retains all rights not expressly granted in this Agreement, including, without limitation, the right to use any component of the Blackboard Mobile Services for any purpose in Blackboard’s sole discretion. Blackboard shall have the right to use Customer’s icon and screenshots from Customer’s Blackboard Mobile Services to demonstrate the technology to other customers and prospective customers and in Blackboard’s promotional materials, provided that Blackboard agrees to discontinue such use within fourteen (14) days of Customer’s written request. Blackboard shall have a royalty-free, worldwide, perpetual license to use or incorporate into Blackboard’s products or services any suggestions, ideas, enhancement requests, feedback, recommendations or other information provided by Customer or Customer’s users. The use of the term “Powered by Blackboard” or similar designation and Customer shall maintain such designation on Customer’s webpage that promotes the Service to Customer’s users.

2.4 **Limited Software Warranty.** Blackboard warrants, solely for the benefit of Customer, that any Blackboard Mobile Service licensed under this Schedule which is manufactured by Blackboard will substantially conform to the designated technical documentation for a period of ninety (90) days after the Schedule Effective Date, provided that: (i) Blackboard has received all amounts owed under this Agreement; (ii) Customer is not in material breach of this Agreement; (iii) Customer has provided all required Customer Data feeds and made the system configurations required to interface with the Blackboard Mobile Services; and (iv) Customer has notified Blackboard in writing of any failure of the Blackboard Mobile Services to conform to the foregoing warranty within the warranty period. The foregoing shall not apply to any portion of the Blackboard Mobile Services offered as a beta version, which shall be deemed to be available on an as-is basis, without warranty of any kind including all implied warranties including any warranties of merchantability or fitness for a particular purpose, to the maximum extent permitted by applicable law. CUSTOMER ACKNOWLEDGES AND AGREES THAT, TO THE MAXIMUM EXTENT PERMITTED BY LAW, THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES BY BLACKBOARD, AND THAT BLACKBOARD’S SOLE OBLIGATION, AND CUSTOMER’S SOLE REMEDY, WITH RESPECT TO ANY BREACH OF THE FOREGOING WARRANTY, IS REPAIR OR REPLACEMENT (AT BLACKBOARD’S OPTION) OF THE RELEVANT SOFTWARE IN A TIMELY MANNER.

2.5 **Product Support.** Customer is eligible to receive Product Support from Blackboard as described from time to time in the Blackboard Customer Support Services Guide located on Blackboard’s website at [http://library.blackboard.com/docs/support/mobiledu/](http://library.blackboard.com/docs/support/mobiledu/) or any successor website, which Blackboard reserves the right to modify, from time to time, effective five (5) days after such modified document is posted at the relevant link, such posting to constitute effective notice of changes.

2.6 **Application Development Kit.** Customer may at its option utilize the Blackboard Mobile Software Development Kit under the terms located on Blackboard’s website at [http://library.blackboard.com/docs/support/mobiledu/](http://library.blackboard.com/docs/support/mobiledu/) or any successor website.

3. **ADDITIONAL DEFINITIONS**

3.1 **“Central Service”** means software and systems provided by Blackboard which facilitate the exchange of Customer Data between User Software and Customer Systems and any associated administrative tools or systems provided by Blackboard to Customer.

3.2 **“Central Service”** includes a change (e.g., fixed, workarounds and other modifications) made by or for Blackboard which corrects Software Errors in the Software, provided in temporary form such as a patch, and later issued in the permanent form of an Update or Upgrade.

3.3 **“Customer Date”** means data, information and any other content supplied by Customer through Customer Systems.

3.4 **“Customer Systems”** means Customer’s business applications, databases and other information technology systems that will interface with the Central Service.

3.5 **“Licensed Modules”** means each of the software modules licensed by Customer pursuant to an Order Form and any Upgrades, Updates or Corrections provided thereunder.

3.6 **“Licensed Platforms”** means each of the software platforms for mobile devices licensed by Customer pursuant to an Order Form.

3.7 **“Blackboard Mobile Service”** means each service provided by Blackboard for each Licensed Module consisting of support services in the production, configuration and maintenance of User Software which operates in conjunction with the Central Service.

3.8 **“Order Form”** means an order form executed by Customer and Blackboard relating to Blackboard Mobile products or services.

3.9 **“Software Error”** means a failure of any Software materially and substantially to conform to applicable Documentation, provided that such failure can be reproduced and verified by Blackboard using the most recent version (including all available Corrections, Updates, and Upgrades) of such Software made available to Customer, and further provided that Software Errors do not include any nonconformity to applicable Documentation caused by: (i) Customer’s or its end users’ negligence; (ii) any modification or alteration to the Software not made by Blackboard; (iii) data that does not conform to Blackboard’s specified data format; (iv) operator error; (v) use on any system other than the operating system specified in the Documentation; (v) accident, misuse or any other cause which, in Blackboard’s reasonable determination, is not inherent in the Software; or (vi) any use of the Software other than as expressly authorized in this Schedule.

3.10 **“Third Party Software”** means the software or content manufactured, distributed or created by third parties that has been incorporated by Blackboard into the Blackboard Mobile Services.

3.11 **“Third Party Programs”** means the programs or agreements offered by third parties, such as Apple Inc.’s iPhone Developer Program, relating to mobile devices on which the User Software is intended to operate.

3.12 **“Updates”** means the object code versions of the Licensed Modules or other software that have been developed by Blackboard to correct any Software Error and/or provide additional functionality and that have been commercially released with a version number that differs from that of the prior version in the number to the right of the decimal point (e.g., 2.0 vs. 2.1) and that are not marketed as a separate product or module.

3.13 **“Upgrades”** means the object code versions of the Licensed Modules or other software that have been customized, enhanced, or otherwise modified by or on behalf of Blackboard, acting in its sole discretion, to include additional functionality and that have been released with a version number that differs from that of the prior version in the number to the left of the decimal point (e.g., 3.0 vs. 2.0) and that are not marketed as a separate product or module.

3.14 **“User Software”** means the software containing Licensed Modules, including Updates, Upgrades, and Corrections, provided by Blackboard to Customer for distribution.

BLACKBOARD

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<tr>
<td>TESS FRAZIER* VICE PRESIDENT</td>
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<td>Print Name and Title</td>
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CUSTOMER:

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Contract UCP-VT-BB-0509 Modification #1 Details

107765_CSPv4(111910)
Virginia Polytechnic Institute & State University on behalf of its Member Institutions

Blackboard Mobile
Order form

<table>
<thead>
<tr>
<th>New order</th>
<th>Additional/revised order</th>
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Customer:

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<tr>
<th>FTE band:</th>
<th>&lt;FTE or User band&gt;</th>
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<tbody>
<tr>
<td>Initial Term:</td>
<td>1 year / 3 years</td>
</tr>
<tr>
<td>Effective Date:</td>
<td>The last of the dates indicated in the signatures below</td>
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Payment schedule for Initial Term:

- $xx,xxx for year 1
- $xx,xxx for year 2
- $xx,xxx for year 3

One-time setup fee: $x,xxx

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<tr>
<th>Licensed Modules:</th>
<th>Blackboard Mobile Central suite</th>
<th>Licensed Platforms</th>
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<td>iPhone, mobile web browser, BlackBerry</td>
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| License Modules: | Blackboard Mobile Learn | iPhone, BlackBerry, Android |

Notes:

1. The terms of the Blackboard Mobile Schedule are incorporated by reference and accompany this Order Form. Capitalized terms used in this Order Form are defined in the Blackboard Mobile Schedule or corresponding Blackboard License and Services Agreement.

2. Above pricing is based on Customer's concurrent licensing of the Community Engagement module of Blackboard Learn for the duration of the term.

BLACKBOARD

Signature

TESS FRAZIER- VICE PRESIDENT

Print Name and Title

Date:

CUSTOMER:

Signature

Print Name and Title

Date:
COMMONWEALTH OF VIRGINIA

STANDARD CONTRACT

Contract Number: UCP-VT-BB-0509

This Contract entered into this 1st day of August 2009, by Blackboard, Inc., hereinafter called the "Contractor" and Commonwealth of Virginia, Virginia Polytechnic Institute and State University, hereinafter called "Virginia Tech".

WITNESSETH that the Contractor and Virginia Tech, in consideration of the mutual covenants, promises and agreements herein contained, agrees as follows:

SCOPE OF CONTRACT: The Contractor shall provide the Learning Management System software and services to Virginia Tech as set forth in the Contract Documents.

PERIOD OF CONTRACT: From August 1, 2009 through July 31, 2014 plus five optional one year renewals.

COMPENSATION AND METHOD OF PAYMENT: The Contractor shall be paid by Virginia Tech and additional contract users in accordance with the Contract Documents.

CONTRACT DOCUMENTS: The Contract Documents shall consist of:
- This signed contract
- Attachment A - Request For Proposal Number 642253 dated September 3, 2008, together with all written modifications thereof
- Attachment B - The proposal with appendices submitted by the Contractor dated October 3, 2008 together with all written modifications thereof
- Attachment C - The Blackboard System-Wide Master Terms and Blackboard System-Wide Professional Services Contract, including any and all applicable schedules, appendices, and Statements of Work as agreed by the parties
- Attachment D - Summary of Negotiations

all of which Contract Documents are incorporated herein.

In WITNESS WHEREOF, the parties have caused this Contract to be duly executed intending to be bound thereby.

In case of conflict, the order of precedence shall be: this contract page; Attachment D; Attachment C; Attachment A; Attachment B.

The parties agree to execute this Contract by electronic means, via facsimile/scanned signatures.

By: Contractor Authorized Signature

By: Virginia Polytechnic Institute and State University

Authorized Signature

Agreed and Accepted by Authorized Representatives of:

Contractor

Authorized Signature

Printed Name

Title

Date

Virginia Polytechnic Institute and State University

Authorized Signature

Printed Name

Title

Date

Invent the Future

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

An equal opportunity, affirmative action institution
Attachment A
to
UCP-VT-BB-0509
Request for Proposal #648253

For

Learning Management Systems

September 3, 2008
QUESTIONS: All inquiries for information regarding this solicitation should be directed to: Nancy Sterling, Senior Contracts Officer, Phone: (540) 231-9517, e-mail: nancy.sterling@vt.edu.

DUE DATE: Sealed Proposals will be received until October 3, 2008 at 3:00 PM. Failure to submit proposals to the correct location by the designated date and hour will result in disqualification.

ADDRESS: Proposals should be mailed or hand delivered to: Virginia Polytechnic Institute and State University (Virginia Tech), Information Technology Acquisitions Office (0214), 1700 Pratt Drive, Blacksburg, Virginia 24061. Reference the Opening Date and Hour, and RFP Number in the lower left corner of the return envelope or package.

In compliance with this Request for Proposal and to all the conditions imposed therein and hereby incorporated by reference, the undersigned offers and agrees to furnish the goods and services in accordance with the attached signed proposal and as mutually agreed upon by subsequent negotiation.

TYPE OF BUSINESS: (Please check all applicable classifications). If your classification is certified by the Virginia Department of Minority Business Enterprise, provide your certification number: ____________. For certification assistance, please visit: http://www.dmbe.state.va.us/swamcert.html.

- Large.

- Small. An independently owned and operated business which, together with affiliates, has 250 or fewer employees or average annual gross receipts of $10 million or less averaged over the previous three years. Department of Minority Business Enterprise (DMBE) certified women-owned and minority-owned business shall also be considered small business when they have received DMBE small business certification.

- Women-Owned. A business concern that is at least 51% owned by one or more women who are U. S. citizens or legal resident aliens, or in the case of a corporation, partnership, or limited liability company or other entity, at least 51% of the equity ownership interest is owned by one or more women who are citizens of the United States or non-citizens who are in full compliance with the United States immigration law, and both the management and daily business operations are controlled by one or more women who are U. S. citizens or legal resident aliens.

- Minority-Owned. A business concern that is at least 51% owned by one or more minority individuals (see Section 2.2-1401, Code of Virginia) or in the case of a corporation, partnership, or limited liability company or other entity, at least 51% of the equity ownership interest in the corporation, partnership, or limited liability company or other entity is owned by one or more minority individuals and both the management and daily business operations are controlled by one or more minority individuals.

COMPANY INFORMATION/SIGNATURE: In compliance with this Request for Proposal and to all the conditions imposed therein and hereby incorporated by reference, the undersigned offers and agrees to furnish the goods and services in accordance with the attached signed proposal and as mutually agreed upon by subsequent negotiation.

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<th>CONTRACTOR'S REGISTRATION</th>
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<th>TOLL FREE TELEPHONE NUMBER</th>
<th>FAX NUMBER TO RECEIVE E-PROCUREMENT ORDERS</th>
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I. PURPOSE:

The purpose of this Request for Proposal (RFP) is to solicit sealed proposals to establish a contract or contracts through competitive negotiations for learning management systems (LMS) and associated services for higher education, specifically any public or private college or university in the Commonwealth of Virginia accredited by the Southern Association of Colleges and Schools (SACS), K-12 educational schools or school districts in the Commonwealth of Virginia; and other institutions and agencies in the Commonwealth of Virginia. Virginia Tech invites vendors of both proprietary systems and open source systems to respond to this solicitation.

II. CONTRACT PERIOD:

The term of this contract or contracts will be for five years, or as negotiated. There will be an option for five, one-year renewals, or as negotiated.

III. BACKGROUND:

There are currently 39 public institutions of higher education in the Commonwealth of Virginia serving approximately 370,000 students. In addition, there are 33 private non-profit colleges and universities serving approximately 79,000 students. Most of these institutions are using learning management systems to deliver course content to students. This software provides a mechanism for faculty to place courses online for students in both the residential setting and for students at distance. Since the establishment of a learning management system on a university campus requires a substantial investment in training and course content development, it is very expensive to transition to a different system once courses are put online.

A. Therefore, it is important that any contract or contracts resulting from this solicitation provide options for universities to continue to use their current LMS as well as other LMS deemed suitable through the RFP evaluation process.

B. The contract or contracts will cover all the teaching, research and service roles of an institution’s faculty, staff, students, and outreach affiliates, regardless of location, including credit and non-credit students, persons enrolled in continuing education activities, and outreach or extension programs.

C. Content developed by faculty and staff using the LMS can be published or otherwise distributed externally without additional payments to the LMS vendor. For example, a course produced under a grant can be marketed by the institution, or assigned to others, without a royalty to the LMS vendor.

D. In no case will the LMS vendor have any claim on the intellectual property developed by an institution or its employees.

IV. CONTRACT PARTICIPATION:

It is the intent of this solicitation and resulting contract(s) to allow for cooperative procurement. Accordingly, any public body, public or private health or educational institutions, or Virginia Tech’s affiliated corporations may access any resulting contract(s) if authorized by the contractor.

Participation in this cooperative procurement is strictly voluntary. If authorized by the Contractor, the resultant contract(s) may be extended to the entities indicated above to purchase at contract prices in accordance with contract terms. The Contractor shall notify Virginia Tech in writing of any such entities accessing the contract. The Contractor will provide semi-annual usage reports for all entities accessing the Contract. Participating entities shall place their own orders directly with the Contractor and shall fully and independently administer their use of the contract to include contractual disputes, invoicing and payments without direct administration from Virginia Tech. Virginia Tech shall not be held liable for any costs or damages incurred by any other participating entity as a result of any authorization by the Contractor to extend the contract. It is understood and agreed that Virginia Tech is not responsible for the acts or omissions of any entity, and will not be considered in default of the contract no matter the circumstances.

Use of this contract does not preclude any participating entity from using other contracts or competitive processes as the need may be.

The resulting contracts will be optional use contracts. The Users of the contract(s) named in the Statement of Needs are in no way required to make purchases from the Contractor(s) and may in their sole discretion purchase the identical and/or similar goods/services from other sources. Any estimates/quantities contained herein do not represent a purchase commitment by the Users of the contract(s).
V. EVA BUSINESS-TO-GOVERNMENT ELECTRONIC PROCUREMENT SYSTEM:

The eVA Internet electronic procurement solution streamlines and automates government purchasing activities within the Commonwealth of Virginia. Virginia Tech, and other state agencies and institutions, have been directed by the Governor to maximize the use of this system in the procurement of goods and services. We are, therefore, requesting that your firm register as a trading partner within the eVA system.

There are registration fees and transaction fees involved with the use of eVA. These fees must be considered in the provision of quotes, bids and price proposals offered to Virginia Tech. Failure to register within the eVA system may result in the quote, bid or proposal from your firm being rejected and the award made to another vendor who is registered in the eVA system.

Registration in the eVA system is accomplished on-line. Your firm must provide the necessary information. Please visit the eVA website portal at www.eva.state.va.us and complete the Ariba Commerce Services Network registration. This process needs to be completed before Virginia Tech can issue your firm a Purchase Order or contract. If your company conducts business from multiple geographic locations, please register these locations in your initial registration.

For registration and technical assistance, reference the eVA website at: eVACustomerCare@dgs.virginia.gov, or call 866-289-7367 or 804-371-2525.

VI. STATEMENT OF NEEDS:

Learning Management Systems are needed that will allow any state college or university, state agency, independent, non-profit college or university, or K-12 school system in the Commonwealth to purchase a license. These LMS provide the software platform for providing online course content to students in an efficient and cost effective manner.

A. The goal is to negotiate a multi-year contract.
B. Institutions should have the ability to renew initially in increments to reach a July 1 contract date, and be able to renew in twelve month or greater increments thereafter.
C. The contractor must provide documentation of all work performed for any work agreement.
D. If a problem is discovered where the software does not perform according to the documentation or representation of the contractor’s staff, the contractor shall fix the problem, at its own expense, including any required work-around solutions that may be necessary to ensure a successful implementation.
E. Acceptance testing will be based on a plan developed jointly by the institution and the contractor and will be performed by the institution for a minimum period of thirty (30) days.
F. Testing will commence upon completion of installation.
G. The contractor shall participate in the acceptance test, in accordance with the jointly developed plan, until the acceptance of the software is complete to the institution’s satisfaction.
H. A standard purchase under this contract should include one (1) license that encompasses production use, development and testing purposes and student teacher training. The test, development, and student teacher training instances will not be used for production purposes.

VII. PROPOSAL PREPARATION AND SUBMISSION:

A. General Requirements:

1. RFP Response: In order to be considered for selection, Offerors must submit a complete response to this RFP. The proposal shall be submitted in both print and electronic media as follows: One (1) printed original, seven (7) printed copies, and one (1) electronic media copy in a generally used format(s) on CD or DVD media, with delivery to:

   Virginia Polytechnic Institute and State University
   Attn: Nancy Sterling, Sr. IT Contract Officer
   Information Technology Acquisitions (0214)
   1700 Pratt Dr.
   Blacksburg, VA 24061

   Reference the Opening Date and Hour, and RFP Number in the lower left hand corner of the return envelope or package.

   No other distribution of the proposals shall be made by the Offeror.
2. Proposal Preparation:
   
a. Proposals shall be signed by an authorized representative of the Offeror. All information requested should be submitted. Failure to submit all information requested may result in Virginia Tech requiring prompt submission of missing information and/or giving a lowered evaluation of the proposal. Virginia Tech may reject proposals, which are substantially incomplete or lack key information, at its discretion. Mandatory requirements are those required by law or regulation or are such that they cannot be waived and are not subject to negotiation.
   
b. Proposals should be prepared simply and economically providing a straightforward, concise description of capabilities to satisfy the requirements of the RFP. Emphasis should be on completeness and clarity of content.
   
c. Proposals should be organized in the order in which the requirements are presented in the RFP. All pages of the proposal should be numbered. Each paragraph in the proposal should reference the paragraph number of the corresponding section of the RFP. It is also helpful to cite the paragraph number, sub-letter, and repeat the text of the requirement as it appears in the RFP. If a response covers more than one page, the paragraph number and sub-letter should be repeated at the top of the next page. The proposal should contain a table of contents that cross references the RFP requirements. Information which the offeror desires to present that does not fall within any of the requirements, such as any license agreement, of the RFP should be inserted at an appropriate place or be attached at the end of the proposal and designated as additional material. Proposals that are not organized in this manner risk elimination from consideration if the evaluators are unable to find where the RFP requirements are specifically addressed.
   
d. Each copy of the proposal should be bound in a single volume where practical. All documentation submitted with the proposal should be bound in that single volume.
   
e. Ownership of all data, material and documentation originated and prepared for Virginia Tech pursuant to the RFP shall belong exclusively to Virginia Tech and be subject to public inspection in accordance with the Virginia Freedom of Information Act. Trade secrets or proprietary information submitted by an Offeror shall not be subject to public disclosure under the Virginia Freedom of Information Act. However, to prevent disclosure the Offeror must invoke the protections of Section 2.2-4342F of the Code of Virginia, in writing, either before or at the time the data or other materials is submitted. The written request must specifically identify the data or other materials to be protected and state the reasons why protection is necessary. The proprietary or trade secret material submitted must be identified by some distinct method such as highlighting or underlining and must indicate only the specific words, figures, or paragraphs that constitute trade secret or proprietary information. The classification of an entire proposal document, line item prices and/or total proposal prices as proprietary or trade secrets is not acceptable and may result in rejection of the proposal.

3. Oral Presentation: Offerors who submit a proposal in response to this RFP may be required to give an oral presentation of their proposal to Virginia Tech. This will provide an opportunity for the Offeror to clarify or elaborate on the proposal but will in no way change the original proposal. Virginia Tech will schedule the time and location of these presentations. Oral presentations are an option of Virginia Tech and may not be conducted. Therefore, proposals should be complete.

B. Specific Requirements: Proposals should be as thorough and detailed as possible so that Virginia Tech may properly evaluate your capabilities to provide the required goods and services. Offerors are required to submit the following information/items as a complete proposal:

1. The return of the General Information Form and addenda, if any, signed and filled out as required.

2. The return of the completed Virginia Tech Security Questionnaire for Technology-based Procurements

3. Small, Women-owned and Minority-owned Business (SWAM) Utilization: If your business can not be classified as Small, Women-owned, or Minority-owned, describe your plan for utilizing SWAM businesses if awarded a contract. Describe your ability to provide statistical reporting on actual SWAM subcontracting when requested. If your firm or any business that you plan to subcontract with can be classified as SWAM, but has not been certified by the Virginia Department of Minority Business Enterprise
it is expected that the certification process will be initiated no later than the time of the award, and the final DMBE certification decision and certification number provided.

4. **Vendor Background and Customers:**
   a. Provide your company’s ownership, history, number of years in business, size, an indication of its financial health, and strategic partners.
   b. Identify the parent corporation and any subsidiaries.
   c. Describe your major products and services, including the different product versions that may be appropriate for institutions with different enrollments and varying levels of integration with administrative systems.
   d. What distinguishes your company and its products and services from your competitors?
   e. Provide a current list of your key customers, and all customers that comprise more than 5% of the company’s revenue.
   f. Describe the details of the LMS implementation of one of your major clients.
   g. Describe the largest institutional (as opposed to vendor-in-house) implementation of your LMS including the number of active classes and students supported by this implementation and the system architecture (if known). Provide the client name, address and the name and phone number of the individual Virginia Tech has your permission to contact.
   h. Provide three (3) additional recent references, either educational or governmental, for whom you have provided the type of goods and services described herein. Include the date(s) the goods and services were furnished, the client name, address and the name and phone number of the individual Virginia Tech has your permission to contact.
   i. Provide references of customers having similar statewide contracts.
   j. Describe procedures, such as source code escrow, to protect an institution’s use of the software if the vendor enters bankruptcy proceedings or otherwise cannot support buyers.

5. **System Background:**
   a. Describe your system architecture and how it’s designed for scalability.
   b. Describe the underlying languages used for system development.
   c. What backend databases are supported?
   d. Which are recommended?
   e. Describe the documentation available for the schema.
   f. What operating systems are supported?
   g. Describe your recommended hardware and software configuration(s) scaling support for loads ranging from student enrollments of 1000 to 200,000 and up.
   h. For each major function, describe your system’s simultaneous user load capability.
   i. Describe the ability to customize vs. configure your LMS.
   j. Define what acceptable performance is, how it is measured, and how the system software and hardware can be scaled to maintain acceptable performance.
   k. Provide a detailed description of how load is balanced.
   l. Estimate how many local man-hours are required for 1) installation, 2) upgrades, and 3) regular maintenance.

6. **System Development and Security:**
   a. Describe your beta testing methodology, how it has evolved, and its future direction.
   b. Describe your quality assurance procedures.
   c. Describe your system’s application security measures, its audit trail capability, and how it can perform data authentication.
   d. Complete the Virginia Tech Security Questionnaire for Technology-based Procurements (Attachment B)
7. **System Integration:**
   a. Describe the system integration capabilities of your system with third-party systems, including but not limited to authentication systems, administrative systems, student-information systems, portals, content repositories, and institutional assessment tools.
   b. Describe how the LMS can provide authentication and/or portal services by itself and also with third-party systems.
   c. Describe the capability, unique features, and constraints involved to turn off built-in LMS tools and replace them with third-party tools, e.g., assessment engine.
   d. Identify the third-party systems that have been integrated with your LMS.
   e. Give details of data import and export capabilities.
   f. Describe the process needed to achieve the integration and how it is accomplished (batch, real-time, etc.).
   g. What formal system integration relationships exist with PeopleSoft, SCT, and Datatel.
   h. Describe a major customer’s experiences with integration with PeopleSoft, SCT-Banner, or Datatel systems, third-party authentication, and external tools like assessment engines.
   i. Describe each standard LMS system report available.
   j. Describe how custom LMS system reports can be generated, including the process (and any restrictions) on how back-end databases can be queried for specific customer-defined dynamic reporting needs.
   k. Describe the documentation provided for the back-end databases, including schemas used.
   l. Describe means by which custom components, tools or plug-ins can be developed.
   m. Describe means by which data stored in the application may be accessed from other systems – e.g. direct database access, web services, etc.
   n. Describe mechanism for faculty to retrieve their course content from the LMS in a meaningful end-user format.

8. **Course Content:**
   a. Describe how your system supports building of course content.
   b. What and where is information maintained, and how it is structured?
   c. Describe how your system handles course registration and pre-requisites.
   d. Describe your content management capabilities.
   e. Describe how your system handles assignment submissions, including but not limited to how assignments are created, how students submit assignments how assignments are stored, and how assignments are returned to students.
   f. What authoring tools unique to your system are available?
   g. Discuss compatibility with courseware interoperability standards.
   h. Describe what assurances exist that course content can always migrate forward to newer version of product, either directly or through vendor provided tools.
   i. Describe conversion tools or processes for converting existing course content from Blackboard and WebCT systems into vendor’s system.
   j. Compared to competitive products, describe how your system is more compatible with Section 508 of the Federal Rehabilitation Act, SCORM, IMS, AICC and similar standards. In that regard, what unique features does your system provide?

9. **Assessment:**
   a. Describe your systems’ capability for creating, administering and tracking tests, evaluations and surveys.
   b. How are questions assembled into tests, exams, quizzes and surveys?
   c. What formats can be exported and imported?
   d. Describe the multiple assessment types available.
   e. How are feedback and scores provided to students?
   f. How are responses stored?
   g. What standard reports are generated?

10. **Implementation and Training:**
    a. Describe your company’s implementation methodology.
    b. What implementation resources are available?
    c. Describe your approach to project management.
    d. How are change requests managed?
    e. Describe professional services available.
    f. What technical and functional training is provided with your product or service?
g. How much and what type of training is recommended for a system administrator and for faculty to use your product?

h. Describe the documentation provided, including on-line resources.

11. System Releases/Upgrades:
   a. What is your current release?
   b. About how many releases are there each year and what is the timing?
   c. How long are new releases supported?
   d. How are bug fixes released?
   e. How are customers notified?
   f. How do customers access upgrades?
   g. Describe the process for transitioning course content to newer versions.
   h. Describe how customers can make recommendations for product changes.
   i. Describe the past processes for upgrading your software from one version to another, converting course content from one version to another, and the effort anticipated to be borne by your customers in these conversions.

12. Support:
   a. Provide details on your company’s support plan(s).
   b. Describe your company’s approach to responsiveness to problems: initial maximum response time, and the procedure for escalating the problem to reach a solution.

13. Professional Services:
   a. Describe and give examples of the professional services available from the company.
   b. Describe what measures are taken to develop price estimates, and what steps are taken to insure actual work does not exceed estimates.

14. Hosting (ASP):
   a. Describe your hosting capabilities.
   b. Include details on security, redundancy, uptime %, backup, and recovery.
   c. Describe and provide samples of service level agreements (SLA) you offer.
   d. Provide the ASP average uptime per month.
   e. Describe the extent of scheduled maintenance windows that could disrupt service.
   f. How much notice is given for unscheduled maintenance?

15. Price:
   a. Provide all pricing that will apply to your offer over the period of the contract.

16. Warranty:
   a. Describe the terms and conditions of any warranty on the software and professional services available.
   b. Describe how such warranty is implemented to provide problem resolution services.

VIII. SELECTION CRITERIA AND AWARD:

A. Selection Criteria: Proposals will be evaluated by Virginia Tech using the following:

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<td>Cost of License</td>
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<td>Functional Features and Support Services</td>
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<td>SWAM Utilization</td>
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Total 100 %
B. **Award**: Selection shall be made of two or more offerors deemed to be fully qualified and best suited among those submitting proposals on the basis of the evaluation factors included in the Request for Proposal, including price, if so stated in the Request for Proposal. Negotiations shall be conducted with the offerors so selected. Price shall be considered, but need not be the sole determining factor. After negotiations have been conducted with each offeror so selected, Virginia Tech shall select the offeror(s) who, in its opinion, have made the best proposal(s), and shall award the contract(s) to that offeror or offerors. Virginia Tech may cancel this Request for Proposal or reject proposals at any time prior to an award. Should Virginia Tech determine in writing and in its sole discretion that only one offeror is fully qualified, or that one offeror is clearly more highly qualified than the others under consideration, a contract may be negotiated and awarded to that offeror. The award document will be a contract incorporating by reference all the requirements, terms and conditions of this solicitation and the Contractor’s proposal as negotiated. See Attachment C for sample contract form.

Virginia Tech reserves the right to award more than one contract as a result of this solicitation.

**IX. OPTIONAL PRE-PROPOSAL CONFERENCE**:

An optional pre-proposal conference will be held on Tuesday, September 16, 2008 at 1:30 p.m. in Room #115, Research Building #14, Corporate Research Center, 1770 Forecast Drive, Blacksburg, VA. The purpose of this conference is to allow potential Offerors an opportunity to present questions and obtain clarification relative to any facet of this solicitation.

While attendance at this conference will not be a prerequisite to submitting a proposal, offerors who intend to submit a proposal are encouraged to attend.

Bring a copy of this solicitation with you. Any changes resulting from this conference will be issued in a written addendum to this solicitation.

All questions and answers from this conference will be posted on the department website: [http://www.ita.vt.edu/LMS-RFP](http://www.ita.vt.edu/LMS-RFP). Additional questions may be emailed to nancy.sterling@vt.edu. These questions and subsequent answers will also be posted on the department website. **Question will be accepted through September 23, 2008.**

**X. CONTRACT ADMINISTRATION**:

A. John D. Krallman, Director of Information Technology Acquisitions, at Virginia Tech or his designee, shall be identified as the Contract Administrator and shall use all powers under the contract to enforce its faithful performance.

B. The Contract Administrator, or his designee, shall determine the amount, quantity, acceptability, fitness of all aspects of the services and shall decide all other questions in connection with the services. The Contract Administrator, or his designee, shall not have authority to approve changes in the services which alter the concept or which call for an extension of time for this contract. Any modifications made must be authorized by the Virginia Tech ITA Office through a written amendment to the contract.

**XI. ATTACHMENTS**:

- Attachment A- Terms and Conditions
- Attachment B- Virginia Tech Security Questionnaire for Technology-based Procurements
- Attachment C - Standard Contract Form
ATTACHMENT A

TERMS AND CONDITIONS

RFP General Terms and Conditions
See http://www.purch.vt.edu/html.docs/terms/GTC_RFP_050608.pdf

Special Terms and Conditions

1. **AUDIT**: The Contractor hereby agrees to retain all books, records, and other documents relative to this contract for five (5) years after final payment, or until audited by the Commonwealth of Virginia, whichever is sooner. Virginia Tech, its authorized agents, and/or the State auditors shall have full access and the right to examine any of said materials during said period.

2. **AVAILABILITY OF FUNDS**: It is understood and agreed between the parties herein that Virginia Tech shall be bound hereunder only to the extent of the funds available or which may hereafter become available for the purpose of this agreement.

3. **CANCELLATION OF CONTRACT**: Virginia Tech reserves the right to cancel and terminate any resulting contract, in part or in whole, without penalty, upon 60 days written notice to the Contractor. In the event the initial contract period is for more than 12 months, the resulting contract may be terminated by either party, without penalty, after the initial 12 months of the contract period upon 60 days written notice to the other party. Any contract cancellation notice shall not relieve the Contractor of the obligation to deliver and/or perform on all outstanding orders issued prior to the effective date of cancellation.

4. **CONTRACT DOCUMENTS**: The contract entered into by the parties shall consist of the Request for Proposal including all modifications thereof, the proposal submitted by the Contractor, the written results of negotiations, the Commonwealth Standard Contract Form, all of which shall be referred to collectively as the Contract Documents. A separate contract will be executed by each agency, institution or public body wishing to use any contract resulting from this solicitation.

5. **INDEPENDENT CONTRACTOR**: The contractor shall not be an employee of Virginia Tech, but shall be an independent contractor. Nothing in this agreement shall be construed as authority for the contractor to make commitments which shall bind Virginia Tech, or to otherwise act on behalf of Virginia Tech, except as Virginia Tech may expressly authorize in writing.

6. **INSURANCE**: By signing and submitting a proposal under this solicitation, the Offeror certifies that if awarded the contract, it will have the following insurance coverages at the time the work commences. Additionally, it will maintain these during the entire term of the contract and that all insurance coverages will be provided by insurance companies authorized to sell insurance in Virginia by the Virginia State Corporation Commission. During the period of the contract, Virginia Tech reserves the right to require the Contractor to furnish certificates of insurance for the coverage required.

   **INSURANCE COVERAGES AND LIMITS REQUIRED**:
   - A. Worker's Compensation - Statutory requirements and benefits.
   - B. Employers Liability - $100,000.00
   - C. General Liability - $500,000.00 combined single limit. Virginia Tech and the Commonwealth of Virginia shall be named as an additional insured with respect to goods/services being procured. This coverage is to include Premises/Operations Liability, Products and Completed Operations Coverage, Independent Contractor's Liability, Owner's and Contractor's Protective Liability and Personal Injury Liability.
   - D. Automobile Liability - $500,000.00
   - E. Professional Liability to include errors and omissions- $500,000.00/occurrence.

   The contractor agrees to be responsible for, indemnify, defend and hold harmless Virginia Tech, its officers, agents and employees from the payment of all sums of money by reason of any claim against them arising out of any and all occurrences resulting in bodily or mental injury or property damage that may happen to occur in connection with and during the performance of the contract, including but not limited to claims under the Worker's Compensation Act. The contractor agrees that it will, at all times, after the completion of the work, be responsible for, indemnify, defend and hold harmless Virginia Tech, its officers, agents and employees from all liabilities resulting from bodily or mental injury or property damage directly or indirectly arising out of the performance or nonperformance of the contract.

7. **MINORITY BUSINESS, WOMEN-OWNED BUSINESSES SUBCONTRACTING AND REPORTING**: Where it is practicable for any portion of the awarded contract to be subcontracted to other suppliers, the contractor is encouraged to offer such business to minority and/or women-owned businesses. Names of firms may be available from the buyer and/or from the Division of Purchases and Supply. When such business has been subcontracted to these firms and upon
completion of the contract, the contractor agrees to furnish the purchasing office the following information: name of firm, phone number, total dollar amount subcontracted and type of product/service provided.

8. **NOTICES:** Any notices to be given by either party to the other pursuant to any contract resulting from this solicitation shall be in writing, hand delivered or mailed to the address of the respective party at the following address:

   If to Contractor:
   
   Address Shown On RFP Cover Page  
   Attention: Name of Person Signing RFP

   If to Virginia Tech:
   
   Virginia Polytechnic Institute and State University  
   Attn: Nancy Sterling, Sr. IT Contract Officer  
   Information Technology Acquisitions (0214)  
   1700 Pratt Dr.  
   Blacksburg, VA 24061

9. **PROPOSAL ACCEPTANCE PERIOD:** Any proposal received in response to this solicitation shall be valid for 120 days. At the end of the 120 days the proposal may be withdrawn at the written request of the Offeror. If the proposal is not withdrawn at that time it remains in effect until an award is made or the solicitation is cancelled.

10. **PRIME CONTRACTOR RESPONSIBILITIES:** The Contractor shall be responsible for completely supervising and directing the work under this contract and all subcontractors that he may utilize, using his best skill and attention. Subcontractors who perform work under this contract shall be responsible to the prime Contractor. The Contractor agrees that he is as fully responsible for the acts and omissions of his subcontractors and of persons employed by them as he is for the acts and omissions of his own employees.

11. **PROPOSAL PRICES:** Proposal shall be in the form of a firm unit price for each item or service during the contract period.

12. **QUANTITIES:** Quantities set forth in this solicitation are estimates only, and the Contractor shall supply at proposal prices actual quantities as ordered, regardless of whether such total quantities are more or less than those shown.

13. **RENEWAL OF CONTRACT:** This contract may be renewed by Virginia Tech upon written agreement of both parties for up to five successive one year periods only under the terms and conditions of the original contract except as stated in A and B below. Price increases may be negotiated only at the time of renewal. Written notice of Virginia Tech’s intention to renew shall be given (approximately 90 days) prior to the expiration date of each contract period.

   **A.** If Virginia Tech elects to exercise the option to renew the contract for an additional one-year period, the contract price(s) for the additional year shall not exceed the contract prices of the original contract increased/decreased by no more than the percentage increase/decrease of the other services category of the CPI-W section of the Consumer Price Index of the United States Bureau of Labor Statistics for the latest twelve months for which statistics are available.

   **B.** If during any subsequent renewal period Virginia Tech elects to exercise the option to renew the contract, the contract price(s) for the subsequent renewal period shall not exceed the contract price(s) of the previous renewal period increased/decreased by more than the percentage increase/decrease of the other services category of the CPI-W section for the Consumer Price Index of the United States Bureau of Labor Statistics for the latest twelve months for which statistics are available.

14. **COMMUNICATIONS:** Communications regarding this Request for Proposals (RFP) shall be formal from the date of issue for this RFP, until either a Contractor has been selected or the Information Technology Acquisitions Office rejects all proposals. Formal communications will be directed to the Information Technology Acquisitions Office. Informal communications, including but not limited to request for information, comments or speculations regarding this RFP to any University employee other than an Information Technology Acquisitions Office representative may result in the offending Offeror’s proposal being rejected.

15. **CERTIFICATION TESTING AND ACCEPTANCE:** The system specified in the contract shall be considered ready for production testing upon receipt of documentation from the Contractor that a successful system audit or diagnostic test was performed at the site demonstrating that the system meets the minimum design/performance capabilities stipulated by the contract. The system shall be deemed ready for production certification testing on the day following receipt of this documentation. Virginia Tech shall provide written confirmation of its acceptance following successful completion of the production certification test. System (software and/or hardware) payment will be authorized after the successful completion and certification test(s).

16. **SEVERAL LIABILITY:** Virginia Tech will be severally liable to the extent of its purchases made against any contract resulting from this solicitation. Colleges and Universities Cooperative Group (CUCPG) will be severally liable to the extent of its purchases made against any contract resulting from this solicitation. Applicable departments, institutions, agencies, Public Bodies of the Commonwealth of Virginia and private colleges or universities in the Commonwealth of Virginia will be severally liable to the extent of their purchases made against any contract(s) resulting from this solicitation.
ATTACHMENT B

Virginia Tech Security Questionnaire
For Technology-based Procurements

If purchased, Virginia Tech reserves the right to conduct an IT security assessment on the product(s), system(s) and/or service(s) once delivered to validate the answers to the questions below. If evaluation copies or instances are available for testing, they should be provided to the IT Security Office when requested.

In the space following each question, please provide a Yes, No or a "no answer" (N/A), and add any appropriate comments. If the answer is No or N/A, please provide comments indicating how this question/concern is addressed elsewhere or why it is not applicable.

1. Does your product(s), system(s) and or service(s) protect against the SANS Top 20 security vulnerabilities [http://www.sans.org/top20](http://www.sans.org/top20)?

2. Does your product(s), system(s) and or service(s) protect against the OWASP [http://www.owasp.org/index.php/OWASP_Top_Ten_Project](http://www.owasp.org/index.php/OWASP_Top_Ten_Project)?

3. What specific encryption algorithms are employed for your product(s), system(s) and/or service(s)?

4. Is all sensitive data (i.e. Social Security Numbers, Credit Card Numbers, Health Information, etc) encrypted in transit and at rest? If not, please explain? (NOTE: Please see the Sensitive Information page at [http://www.security.vt.edu/sensitiveinfo.html](http://www.security.vt.edu/sensitiveinfo.html) for specifics).

5. Is login information such as user name and password encrypted during transmission from the client to the server? NOTE: Base-64 encoding is not acceptable.

6. Are operating systems (e.g. Windows or Linux), programming and scripting languages (e.g. Java or PHP), web servers (e.g. Apache or IIS), database servers (e.g., Oracle or MySQL), application servers, etc. always promptly patched and current with security updates? If not, please explain.

7. Is all access, including administrative accounts, controlled and logged (i.e. firewalls, file system permissions, ACLs, database table permissions, packet logs, etc.)? If not, please explain.

8. Does your product(s), system(s) and/or service(s) prevent the use of shared credentials or accounts including administrative accounts?

9. Describe how your product(s), system(s) and/or service(s) authenticates and authorizes users?
10. Does your product(s) and/or system(s) facilitate compliance with Federal and State laws, such as FERPA, HIPPA and PCI?

11. Does your company alert customers to vulnerabilities and security issues in a timely fashion? If so, please describe your process.

For hosted services, in addition to questions above

1. Are intrusion detection technologies and firewalls utilized on the hosted system(s)?

2. Describe how your facility is physically secured?

3. Does your network or facility undergo vulnerability scanning and penetration testing?

4. Do your employees hold Information Technology Security certifications and/or secure coding certifications? If so, please describe them.
ATTACHMENT C

Standard Contract form for reference only
Offerors do not need to fill in this form

COMMONWEALTH OF VIRGINIA
STANDARD CONTRACT

Contract Number:_______________________

This contract entered into this ____ day of ____________ 20___, by ______________________, hereinafter called the "Contractor" and Commonwealth of Virginia, Virginia Polytechnic Institute and State University called "Virginia Tech".

WITNESSETH that the Contractor and Virginia Tech, in consideration of the mutual covenants, promises and agreements herein contained, agrees as follows:

SCOPE OF CONTRACT: The Contractor shall provide the _____________ to Virginia Tech as set forth in the Contract Documents.

PERIOD OF CONTRACT: From _________________________ through ________________________.

COMPENSATION AND METHOD OF PAYMENT: The Contractor shall __________ be paid by Virginia Tech __________ in accordance with the contract documents.

CONTRACT DOCUMENT: The contract documents shall consist of this signed contract, Request For Proposal Number __________ dated __________, together with all written modifications thereof and the proposal submitted by the Contractor dated ________ and the Contractor's letter dated __________, all of which contract documents are incorporated herein.

In WITNESS WHEREOF, the parties have caused this Contract to be duly executed intending to be bound thereby.

Contractor: Virginia Tech

By:______________________________        By:______________________________

Title:______________________________        Title:______________________________
VA Tech RFP 648252 – Learning Management System – Update -1

Re: Optional Pre-Proposal Conference (RFP Section IX, page 9
Date: September 23, 2008
Time: 1:30 pm
Location: RB14, Room 115, 1770 Forecast Dr, Blacksburg, VA 24060

Point of Contact: Nancy Sterling, nancy.sterling@vt.edu, 540-231-9517

NEW - We will offer a choice of in-person or pre-arranged teleconference attendance for the optional pre-proposal conference. All teleconference attendance requires advance arrangements, deadline September 19, 2008, 3:00 pm Eastern time. See Attendance section below.

The format of the conference is to summarize background and procedural information, ask if there are follow-up questions to the Questions & Answers documents already posted to our department website (www.ita.vt.edu), receive any new questions, and close. Note that we do not plan to provide answers to questions immediately. For accuracy we plan to respond in writing in a document entitled Questions & Answers-Conference that will be posted the next day to our department website, www.ita.vt.edu under Computer Purchasing and then under the RFP. Please contact Nancy Sterling if any questions arise.

Attendance:

a) In-person attendance – To attend in person, no pre-arrangement is necessary. However an email to Nancy Sterling with your company name and the number of people planning to attend does help with our planning. Information similar to the teleconference information will be taken at the meeting.

b) Teleconference attendance – To attend by teleconference, pre-arrangement is necessary. The deadline for receipt of teleconference requests is Friday, September 19, 2008 at 3:00 pm Eastern time. The process requires contractors to complete the attached Attendance Roster, including authorized signature confirming the requirements, and email to Nancy Sterling (nancy.sterling@vt.edu). Virginia Tech will provide teleconference access information by Monday, September 22, 2008. Callers will pay their normal long distance fees, if applicable. Note that the maximum number of phone connections per company is two. For sound quality and least background noise, please call from a quite room, use a hard-wired land line, and mute speakerphones when not addressing the conference.
VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
Attendance Roster for Pre-Proposal Conference - Teleconference

**RFP Number 648252  -  Learning Management System (LMS)**

TELECONFERENCE registration deadline is September 19, 2008, 3:00 pm Eastern - - complete and email this form to nancy.sterling@vt.edu

Date:  September 23, 2008  - -   Time: 1:30 pm  - -   Location: RB14, Room 115, 1770 Forecast Dr, Blacksburg, VA 24060

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The authorized signature below confirms the following:

1) the above information is accurate - only those individuals named above will attend the teleconference - any changes will be emailed by Sep 22, 2008, 3:00 pm
2) the company will honor the **limit of two phone connections** for their entire company
3) the company will minimize background noise during teleconference participation – suggestions: call from quiet room, use hard-wired land line, mute speakerphones
4) the company will not share the phone number and access code (provided later) with anyone beyond those named above

Authorized Signature for Company Named Above: ____________________________________________________________

Printed/Typed Name and Title: __________________________________________________________________________

Attachment A to UCP-VT-BB-0509
### QUESTION

1) What is Virginia Tech using for the current LMS and how many FTE you have or anticipate being on your new LMS?

### ANSWER

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A) Incumbents: Blackboard and Angel Learning.</td>
<td></td>
</tr>
<tr>
<td>B) Approximate FTE: from IPEDS Fall of 2007 Students 27,572, Faculty 3,115, Staff 4,061</td>
<td></td>
</tr>
</tbody>
</table>

2) What is the decision process after RFP submissions and when will Virginia Tech be making a decision? Also, when will the new LMS be implemented?

### ANSWER

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A) Proposal Deadline: Oct 3, 2008, 3:00pm Eastern</td>
<td></td>
</tr>
<tr>
<td>B) Next steps: Proposal review and evaluation, internal meetings, potential for onsite demonstrations and/or clarifications, negotiations, contract development, legal review, contract signing and contract award.</td>
<td></td>
</tr>
<tr>
<td>C) Estimated Contract Award: Feb 2009</td>
<td></td>
</tr>
<tr>
<td>D) Implementation: for Virginia Tech no later than May 2009; however, each agency controls their own implementation date if they choose to use the contract.</td>
<td></td>
</tr>
<tr>
<td>QUESTION</td>
<td>ANSWER</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1) Is Virginia Tech working with the Department of Education?</td>
<td>No, we have not worked with the Department of Education. We contacted other VASCUPP (VA Assoc of State Colleges and Univ Purchasing Professionals) schools before we issued this RFP.</td>
</tr>
<tr>
<td>2) Do you want only web based solutions?</td>
<td>Ideally offerors will propose their full breadth of services and offerings. Potential contract users have a wide range of needs.</td>
</tr>
<tr>
<td>3) See Page 4, Section 6, Statement of Needs . … include one license… Is that one license for up to four instances?</td>
<td>Yes, include pricing for single licenses with up to four instances. Not all schools may use multiple instances, but offer options for up to four.</td>
</tr>
<tr>
<td>4) What learning management systems are schools using now?</td>
<td>Virginia Tech currently uses Blackboard and Sakai (open source). Some schools use our contract with Angel Learning. Not sure of all the options currently in use at other schools.</td>
</tr>
<tr>
<td>5) Please clarify FTE.</td>
<td>Those FTE in Q&amp;A-1 are for Virginia Tech only. Proposals should allow for a wide range of users, including small schools up through a few larger than Virginia Tech.</td>
</tr>
<tr>
<td>6) Are there regional support centers that may purchase for K-12?</td>
<td>We are not aware of regional support centers.</td>
</tr>
<tr>
<td>7) Are you interested in only custom content that each state agency provides, or do you want vendor provided content?</td>
<td>Most of Virginia Tech material will be custom content we develop. However, other users may want populated curriculum if you offer that. Propose broadly, and we can negotiate from there.</td>
</tr>
<tr>
<td>8) What systems will the proposed solutions integrate with?</td>
<td>Virginia Tech runs SCT Banner, but other agencies run other systems, such as PeopleSoft and many others.</td>
</tr>
<tr>
<td>9) What authorization does Virginia Tech use?</td>
<td>Virginia Tech uses an internally developed system based on EduSystem. We use rich authorization capabilities, including CAS (central authorization system), and we are a member of the InCommon defined identity assurance program.</td>
</tr>
<tr>
<td>QUESTION</td>
<td>ANSWER</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1) What are the guidelines for proposal format?</td>
<td>1) Refer to the RFP. In particular consider Section VI-Statement of Needs and Section VII-Proposal Preparation and Submission. Under Section VII, the format ideally should follow sub-section B-Specific Requirements. Proposal evaluation will be based on Section VIII-Selection Criteria and Award.</td>
</tr>
<tr>
<td>2) Can you provide a copy of the current incumbent contracts preceding Request for Proposal #648253.</td>
<td>2) State contracts are public information except sections marked or negotiated as confidential. You may access the incumbent contracts related to RFP 648253 at the URL below. Note that the final pricing and negotiations for the Blackboard contract are confidential and therefore those attachments are not included. <a href="https://www.ita.vt.edu/contracts/BLACKBOARD-ANGEL.zip">https://www.ita.vt.edu/contracts/BLACKBOARD-ANGEL.zip</a>.</td>
</tr>
</tbody>
</table>
I. SELECTION CRITERIA AND AWARD:

A. Selection Criteria: Proposals will be evaluated by Virginia Tech using the following:

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Maximum Point Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of License</td>
<td>20%</td>
</tr>
<tr>
<td>Functional Features and Support Services</td>
<td>35%</td>
</tr>
<tr>
<td>Company Background &amp; Financial Stability</td>
<td>10%</td>
</tr>
<tr>
<td>System Integration</td>
<td>10%</td>
</tr>
<tr>
<td>Scope &amp; Breadth</td>
<td>15%</td>
</tr>
<tr>
<td>SWAM Utilization</td>
<td>10%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100 %</strong></td>
</tr>
</tbody>
</table>
Attachment B

to

UCP-VT-BB-0509
A SYSTEM WIDE SOLUTION
A PROPOSAL FOR VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Presented to:
Nancy Sterling, Senior IT Contract Officer
Virginia Polytechnic Institute and State University

Presented by:
Jim Brown, Regional Sales Manager
Blackboard Inc.

October 3, 2008
October 1, 2008

Ms. Nancy Sterling  
Senior IT Contract Officer  
Virginia Polytechnic Institute and State University  
1700 Pratt Drive  
Blacksburg, Virginia  24061  

Dear Ms. Sterling:  

Thank you for providing us with the information in the Request for Proposal #648253 For Learning Management Systems and the vision into the business environment of Virginia Polytechnic Institute and State University (Virginia Tech) and of course the VA State Contract at hand. We welcome the opportunity to provide our response to the requirements.  

In particular, you mentioned the need for a Comprehensive Learning Management System as well as related products and it is with pleasure we make the attached submittal. The Blackboard Academic Suite™ will meet these requirements. As Web-based server software, our proposed solution will enable a complete e-Education enterprise including online teaching and learning, community building, content management, and integration capabilities with multiple business and administrative enterprise software systems.  

We believe Blackboard Inc. can be an excellent partner for Virginia Tech. We are committed to our customer base and we continue to strive to exceed expectations through teamwork, innovation, and a commitment to customer satisfaction.  

I will be contacting you soon to discuss this proposal in detail and to schedule the next steps.  

Sincerely,  

Jim Brown  
Regional Sales Manager
Presented to:
Nancy Sterling, Senior IT Contract Officer
Virginia Polytechnic Institute and State University

Presented by:
Jim Brown, Regional Sales Manager
Blackboard Inc.

October 3, 2008
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ADDITIONAL MATERIAL

Blackboard Comments, Clarifications, and Exceptions
Appendix 1: Blackboard’s Hardware Sizing Guide
Appendix 2: Blackboard’s Performance and Capacity Planning Guide
Appendix 3: Blackboard’s Hardware, Software, and Browser Guide
Appendix 4: Blackboard’s Implementation Planning Overview
Appendix 5: Blackboard’s Client Support Guide
Appendix 6: Blackboard’s Consulting Services Catalog
Appendix 7: Blackboard’s Sample License and Services Agreement
Appendix 8: Blackboard’s Detailed Pricing
Appendix 9: Blackboard’s Managed Hosting Security Policies
EXECUTIVE SUMMARY

Founded in 1997 with a vision to enable educational innovations everywhere by connecting people and technology, Blackboard is a leading provider of e-Education enterprise software applications and services. Consisting of five software applications bundled in three suites, the Blackboard Academic Suite™ and the Blackboard Commerce Suite™, and Blackboard Connect™—these products are licensed on a renewable basis. Products are available in various licensing sizes with integration features at all levels. Blackboard’s products are often integrated to various SIS solutions and allow seamless data transfer among numerous platforms.

Blackboard is headquartered in Washington, D.C., with offices in North America, Europe, Australia, and Asia. Blackboard is a publicly traded company (NASDAQ) with over 1000 employees worldwide.

Our global clients include primary and secondary schools, higher education, corporation and government markets as well as textbook publishers and student-focused merchants. Blackboard and its clients have pioneered the emergence of the e-Education industry around the world. Blackboard’s online learning application, the Blackboard Learning System™, is the most widely adopted course management system among U.S. postsecondary institutions. Blackboard’s unique features center mainly on modularization, student engagement, and openness of architecture.

In summary, we feel you will find our offering provides:

■ A reliable, financially viable, experienced e-Education solutions vendor
■ A flexible, functional, scalable, and easy-to-use course management system
■ A system capable of integrating with multiple external systems and programs
■ A product with the technological solutions and system development to remain on the cutting edge of e-Education enterprise industry
■ A system capable of content creation, development, use, and management
■ A vendor capable of providing hosting solutions to the constituents of the contract
■ Support services sufficient to offer customization of the product, technical support, and training
■ An efficient and cost effective software platform to multiple institutions

As of March 31, 2008, more than 6,900 licenses of Blackboard solutions are meeting the e-Education and business needs of global institutions. Each of these institutions has evaluated Blackboard products relative to a number of competitors, with most decision makers comprised of cross-functional committees that include faculty, administrators, instructional technologists, and other e-Education and technology deployment stakeholders. These committees often have numerous and disparate purchase criteria that include pedagogical, managerial, administrative, and financial requirements, yet they ultimately choose Blackboard because of our experience in delivering the systems that
best match each client’s requirements. Therefore, we believe our proposed solution for Virginia Tech is unmatched.

VALUE

Virginia Tech requires a cost effective online Learning Management System. Cost efficiency incorporates many different aspects of a product including competitive pricing, proven reliability, experience, and a dynamic approach to product design, development, and service. Blackboard’s vision of enabling educational innovations everywhere by connecting people and technology as well as our dedication to our clients encompasses the value of all of our e-Education solutions. As the enterprise e-Education solutions market leader, Blackboard has offered many of our clients an enterprise technology solution that provides a competitive edge within their respective markets.

The Blackboard Academic Suite has proven to be a product that our clients trust. In fact, of the top 50 Colleges and Universities reported by U.S. News in 2007, 46 are Blackboard clients. We collaborate with our clients to ensure their e-Education solution continues to be a perfect fit as demonstrated by our 90% client retention rate. Since the genesis of the Blackboard Learning System, we have focused on our clients, incorporating their needs, suggestions, and wants into each new generation of our products.

Over the past three years, Blackboard has reinvested 45 million dollars in research and development activities. Our product design has one of the most flexible and scalable course management system architectures available. Understanding that not every customer is the same, we have designed our system to allow for customization, integration with other systems, scalability, security, and ease-of-use.

The value of software products for any institution is ultimately tied to the ability of the users to easily master and work with the solution. Ease-of-use fuels increased productivity and greater returns on investment that directly translate into significant cost savings relative to competing applications. Ease of use has been Blackboard’s hallmark since the first release of CourseInfo.

FUNCTIONAL FEATURES

In order for Virginia Tech to find a vendor with the ability to meet the needs of your users, a product with a wide range of features and functions is mandatory. Blackboard has just the functional capabilities needed and the ability to tailor our system to incorporate additional features and functions and integrate with other systems.

- Content and Assessment—The center of the Blackboard Academic Suite are the processes for creating, discovering, adding, sequencing, and aligning learning objects with pedagogical objectives. Blackboard provides a complete set of assessment and Gradebook tools to measure and track student performance.

- Collaboration and Communication Tools—The Blackboard Academic Suite provides a variety of asynchronous and synchronous tools that enable faculty-student interaction, group work among students, assignment workflow and more.

- System Administration Tools—As one of the most visible and mission-critical enterprise applications on campus, the Blackboard Academic Suite delivers a full set of system
administration tools focusing on installation, configuration, integration, maintenance, and reporting.

ENTERPRISE PLATFORM ARCHITECTURE

Virginia Tech and the Commonwealth of Virginia require an e-Education environment that can be scaled to support hundreds of courses for thousands of users. Blackboard believes enterprise software solutions are central to the way the education industry operates. Our platform has been architected to optimize customization, interoperability, scalability, and role flexibility. These enterprise features underpin a suite of teaching and learning tools designed to enhance classroom instruction or deliver Web-based instruction all designed with the technology skills of today’s educator in mind. Blackboard is the only e-Education solution that unifies course management, organizational portal, and community building technologies, organizational services, content management, and extended online training and continuing education resources.

SCALABLE AND MODULAR ARCHITECTURE

At institutions worldwide, individual Blackboard installations are powering e-Education environments consisting of thousands of courses and tens of thousands of users. This level of platform scalability is achieved with Blackboard Academic Suite through its modular architecture and the resulting ability to distribute various applications within Blackboard to multiple machines.

- The architecture of Blackboard Academic Suite is three tiered. It encompasses a database on the back end and a Web server interacting with the Blackboard application (written in object-oriented Java and Perl) in the middle, accessible by a browser on the front end.
- Blackboard Academic Suite can be licensed with a two-machine configuration that features a Java Servlet Engine (Tomcat) and an HTML-based mail reader that aggregates information through a browser.

As detailed in the following proposal, we believe that Blackboard is best suited to partner with Virginia Tech to provide an e-Learning solution that fully meets the requirements as delineated within the RFP. We look forward to partnering with you.
B. SPECIFIC REQUIREMENTS

Proposals should be as thorough and detailed as possible so that Virginia Tech may properly evaluate your capabilities to provide the required goods and services. Offerors are required to submit the following information/items as a complete proposal:

1. General Information Form and Addenda

The return of the General Information Form and addenda, if any, signed and filled out as required.
RFP 9999999
GENERAL INFORMATION FORM

QUESTIONS: All inquiries for information regarding this solicitation should be directed to: Nancy Sterling, Senior Contracts Officer, Phone: (540) 231-9517, e-mail: nancy.sterling@vt.edu.

DUE DATE: Sealed Proposals will be received until October 3, 2008 at 3:00 PM. Failure to submit proposals to the correct location by the designated date and hour will result in disqualification.

ADDRESS: Proposals should be mailed or hand delivered to: Virginia Polytechnic Institute and State University (Virginia Tech), Information Technology Acquisitions Office (0214), 1700 Pratt Drive, Blacksburg, Virginia 24061. Reference the Opening Date and Hour, and RFP Number in the lower left corner of the return envelope or package.

In compliance with this Request for Proposal and to all the conditions imposed therein and hereby incorporated by reference, the undersigned offers and agrees to furnish the goods and services in accordance with the attached signed proposal and as mutually agreed upon by subsequent negotiation.

TYPE OF BUSINESS: (Please check all applicable classifications). If your classification is certified by the Virginia Department of Minority Business Enterprise, provide your certification number: ___

- Small. An independently owned and operated business which, together with affiliates, has 250 or fewer employees or average annual gross receipts of $10 million or less averaged over the previous three years. Department of Minority Business Enterprise (DMBE) certified women-owned and minority-owned business shall also be considered small business when they have received DMBE small business certification.

- Women-Owned. A business concern that is at least 51% owned by one or more women who are U. S. citizens or legal resident aliens, or in the case of a corporation, partnership, or limited liability company or other entity, at least 51% of the equity ownership interest is owned by one or more women who are citizens of the United States or non-citizens who are in full compliance with the United States immigration law, and both the management and daily business operations are controlled by one or more women who are U. S. citizens or legal resident aliens.

- Minority-Owned. A business concern that is at least 51% owned by one or more minority individuals (see Section 2.2-1401, Code of Virginia) or in the case of a corporation, partnership, or limited liability company or other entity, at least 51% of the equity ownership interest in the corporation, partnership, or limited liability company or other entity is owned by one or more minority individuals and both the management and daily business operations are controlled by one or more minority individuals.

COMPANY INFORMATION/SIGNATURE: In compliance with this Request for Proposal and to all the conditions imposed therein and hereby incorporated by reference, the undersigned offers and agrees to furnish the goods and services in accordance with the attached signed proposal and as mutually agreed upon by subsequent negotiation.

<table>
<thead>
<tr>
<th>FULL LEGAL NAME (PRINT)</th>
<th>FEDERAL TAXPAYER NUMBER</th>
<th>CONTRACTOR’S REGISTRATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackboard Inc.</td>
<td>52-2081178</td>
<td>Not Applicable.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BUSINESS NAME/DBA NAME/TA NAME</th>
<th>FEDERAL TAXPAYER NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>(If different than the Full Legal Name)</td>
<td>(If different than ID# above)</td>
</tr>
<tr>
<td>Blackboard Inc.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BILLING NAME</th>
<th>FEDERAL TAXPAYER NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Company name as it appears on your invoice)</td>
<td>(If different than ID# above)</td>
</tr>
<tr>
<td>Blackboard Inc.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PURCHASE ORDER ADDRESS</th>
<th>PAYMENT ADDRESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>650-Massachusetts Avenue, NW 6th Floor Washington, DC 20001-3796</td>
<td>Blackboard Inc. PO Box 200154 Pittsburgh, PA 15251-0154</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CONTACT NAME/TITLE (PRINT)</th>
<th>SIGNATURE (IN INK)</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jim Brown, Regional Sales Manager</td>
<td>September 31, 2008</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>E-MAIL ADDRESS</th>
<th>TELEPHONE NUMBER</th>
<th>TOLL FREE TELEPHONE NUMBER</th>
<th>FAX NUMBER TO RECEIVE E-PROCUREMENT ORDERS</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="mailto:jim.brown@blackboard.com">jim.brown@blackboard.com</a></td>
<td>724-327-5997</td>
<td>(800) 424-9299</td>
<td>(202) 318-2619</td>
</tr>
</tbody>
</table>
2. Virginia Tech Security Questionnaire for Technology-based Procurements

The return of the completed Virginia Tech Security Questionnaire for Technology-based Procurements

Please refer to our completed Security Questionnaire included as Attachment B in our response.

3. Small, Women-owned and Minority-owned Business (SWAM) Utilization:

If your business can not be classified as Small, Women-owned, or Minority-owned, describe your plan for utilizing SWAM businesses if awarded a contract. Describe your ability to provide statistical reporting on actual SWAM subcontracting when requested. If your firm or any business that you plan to subcontract with can be classified as SWAM, but has not been certified by the Virginia Department of Minority Business Enterprise (DMBE), it is expected that the certification process will be initiated no later than the time of the award, and the final DMBE certification decision and certification number provided.

Blackboard takes exception to this entire section and respectfully requests that it be deleted in its entirety, as it is not applicable to this type of commodity.

4. Vendor Background and Customers:

a. Provide your company’s ownership, history, number of years in business, size, an indication of its financial health, and strategic partners.

Formed in 1997 with a vision of transforming the Internet into a powerful environment for the education experience, Blackboard quickly became the leading provider of e-Education systems. Blackboard’s roots originate with its first teaching and learning software platform, CourseInfo, which was created within the education community.

In 1997, the founders of Blackboard were contracted to help lead the formation of the Educause IMS standards group for online education technology. At the same time, a student-faculty team at Cornell University was developing a software product that would power online education and be scalable for wider institutional application. Recognizing the high demand for a sophisticated, easy-to-use, affordable online education software platform, the two groups merged in June 1998 to form Blackboard Inc. and released the first generation of our teaching and learning software platform, CourseInfo. Ten years later, Blackboard and its clients have pioneered the emergence of the e-Education industry around the world.

Our Company has some very impressive figures:
A Proposal for Virginia Tech from Blackboard Inc.

- Largest network of eLearning practice worldwide with over 400,000 fully online and Web-enhanced courses delivered to more than 3,500 global clients
- Full set of product solutions supporting all aspects of online education
- Most scalable and open solutions
- Continuous development environment and ability to commit significant company investment in R&D, services, and support
- Strong focus on product ease of use and next-generation functionality
- In-depth experience and understanding of client needs and expectations in the eLearning marketplace
- Financial stability

COMPANY MISSION AND VISION

With a mission to enable educational innovations everywhere by connecting people and technology, Blackboard offers a rich eLearning experience that extends beyond the boundaries of a traditional learning system into a vast social and online network. Our vision is to help shape the technology that moves the eLearning process into the next generation of education—a growing network of learning environments dedicated to better communication, commerce, collaboration, and content.

We see ourselves now, and in the future, as innovators. By building a strong organization that incorporates best practices with unmatched products and services, we believe we deliver on that mission and vision.

STABILITY

Blackboard is a financially stable, cash-flow positive company. Our audited 2007 financial statements and management-related documents are publicly available and on file with the Securities and Exchange Commission (SEC). In addition, this information is easily accessible via our Web Investor Center at the following link:

b. Identify the parent corporation and any subsidiaries.

Xythos Software is Blackboard’s only subsidiary company.

c. Describe your major products and services, including the different product versions that may be appropriate for institutions with different enrollments and varying levels of integration with administrative systems.

The Blackboard Academic Suite is a comprehensive engagement and assessment solution that grows as your institution grows. It enables you to:
- Increase faculty adoption of technology for teaching
- Drive student engagement through personalized experiences and active learning tools
A Proposal for Virginia Tech from Blackboard Inc.

- Securely share and collaborate around content across the institution
- Meet diverse assessment needs of institutions

Its best-of-breed components include:
- *Blackboard Learning System™*—Enterprise License
- *Blackboard Learning System™*—Vista Enterprise License
- *Blackboard Learning System™*—CE Enterprise License
- *Blackboard Content System™*
- *Blackboard Community System™*
- *Blackboard Outcomes System™*

d.

**What distinguishes your company and its products and services from your competitors?**

The unique features that distinguish our proposed solution from our competitors are system modularization, student engagement, and openness of architecture.

e.

**Provide a current list of your key customers, and all customers that comprise more than 5% of the company’s revenue.**

The following list highlights several key Blackboard clients:

<table>
<thead>
<tr>
<th>Company Name</th>
<th>City</th>
<th>ST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fairfax County Public Schools</td>
<td>Fairfax</td>
<td>VA</td>
</tr>
<tr>
<td>Virginia Community College System</td>
<td>Richmond</td>
<td>VA</td>
</tr>
<tr>
<td>Pennsylvania State System of Higher Education</td>
<td>Harrisburg</td>
<td>PA</td>
</tr>
<tr>
<td>Department of Defense Education Activity (DoDEA)</td>
<td>Arlington</td>
<td>VA</td>
</tr>
<tr>
<td>Alexandria City Public Schools</td>
<td>Alexandria</td>
<td>VA</td>
</tr>
<tr>
<td>James Madison University</td>
<td>Harrisonburg</td>
<td>VA</td>
</tr>
<tr>
<td>College of William and Mary</td>
<td>Williamsburg</td>
<td>VA</td>
</tr>
<tr>
<td>Liberty University</td>
<td>Lynchburg</td>
<td>VA</td>
</tr>
<tr>
<td>Hampton University</td>
<td>Hampton</td>
<td>VA</td>
</tr>
<tr>
<td>Marymount University</td>
<td>Arlington</td>
<td>VA</td>
</tr>
<tr>
<td>Regent University</td>
<td>Virginia Beach</td>
<td>VA</td>
</tr>
</tbody>
</table>
A Proposal for Virginia Tech from Blackboard Inc.

<table>
<thead>
<tr>
<th>Company Name</th>
<th>City</th>
<th>ST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roanoke College</td>
<td>Salem</td>
<td>VA</td>
</tr>
<tr>
<td>Texas State Technical College System</td>
<td>Waco</td>
<td>TX</td>
</tr>
<tr>
<td>Jefferson College of Health Sciences</td>
<td>Roanoke</td>
<td>VA</td>
</tr>
<tr>
<td>WVNET- West Virginia Network for Education</td>
<td>Morgantown</td>
<td>WV</td>
</tr>
<tr>
<td>George Mason University</td>
<td>Fairfax</td>
<td>VA</td>
</tr>
<tr>
<td>Radford University</td>
<td>Radford</td>
<td>VA</td>
</tr>
<tr>
<td>Virginia State University</td>
<td>Petersburg</td>
<td>VA</td>
</tr>
<tr>
<td>Longwood University</td>
<td>Farmville</td>
<td>VA</td>
</tr>
<tr>
<td>Shenandoah University</td>
<td>Winchester</td>
<td>VA</td>
</tr>
<tr>
<td>Hampden-Sydney College</td>
<td>Hampden-Sydney</td>
<td>VA</td>
</tr>
<tr>
<td>Eastern Virginia Medical School</td>
<td>Norfolk</td>
<td>VA</td>
</tr>
<tr>
<td>Stratford University</td>
<td>Falls Church</td>
<td>VA</td>
</tr>
<tr>
<td>Blendedschools.net</td>
<td>McVeytown</td>
<td>PA</td>
</tr>
</tbody>
</table>

f.

Describe the details of the LMS implementation of one of your major clients.

Blackboard has included an overview of the implementation for Virginia Community College System in the following requirement.
g.

Describe the largest institutional (as opposed to vendor-in-house) implementation of your LMS including the number of active classes and students supported by this implementation and the system architecture (if known). Provide the client name, address and the name and phone number of the individual Virginia Tech has your permission to contact.

We are pleased to provide the following contact information and institutional summaries for some of our largest clients:

**VIRGINIA COMMUNITY COLLEGE SYSTEM**

<table>
<thead>
<tr>
<th>Address:</th>
<th>101 14th Street, Richmond, VA, 23219, USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solutions:</td>
<td>Blackboard Learning System-Enterprise, Blackboard Community System, Blackboard Content System, Blackboard Consulting Services: planning and integration</td>
</tr>
<tr>
<td>Contact Name:</td>
<td>Matthew Lawson, Interim Director, Enterprise Serv.</td>
</tr>
<tr>
<td>Phone Number:</td>
<td>804/423-5631</td>
</tr>
<tr>
<td>Additional:</td>
<td>Users: 120,000; 23 institutions; 40 campuses; 15,000 Active Courses; Oracle Dbase; RedHat Operating System; PeopleSoft SIS</td>
</tr>
</tbody>
</table>

In addition, the following user statistics on other large clients may be helpful:

- **Servicio Nacional de Aprendizaje (SENA)**: 200,000 Users
- **Brigham Young University**: 92,000 Users
- **New York University**: 74,000 Users
Provide three (3) additional recent references, either educational or governmental, for whom you have provided the type of goods and services described herein. Include the date(s) the goods and services were furnished, the client name, address and the name and phone number of the individual Virginia Tech has your permission to contact.

**VIRGINIA COMMUNITY COLLEGE SYSTEM**

<table>
<thead>
<tr>
<th>Address:</th>
<th>101 14th Street, Richmond, VA, 23219</th>
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</thead>
<tbody>
<tr>
<td>Solutions:</td>
<td>Blackboard Learning System-Enterprise, Blackboard Community System, Blackboard Content System, Blackboard Consulting Services: Planning and Integration</td>
</tr>
<tr>
<td>Contact Name:</td>
<td>Matthew Lawson, Interim Director, Enterprise Services</td>
</tr>
<tr>
<td>Phone Number:</td>
<td>804/423-5631</td>
</tr>
<tr>
<td>Users:</td>
<td>120,000</td>
</tr>
</tbody>
</table>

**GEORGE MASON UNIVERSITY**

<table>
<thead>
<tr>
<th>Address:</th>
<th>4400 University Drive, Fairfax, VA, 22030-4422</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact Name:</td>
<td>Sharon Pitt, Executive Director</td>
</tr>
<tr>
<td>Phone Number:</td>
<td>703/993-3178</td>
</tr>
</tbody>
</table>

**VIRGINIA COMMONWEALTH UNIVERSITY**

<table>
<thead>
<tr>
<th>Address:</th>
<th>901 West Franklin Street, Richmond, VA, 23284-9066</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solutions:</td>
<td>Blackboard Learning System-Enterprise, Blackboard Community System, Blackboard Content System, Blackboard Consulting Services: Planning; Blackboard Training</td>
</tr>
<tr>
<td>Contact Name:</td>
<td>Sheila Chandler, Manager - Blackboard Systems</td>
</tr>
<tr>
<td>Phone Number:</td>
<td>804/828-7728</td>
</tr>
</tbody>
</table>
Provide references of customers having similar statewide contracts.

State-Wide and/or Country-Wide clients include the following.

- Kentucky
- New Mexico
- SURF Diensten
- Utah System

Describe procedures, such as source code escrow, to protect an institution’s use of the software if the vendor enters bankruptcy proceedings or otherwise cannot support buyers.

Blackboard agrees to annually deposit the source code for the most recent version of the Software in an escrow account giving Customer, provided Customer has paid all fees due hereunder, the right to withdraw the source code upon the occurrence of: (i) failure of a trustee or Blackboard in any bankruptcy case hereafter filed by or against Blackboard either to assume this Agreement within sixty (60) days after the filing of the initial bankruptcy petition or to perform this Agreement within the meaning of Section 365(a)(4)(i) of Title 11 of the United States Code; or (ii) the termination of substantially all of Blackboard’s, (or its successors, if applicable) ongoing business operations relating to the Software. The custodian for the escrow shall be Iron Mountain Escrow Services, Inc (“Iron Mountain”). Customer shall be responsible for any costs associated with maintaining the source code in escrow. Subject to the terms of a standard source code escrow agreement with Iron Mountain, Customer shall be entitled to access, use, copy, and modify the source code for the purposes of continuing the rights under this Agreement, and for the purposes of maintaining and updating the Software, provided that Customer shall be obligated to pay continuing License Fees to Blackboard or its successor, unless and until such license is terminated by Customer and the source code, with all modifications is returned. Customer shall not have the right to sublicense, disclose, or provide access to the source code to any third party.

5. System Background:

Describe your system architecture and how it’s designed for scalability.

Essentially no limitations exist for scalability of the Blackboard platform. Multiple application servers can be implemented to create a highly available system. A range of industry standard tools and practices can be used for load testing in addition to sizing the system according to the performance benchmarks provided in the Hardware Sizing Guide in Appendix 1. We have also included our Performance and Capacity Planning Guide in Appendix 2 for additional information concerning scalability of the system.
b. Describe the underlying languages used for system development.

The Blackboard Learning System, Release 8 is written in approximately 85-90% Java and 15-10% Perl.

c. What backend databases are supported?

Blackboard Learning System utilizes a relational database throughout the platform. Microsoft SQL Server 2005, and Oracle10g, all supported by Blackboard, are designed for scalability, and are used daily by Fortune 500 companies. Many competing course management systems rely on flat-file databases within their learning management architecture. Unlike relational databases, these flat-file databases store multiple entries of identical data in disparate locations. This database configuration is inherently redundant and materially reduces scalability.

d. Which are recommended?

Without other information, Blackboard cannot recommend one platform over another. Since we support Microsoft SQL Server 2005 for systems on the Windows operating system and Oracle 10g for systems on Linux or Solaris, the choice of database is dictated by selection of operating system. (Note that Blackboard Managed Hosting primarily operates systems using Oracle 10g on RedHat Enterprise Linux.).

e. Describe the documentation available for the schema.

Blackboard does not release our production database schema. We prefer that you interact with our database through our documented API’s in order to preserve data integrity.

Blackboard does publish a schema and data dictionary for a secondary, reporting database that includes a subset of the production tables and is automatically updated daily.

f. What operating systems are supported?

Please refer to Appendix 3 for a detailed list of supported Hardware, Software, and Browser applications.
g. **Describe your recommended hardware and software configuration(s) scaling support for loads ranging from student enrollments of 1000 to 200,000 and up.**

Many hardware configuration options are available to Virginia Tech as outlined in our Hardware Sizing Guide provided in Appendix 1.

h. **For each major function, describe your system's simultaneous user load capability.**

Because Blackboard is fully scalable, the applications and architecture do not limit the number of concurrent users. As Virginia Tech increases the number of users registered on the system, the system can be scaled out at appropriate intervals to ensure optimal performance and availability of the system.

i. **Describe the ability to customize vs. configure your LMS.**

Users are presented with basic course and personal information management tools through a user-centric My Institution portal. The menu allows users to:

- View announcements, calendar events, tasks, and grades from multiple courses in one aggregated view
- Access the courses through direct links in the portal
- View a comprehensive institutional course listing and browse guest-accessible courses through the course catalog
- Maintain personal calendar, address book, user directory and to-do lists. The My Institution page of the Blackboard Learning System is the gateway page for all current projects. Additionally, with the Blackboard Community System, custom modules can be constructed by the institution or Blackboard to add modules to address specific requirements.

Users can also customize their Portal pages by choosing content, including showing the courses in which they are enrolled, adding different modules the school makes available, and choosing information channels they would like to have on their My Institution portal. Likewise, should the System Administrator enable the capability, users can customize the My Institution page by customizing the layout of the content and the color theme for the page. Within some portal modules, when enabled, students can identify what information is shown within the portal module when opening the My Institution page.

In addition, the Blackboard system provides administrators with a broad range of functionality and options for how to present the system to users including the look and feel of the system. Blackboard allows for many customizations by the institution and by professional services to meet each institution’s specific needs. Blackboard provides for the following system-wide customizations of course graphical interfaces:
- Set left-hand navigation item availability/labeling defaults and overrides
- Set course navigation button style/color/pattern defaults
- Instructors can customize their individual courses by adding a course banner, enabling/disabling course tools, and by changing the button colors and styles as shown in the following pictures:

Following are some of the core design functions available to administrators:
- Assign system-wide image to appear at top of course navigation button list
- Assign up to two system-wide images to appear below course announcements areas
- Set system-wide icon themes
- Customization of the Blackboard splash (gateway) page
• Customization of which tabs appear in Blackboard and the titles and appearance of the tabs
• Institutional branding, graphics and imagery
• Adaptable administrative menus define which commands and actions appear on administrative menus

j. Define what acceptable performance is, how it is measured, and how the system software and hardware can be scaled to maintain acceptable performance.

Because of the vast experience gained by our Managed Hosting experience over the last five years, Blackboard has tremendous evidence of performance testing. In fact, we compiled that experience into our Performance Capacity and Planning Guide available to non-Managed Hosting clients who wish to take advantage of our knowledge to configure their locally installed Blackboard systems. We have included this document in Appendix 2 for your information.

k. Provide a detailed description of how load is balanced.

A range of industry standard tools and practices can be used for load testing in addition to sizing the system according to the performance benchmarks provided in the Hardware Sizing Guide in Appendix 1. In addition, Blackboard Consulting Services provides a Performance Audit and Tuning Service. We will be pleased to provide additional information on this service upon request.

l. Estimate how many local man-hours are required for 1) installation, 2) upgrades, and 3) regular maintenance.

Installing and supporting a Blackboard installation hosted at your institution requires some specific technical skills. It is important that human resources dedicated to installing and maintaining the installation and support of the Blackboard Academic Suite have the following skills:

DATABASE SKILLS

The following database skills are recommended for installing and maintaining the Blackboard Academic Suite.

• Experience with Microsoft SQL Server 2000 or Oracle.
• Accessing database and running SQL scripts
• Online and offline database backup and restore
• Monitor and reconfigure database parameters to meet growing demand
• Tune the performance of the host machine and the database server
NETWORK SKILLS
The following networking skills are recommended for installing and maintaining the Blackboard Academic Suite.

- Troubleshooting network bottlenecks
- Experience with threading
- Knowledge of authentication and experience with institutional authentication methods (LDAP, Active Directory®, or similar method)
- Experience supporting 24/7 network environments with failover contingencies
- Experience configuring load-balanced solutions

OPERATING SYSTEM AND WEB/APP SERVER SKILLS
The following operating system and Web/app server skills are recommended for installing and maintaining the Blackboard Academic Suite.

- Experience with IIS or Apache.
- Experience with the operating system including file management and permissions.
- Experience in optimization and monitoring techniques
- Comfortable with using a text editor to make changes to configuration files
- Experience installing software
- Knowledge of starting and stopping applications on the server to avoid damaging or corrupting the workstation or database
- Knowledge of creating scheduled jobs to automate system processes such as backup and log file management
- Experience installing and troubleshooting operating systems
- Comfortable using the command line interface
- Understand how Web/app servers work and be able to start and stop the various servers and system processes
- Knowledge of how to add hardware to the server
- Perform tape backups and tape archive programs and understand how to use these backup tools to move files around the system and between machines
- Experience managing multiple points of integration

DEVELOPER SKILLS
The following skills are recommended to create Blackboard Building Blocks® or to use the Event-Driven API.

- Familiar with compiling software
- Relational database experience
- Java developer experience comparable to a mid- or senior-level programmer
- Experience programming Java Server pages
- Experience with JDBC 2.0
- Experience with Java 2
- Connection pooling
6. System Development and Security:

a. Describe your beta testing methodology, how it has evolved, and its future direction.

Blackboard utilizes early adopter testing as a beta program. Through this process, current clients have the ability to beta-test application packs and annual releases, provide feedback about new and enhanced features, and participate in the product development process.

b. Describe your quality assurance procedures.

Blackboard has a clearly defined approach toward ensuring high product quality control, usability, and scalability. Quality control factors include:

- Client-based Product Advisory Board
- Alignment of Product Strategy and Quality Assurance teams to ensure that the product functions as designed
- Usability, accessibility, and load testing
- Numerous regression test cases applied to each upgrade and platform by the Blackboard Quality Assurance team
- Formal client beta process
- Usability testing
- Integrated customer support and trouble ticket system centralizing item tracking
- Scalable multi-server configuration since 1999
- Hardware and software expertise supporting the over 1,000,000 users of Blackboard.com online course environment
- Real-world experience hosting over 450 customer production and development environments through the Blackboard Managed Hosting service
- Client feedback

c. Describe your system’s application security measures, its audit trail capability, and how it can perform data authentication.

Numerous system security configurations are possible with Blackboard Learning System. SSL Choice allows the system to selectively utilize Secure Socket(s) Layer to further protect the system data via encryption. SSL Choice allows the system administrator to determine exactly when the application will use SSL and when it will not. For example, the application can be configured to use SSL during the login,
assessment, and grade book functions, but not during the presentation of general content or portal tools. This has the benefit of balancing the need to prevent this data from being transmitted in clear text with the equally important need to minimize or eliminate unnecessary server performance limiters.

The Blackboard Leaning System has built-in log management functionality that includes “sending” logs via email, log rotation, and downloading individual system logs. These logs include:

- Java app server logs
- PERL app server logs
- System Information logs
- Content Exchange Tool logs
- Servlet logs
- Windows Mail Utility logs
- Installation logs
- Blackboard Services logs.

Blackboard Learning System supports LDAP authentication and has been tested in large scale configurations. A system administration interface is provided that allows end-user authentication against LDAP 3.0. Blackboard Academic Suite also supports Web server delegation that optimizes the integration of Microsoft Active Directory with the Blackboard platform. Using Windows 2000, system administrators can configure IIS to authenticate against Active Directory so that Blackboard accepts IIS’ credential verification. Blackboard uses structured XML data at various different levels throughout the application. The XML employed conforms to the XML 1.0 specification.

d.

Complete the Virginia Tech Security Questionnaire for Technology-based Procurements (Attachment B)

Please refer to our completed Security Questionnaire included as Attachment B in our response.

7. System Integration:

a.

Describe the system integration capabilities of your system with third-party systems, including but not limited to authentication systems, administrative systems, student-information systems, portals, content repositories, and institutional assessment tools.

The Blackboard Building Blocks program is a dynamic architectural component of Blackboard’s approach to e-Education. Blackboard Building Blocks centers on an open platform architecture. This supportable framework for platform customization and integration not only provides flexibility and choice, but also maintains the integrity of the
core system, thereby ensuring cross-platform compatibility and reliable performance of the integrations across upgrades.

At a broader level, Blackboard enthusiastically supports the IMS standards as the offer tremendous promise in terms of ensuring inter-operability amongst courses and content. Blackboard’s support for these standards began in several years ago with support for the IMS’ Enterprise data and meta-data specifications and it continues today by providing support for the content packaging and QTI specifications.

Blackboard Building Blocks enables institutions to accomplish their strategic goals through an open, flexible, and supported technology for building new functionality on top of the Blackboard platform or integrating external tools and systems with the Blackboard Academic Suite. As institutions begin to evaluate and explore how technologies can best benefit them, they learn that there is no “one size fits all” approach when it comes to a technology investment. Most institutions concluded that it is ideal to invest in technology that is flexible and extensible. Through extensive feedback from educators, students, and instructional technologists, the Blackboard Product Advisory Board, Beta testing partners, and members of the Blackboard Developers Network™ (BbDN), the Building Blocks™ technology has been developed to deliver on four core client success pillars:

- Ease of Use and Simplicity—Intuitive and comprehensive feature set to support institution’s education and community-building goals.
- Open Architecture—Flexibility to achieve institution’s unique strategic objectives.
- Proven Enterprise Technology—Reliable, scalable, secure, e-Education operating environment that is easy to implement and maintain.
- Ability to Maximize Returns and Optimize Cost of Ownership—Cost-effective and efficient architecture and functionality to reduce the administrative overhead required to manage growth and maintenance.

Building Blocks enables data exchange and interoperability with technologies including:

- Authentication and Security Protocols (e.g., LDAP, Kerberos, Active Directory)
- Enterprise Resource Planning (ERP) systems such as Student Information Systems (SIS)
- Third-Party Applications (e.g., content authoring tools, virtual classrooms, streaming media, anti-plagiarism, and more)
- XML-based Web Services

Using Building Blocks, institutions can customize their Blackboard implementation to meet institution-specific needs for teaching, learning, and community-building. Through a comprehensive developers program, a freely available Software Developers Kit (SDK), and published integration specifications and developer guides, Building Blocks is designed to readily facilitate integration with various systems and software products to enhance the daily education experience of administrators, students, and faculty.

All network-based data integration solutions that previously used database networking (JDBC) as the network transport layer now have the option of using XML over HTTP (SOAP) for improved Internet reliability. MARC is not currently supported. Blackboard is looking into supporting the importing and exporting MARC for our SDK.
is also looking into supporting IMS Digital repositories and ODRL is also being considered. Blackboard provides a WebDAV tool within the Blackboard Academic Suite.

b. Describe how the LMS can provide authentication and/or portal services by itself and also with third-party systems.

Yes. Blackboard understands that institutions often times have a portal product other than Blackboard. To provide a seamless environment for all web enabled systems on campus, Blackboard can serve as an extension of the institution’s portal and vice versa. A common way to integrate Blackboard and the institution’s portal is to create a single sign-on environment between the two. Blackboard can be customized to authenticate users that have already logged onto another authentication authority (such as a campus portal). When users navigate to the Blackboard system, the system automatically logs them without further prompting of login credentials. These customizations are made on a client by client basis, often using encryption and/or cookies to extract the user ID and automatically log-in the user. Each single sign-on (SSO) integration generally involves analyzing the client’s existing SSO environment and working with them to develop an authentication system that meets the institution’s requirements. SunGard has developed the CPIP connector to provide authentication integration between Luminis and the Blackboard platform.

c. Describe the capability, unique features, and constraints involved to turn off built-in LMS tools and replace them with third-party tools, e.g., assessment engine.

There are typically two levels of control that allow product-delivered tools to be disabled in the user interface. Administrators may select the super-set of course tools that are availed system wide for instructors to use in their courses and even provides additional granular management to allow Observers or Guests to access the tools as well. For any tool that has been enabled, the course instructor also has the option to hide the tool in his or her course.

As mentioned elsewhere in this response, Blackboard is an open platform with carefully defined and documented mechanisms for adding new and integrating external tools. The Building Blocks framework allows administrators to easily add custom capabilities to the system including integration with 3rd party tools. Since one of the deployment options for Building Blocks is a “Course Tool”, it is this framework that allows customers to replace product-delivered tools with those from third parties.

d. Identify the third-party systems that have been integrated with your LMS.

A complete list can be found at our company website’s Building Blocks page at http://blackboard.com/extend/b2/
Give details of data import and export capabilities.

The need to easily and comprehensively administer import and export data between enterprise applications has become critical to academic institutions. Blackboard has developed automated processes for handling these data sharing needs. The information model used by the Blackboard Learning System is defined by the IMS consortium. Data import/integration may be achieved through the snapshot tool, which allows users to schedule one-time or periodic (hourly, daily, weekly) data integration from existing Student Information Systems that automate user data and allow total control for the institution’s users, courses, categories, course templates, and organizations. In addition, data integration may be achieved through real-time, event-driven information transactions.

SNAPSHOT TOOL

The snapshot tool offers administrators a command line interface to update the Blackboard database with information contained in a flat file or XML file. The Blackboard database can be updated with a manually controlled explicit operation or through snapshot mode, which automatically synchronizes data and performs logic based on this interaction.

Snapshot Data Integration

* Snapshot Controller is “custom” software.
EVENT-DRIVEN APPLICATION PROGRAMMING INTERFACE (API)

The event-driven API provides a collection of Java classes that programmers can use to insert, update, delete, or actively disable information in the Blackboard database based on data extracted from an institution’s information systems. While similar to the snapshot tool in that each achieves data integration, the event-driven API allows an institution to create robust software to manage the data link.

Event-Driven Data Integration

Both the snapshot and event-driven methodologies provide essential administrative and operational flexibility, enabling institutions to:

- Automate entry of users to replace manual administration and to manage diverse users from disparate databases including SIS, HRMS, alumni system and adult education
- Coordinate passwords with role-based management for system authentication
- Address FERPA guidelines
- Track course sections and section changes, manage content use and reuse across academic terms and for multiple sections
- Manage add/drops
- Categorize courses
- Populate courses with required templates at the college, department, and discipline level
- Disable student access at the end of the semester
- Delete obsolete or redundant user and course data
- Enforce consistency in access policies
- Promote institutional branding at many levels
- Establish and maintain standards
A Proposal for Virginia Tech from Blackboard Inc.

- Provide consistency within and across departments and organizations
- Establish best practices in instructional design, accessibility, and student involvement

f. Describe the process needed to achieve the integration and how it is accomplished (batch, real-time, etc.).

Please refer to the response provided to Requirement e directly above.

g. What formal system integration relationships exist with PeopleSoft, SCT, and Datatel.

Blackboard has been a PeopleSoft partner since 1999. The companies work together to enable technical integration between their product suites. For example, PeopleSoft offers a "snapshot" data integration tool that allows clients to extract user and course data from PeopleSoft User Administration and automatically import the data into the Blackboard Learning System. In addition, the companies have collaborated on portal integration, so clients can implement PeopleSoft’s and/or Blackboard’s portal products effectively, using single sign-on and easy navigation between the systems. Blackboard has worked with dozens of clients on integration projects involving PeopleSoft systems.

Blackboard is a PeopleSoft client. Blackboard is implementing PeopleSoft’s CRM tools to support the entire client life cycle from pre-sales to technical support. As part of the process, Blackboard is integrating the PeopleSoft system with a variety of web interfaces, and with Blackboard’s Great Plains accounting system.

SCT and Blackboard have a relationship based on a common vision reflected in SCT’s “E-Education Infrastructure” and the Blackboard Building Blocks—interconnecting systems to unify a broad spectrum of education-related activities on the web. The SCT and Blackboard services teams collaborate to implement data integration, single sign-on, and grade exchange between SCT’s systems and the Blackboard Learning System. This collaboration permits the companies to work together to design the project plan, consult with clients on business logic, and implement an integrated solution. Course Catalog integrations have been successfully integrated in addition offerings mentioned above.

Datatel and Blackboard have established a partnership to assist institutions with the intricate software integration process, helping create far-reaching and dynamic online solutions that span the campus environment.

As a leading provider of fully integrated enterprise-wide information management solutions for higher education, Datatel offers a complete suite of robust administrative solutions for colleges and universities. Datatel’s Colleague® is a comprehensive, feature-rich solution that provides higher education institutions with over 35 different modules to help plan, manage, and analyze their business processes and improve services to constituents.
This solution incorporates several essential integration points between Datatel’s Colleague software and the Blackboard Learning System:

- Enterprise data—such as users, courses, and enrollments—entered into Colleague automatically populates the Blackboard Learning System instantaneously.
- Single sign-on authentication allows users to log in only once for all Web-based services.
- Grades automatically transfer from the Blackboard Gradebook to the Colleague Gradebook—in real-time.
- Utilizing both the Datatel and Blackboard systems makes it possible for institutions to achieve fully integrated e-Education environments. With a single logon, access to and navigation through an institution’s services, online courses, and academic resources is made completely seamless.
- Students have immediate Web access to courses registered through Colleague.
- Instructors manage their students’ grades in the Blackboard Gradebook throughout the semester, and effortlessly transmit final grades to Colleague through a unified user interface.

h.

Describe a major customer’s experiences with integration with PeopleSoft, SCT-Banner, or Datatel systems, third-party authentication, and external tools like assessment engines.

Please refer to the information provided in our overview of the implementation for Virginia Community College System in the following requirement 4.g.

i.

Describe each standard LMS system report available.

Blackboard’s system reporting capabilities are built into the application interface and provide the following reporting capabilities:

**COURSE REPORTING**

Course reports either by individual user or by all users can be created for:

- Overall Summary of Course Usage
- Main Content Areas Report
- Communication Areas Report
- Group Areas Report
- Student Areas Report

In addition, the Blackboard platform provides significant differentiators from other Learning Management Systems with the performance monitoring capabilities available through the Review Status and Performance Dashboard tools.

- Review Status Tool—enables instructors to track item hits on a user-by-user basis for outcomes management. When the instructor clicks the Manage button for a content item, they will see two Review Status related options on this page:
Review Status—allows instructors to enable or disable review for the item. The current status (enabled or disabled) is displayed.

User Progress—allows instructors to see details on the item for all users in the course, whether the item is visible to the student user, and whether the user has marked the item as reviewed.

- Performance Dashboard Tool—provides a window into all types of user activity in the course or organization such as:
  - Last Name
  - First Name
  - Username
  - Role
  - Last Login (date/time)
  - Days Since Last Login
  - Review Status (count of items reviewed, detailed view opens in a new window, displayed only if the Review Status tool is enabled)
  - Adaptive Release (overview of Student path opens in a new window, displayed only if the Adaptive Release tool is enabled)
  - View Grades (direct link to the Gradebook: User Grade List page for that user, displayed only if the Gradebook tool is enabled)

For more detailed performance analysis or for analysis across multiple courses, the Gradebook data can be downloaded into an excel spreadsheet from which the instructor can develop custom reports either within the excel application or through reporting tools such as Crystal Reports.

**SYSTEM REPORTING**

Reports for the entire system can be created for a designated time frame or by all dates for the following areas:

- Overall Summary of Usage
- User Statistics
- Course/Organization Statistics
- Site Hits
The following picture shows the Overall Usage of a sample Blackboard system:

**ADVANCED REPORTING**

The Blackboard Learning and Community Systems also provide Advanced System Reporting tools for System Administrators. This provides a separate database for essential system data and allows the creation of custom reports against this data to meet the unique reporting needs of your institution.

Data is transferred nightly into this separate reporting database so reporting (which is CPU intensive) does not negatively impact the production system. System administrators can schedule the data transfer so that it occurs at a low-traffic time of the night and is properly coordinated with data integration efforts.

System administrators have open access to this database so they can use the Crystal Reports templates provided by Blackboard or develop their own reporting mechanisms. They can even script processes to automatically generate reports at regular intervals, integrate those reports with other data and processes, etc.

The Blackboard database schema is not available for external access or updating, however, the system provides enterprise views to access the user, course, and enrollment information in a useful format. The system contains the ability to populate a separate reporting database with information from the production system. This (reporting) system and its data can be used for reporting and data mining purposes. We will be pleased to provide a diagram of the reporting database schema upon request.

**CUSTOM REPORTING CAPABILITIES**

Blackboard Consulting can design and develop custom reports to allow instructors and system administrators to obtain detailed reports on Blackboard usage and student performance. Some of these reports include:
• Overall system access—Total system accesses by day, time of day, and course area
• Student performance—Specific student’s or multiple students’ performance in selected courses, or all courses (current grade, completion percentage, time logged into course)
• Course statistics—Average grade in a course section, average percentage complete in a section, and average amount of time student spent logged into a course section
• Assessment analysis—Mean, median, and mode scores for an assessment and three most-missed items for an assessment.

j. Describe how custom LMS system reports can be generated, including the process (and any restrictions) on how back-end databases can be queried for specific customer-defined dynamic reporting needs.

Through the Blackboard Building Blocks program, clients can extend the Blackboard System to provide application customizations to meet discipline-specific, pedagogical needs, or aid system administration. Blackboard Building Blocks is used by institutions and independent software vendors to develop, contribute, and share innovation.
http://www.blackboard.com/extend/b2/

k. Describe the documentation provided for the back-end databases, including schemas used.

In addition to our published APIs, Blackboard publishes a schema and data dictionary for a secondary, reporting database that includes a subset of the production tables and is automatically updated daily.

l. Describe means by which custom components, tools or plug-ins can be developed.

With the Advanced System Reporting feature of Blackboard Learning System, system administrators have a powerful tool for creating custom reports with such tools as Crystal Reports. Data is transferred nightly into a separate reporting database so reporting does not negatively impact the production system. System administrators have open access to this database so they can use the Crystal Reports template provided by Blackboard or develop their own reporting mechanisms.
Describe means by which data stored in the application may be accessed from other systems – e.g. direct database access, web services, etc.

Blackboard does not release our database schema. We prefer that you interact with our database through our open API’s (java and .Net) in order to preserve data integrity.

Describe mechanism for faculty to retrieve their course content from the LMS in a meaningful end-user format.

The Archive Course tool creates a permanent record of a course including all the content and user interactions. When an Archive package is restored, not only is the content of the Course restored but all of the user information and user interactions are restored as well. Automated archiving and retrieval can be set. Archived Courses are saved as .ZIP files with the following file naming structure: ArchiveFile_Course_ID.ZIP. For partial course archiving, Blackboard recommends using the Course Copy functionality described in item C.2.c, which allows selection of course components. The copy can then be saved on a server or other tool as an archived course.

8. Course Content:

Describe how your system supports building of course content.

The Blackboard Learning System is a delivery system geared to allow the greatest flexibility to its users. We designed our Learning System to allow instructors to create documents and course content in other programs and then display this content through Blackboard without any changes to the appearance. Because most content is created by external authoring tools, Blackboard’s focus on providing the most flexible, easy-to-use system eliminates the stress of learning to create content in an unfamiliar program and the frustration of unexpected changes once the content has been uploaded into the course site.

What and where is information maintained, and how is it structured?

In addition to system administrators performing regular data backup and archival procedures, the Blackboard user interface provides individuals with course archiving, content archiving, and file management capabilities. Additionally, a command line interface exists which provides for batch archiving of learning system courses, allowing for the archival of multiple courses at-a-time.
Describe how your system handles course registration and pre-requisites.

The Blackboard solution provides Virginia Tech with great flexibility in enrollment management, as there are several different ways to register for a course:

- **Self-Registration**—course designer may allow students to self-register for a course. If this option were chosen, the student would follow simple directions to provide the information needed to register for the course.
- **Instructor Controlled Registration**—instructor is emailed that a student wishes to register for a course. The course instructor would then complete the student registration either as a batch along with all the other students who will be taking the course or individually with each approved request. The following picture shows the Enroll User function within Blackboard’s Control Panel.

  ![Enroll User](image)

- **Integration with Administrative System**—for a more controlled registration environment which identifies if prerequisites for a course have been completed and other variables which may affect the learner’s ability to enroll for a course, the Blackboard Consulting Services team can develop a specified system integration Building Block meeting the identified list of requirements for the customized registration system. This system would be integrated with all the necessary systems to allow for a seamless function throughout the e-Education platform.

Instructors and administrators can easily add and remove students from courses and from the system through the following tools. Authorization to do so is enabled system wide based on the permissions associated with course-roles and system roles.

- **Create user**—instructors can use this tool to create a new user within a course
- **Batch create users for course**—instructors can use this tool to create a group of new users within a course
- **Remove users from course**—instructors can use this tool to un-enroll one or many users from a course using the course roster
- **List/modify users**—instructors and administrators can use this tool to change a user’s roles or modify user’s information within a course or the system
• Batch create users—administrators can use this tool to create groups of users for the system.
• Remove users from system—administrators can use this tool to delete users from the system
• Batch remove users from system—administrators can use this tool to delete groups of users from the system (for instance last year’s graduates may be removed from the system at the end of the school term)
• Batch enroll users in course—administrators can create and enroll a specific group of users into a specific course.

There is no built-in notification process to alert instructors to course enrollment changes. A custom solution could be implemented to accomplish this, but one is not included in our proposal at this time. Individual courses may be configured to allow guest access where any user can browse the contents, but not interact with the course. Additionally, a course may be configured to allow student self-enrollment. While the system can be configured to direct certain user groups to particular courses, there is no built-in enforcement.

d.

Describe your content management capabilities.

Our proposed solution offers the flexibility to create and organize online course materials and activities in a number of ways, including by lecture topic, project, seminar, or group task. When creating a course, the instructor can designate the content areas, learning units, and names of the content areas within the course through the Instructor Control Panel interface shown in the following picture:
Once a course is created, content can be added, ordered, and structured using a pedagogical approach with items, folders, external links, course links, and tests as shown in the following picture.

CONTENT SYSTEM

As an optional component, the Blackboard Content System provides versioning tools that allow users to automatically keep track and access previous versions of their files and content. If a file is edited or modified, Versioning allows users to go “back” and access the old copies before the changes were made, providing an automatic backup for overwritten files. Versioning allows users to collaborate on content development by creating separate copies of the document after each user has made his changes. Versioning also provides a view of all of the versions that have been created including creation date, who created them. If the content owner does not want the latest version, he can “roll back” to a previous version.

e.

Describe how your system handles assignment submissions, including but not limited to how assignments are created, how students submit assignments, how assignments are stored, and how assignments are returned to students.

Blackboard’s assignment management tools provide instructors with a powerful, easy-to-use system to administer and manage assignments. Through the tools available within the Control Panel, instructors can:

- Manage collection, storage, and organization of student assignments and instructor feedback
- Create assignments in any of the content areas of the course with the ability for students to submit an assignment directly to the item
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- Automatically generate a corresponding Gradebook entry when an assignment is created
- Manage student files, “corrected” versions, rewrites, and feedback through the Gradebook
- Provide instructions and a user interface for the student to browse local drives and upload files
- Bulk download assignments from the Gradebook, including the bulk download of all student work for one particular assignment, bulk download of all ungraded files, and bulk deletion of selected files

Calculate and display student grades based on all assessments or on only completed assessments to display current student performance

Blackboard provides students with the Digital Dropbox. This tool is enabled or disabled by the instructor, not at the System Administration level.

f.

What authoring tools unique to your system are available?

The WYSIWYG Editor offers teachers and course designers a way to add dynamic content such as video clips or other media as well as create formatted documents using the editing tools with which they are familiar without having to know HTML. The WYSIWYG Editor is integrated with all areas within the course content creation capabilities and provides the interface shown in the following picture:
g. **Discuss compatibility with courseware interoperability standards.**

From our inception, we have actively promoted open-industry standards. In fact, we were the primary contractor to the IMS as well as active participants in various international efforts such as ADL SCORM, OKI, and Internet2. Furthermore, we continue these efforts via our Blackboard Building Blocks Initiative that promotes open architecture and platform interoperability, and we invest heavily in research and development. We also are committed to usability and, therefore, comply with Section 508 of the Federal Rehabilitation Act.

h. **Describe what assurances exist that course content can always migrate forward to newer version of product, either directly or through vendor provided tools.**

Historically, every update to the Blackboard system has provided both a software upgrade path from previous versions as well as reverse compatibility for exporting and importing courses. Blackboard has every intention of ensuring that future versions of our product will continue to respect the investment our customers have made in content and course development.

i. **Describe conversion tools or processes for converting existing course content from Blackboard and WebCT systems into vendor’s system.**

The value Blackboard offers Virginia contracting entities is that no conversion of course content would be required for existing Blackboard or WebCT clients. For Virginia contracting entities currently using other course management systems, we offer course conversion services based upon a specific Scope of Work and on a time and materials basis.

j. **Compared to competitive products, describe how your system is more compatible with Section 508 of the Federal Rehabilitation Act, SCORM, IMS, AICC and similar standards. In that regard, what unique features does your system provide?**

Blackboard is compliant with the American equivalent standards body (ADA Section 508). We are very active in adhering to and developing standards and are currently involved in the following accessibility projects:

- WebAIM
- Helen A. Kellar Institute for Human Disabilities
- SALT
9. **Assessment:**

   a. **Describe your systems’ capability for creating, administering and tracking tests, evaluations and surveys.**

   Blackboard offers a comprehensive assessment tool that enables users to complete self-assessments and tests. Instructors can create self-assessments using either of the following options:

   - Include the Score in the Gradebook — Tests taken by the student affect their overall score. Both the instructor and the student will be able to review the results of the test. This option was previously only available through the Gradebook but is now also available in the course content area when deploying a test.
   - Hide the Score in the Gradebook — The second self-assessment option, allows the student to take the test without displaying the results to the instructor.

   When a course designer creates the assessment, they can provide comments within the assessment answers for both correct and wrong answers that are available. The comments can provide guidance where a mistake may have been made, congratulate the user for getting the answer correct, or redirect the user to review additional materials. When the final assessment response is submitted, the user will see the comments associated with the answers provided, the correct answer, and score.

   b. **How are questions assembled into tests, exams, quizzes and surveys?**

   Blackboard provides a Question Pool feature for the management of test items. Question pools can be created by instructors, course builders, and graders in courses. These pools can facilitate question storage within courses and can allow for randomization of question presentation in assessments. The questions might be related by topic or subject matter, or they may be grouped by some other relationship. For example, an instructor might create a pool of hard questions, a pool of medium difficulty questions, and a pool of easy questions and use those to generate a randomized test. A pool can be thought of as a test bank or database that can be defined with a name and description, and then utilized to add different questions to assessments.

   Blackboard question pools can be copied, imported, and exported among all courses on the Blackboard system and to/from other Blackboard installations that allows for test bank content exchange among school systems. An instructor can select random blocks from question pools and provide some variation in the questions a student sees in an assessment.
c. What formats can be exported and imported?

Instructors can import questions from an existing question pool or import files containing questions into an Assessment. To upload questions from file, the instructor selects Upload Questions from the drop down menu in the following picture, and the Upload Questions page appears as shown in the next picture.

The questions in the uploaded file must match a specific file structure. Instructions for these file structures are explained thoroughly in the Instructor Manual. The file may include any of the following question types:

- Essay
- Ordering
- Matching
- Fill in the Blank
When questions are imported, they automatically default to the point value set in Creation Settings. If a default value has not been chosen in Creation Settings, questions will automatically have a point value of ‘0’ and Instructors must enter a point value for each question.

d. **Describe the multiple assessment types available.**

From the Assessment area of the Instructor Control Panel, instructors can add tests, quizzes, surveys, self-assessments and access any question pools that are available. Instructors can create, edit, and deploy tests, quizzes, and surveys in any content area.

e. **How are feedback and scores provided to students?**

With the power of our proposed solution’s course and content management environment, students can submit their work for instructor review and feedback (i.e., comments and marks) via the Course Assignment tool. Instructors also can download, annotate, and re-attach the work in addition to storing annotated files in the content section for further feedback and collaboration. Once the instructor stores the annotated file, he/she also can enable versioning to track any changes.

Within the course environment, instructors can provide feedback to individual questions on a test as follows:

- If the student provides the correct answer, the instructor’s feedback can direct that student to resources or other parts of the course that might help him/her continue studies within the course.
- If the student provides an incorrect answer, the instructor’s feedback can provide that student with more resources, supporting the learning process by offering access to more information.
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From the My Grades interface in each course, learners can view their course grades as shown in the following picture:

![My Grades Interface](image1.png)

Learners can also access their grades from the My Institution entry page by clicking on the View Grades link from the Quick Tools shown in the following picture:

![Quick Tools Interface](image2.png)

f. **How are responses stored?**

The results of all assessments, quizzes, and assignments are automatically populated to the Blackboard Gradebook for immediate results. The Gradebook can be exported to tools such as Excel for reporting purposes. As web-based, server software, our system cannot be delivered as CBT; however, course content can be provided using CD’s for learners to complete assignments. Instructors would need to provide the CD to the learners. Additionally, assignments saved within the course can be downloaded to the user’s computer and burned onto a CD.
g. What standard reports are generated?

Instructors can view the number of attempts and time submitted for the last attempt through the Gradebook interface shown in the following picture. There is no data on length of time spent on the exam; however, this could be deduced through a custom report.

10. Implementation and Training:

a. Describe your company’s implementation methodology.

Blackboard Consulting Services partners with our clients to design, develop, and implement customized, integrated Blackboard solutions. Our experienced consultants provide project management and technical integration services to ensure the success of each Blackboard implementation including a complete Scope of Work with detailed tasks, deliverables, and documentation. Our expertise in integrating Blackboard with a variety of administrative, security, authentication, and Student Information Systems is available throughout the implementation lifecycle and to the extent required by each client.

Our consultants work closely with our clients from scope to implementation. In fact, we insist that our clients assign a Client Project Manager to manage the financial and operational aspects of the project onsite and serve as the single point of contact for all Blackboard project issues and questions. This Client Project Manager should have the authority to make decisions concerning the integration and provide leadership to the client team members.

The Blackboard Project Manager is likewise responsible for overall management of the project, as well as tasking and supervision of specified project activities. The Blackboard Project Manager is responsible for ensuring that the project is completed to specification and within cost and schedule.
Blackboard consultants can provide the level of project management, analysis, design, and development expertise through each stage of the project lifecycle, required by the specific needs and constraints of our clients. Costs and timelines will vary widely based on the complexity and extent of the services provided however, the process begins with the completion of a services agreement and is finalized with the deployment of the system and a final report of the customization. The following steps provide an overview for a successful implementation of a tailored Blackboard system.

- **Project Scope**
  - Project Planning Call
  - onsite project initiation engagement
  - Hardware/Software Plan
  - Initial Project Plan

- **Requirements**
  - Requirements Analysis
  - User Interface (UI) Specifications
  - Test Plan
  - Revised Project Plan

- **Design and Development**
  - Custom Software
  - Test Cases
  - Operating Procedures
  - Systems configuration
  - Design review

- **Testing**
  - Test Results
  - Administrator Training

- **Deployment**
  - Deploy system
  - Finalize report of customization

For more detailed information on Blackboard’s implementation processes, please refer to Appendix 4.
b.

What implementation resources are available?

The coordination between Virginia Tech’s participants and Blackboard Consulting participants is critical to the success of the project. The following diagram represents typical team coordination:

Virginia Tech’s Project Manager must be empowered to make project related decisions including project direction, scope, activities, quality control measures, and budget management. This individual must be available on a day-to-day basis to make critical project decisions that are required to allow the work to progress and must be authorized to approve expenditure of funds in accordance with the project requirements.

Virginia Tech’s team should be selected by your assigned Project Manager as appropriate. The Blackboard Consulting Project Manager will work with your Project Manager to assist in selecting the appropriate people required. The assigned team
must be available to participate in the engagement process as is required to meet budgetary and schedule limitations.

c. Describe your approach to project management.

Blackboard Consulting will provide project management support and technical expertise to the client throughout the implementation process. Our expertise in integrating Blackboard with a variety of administrative, security, authentication, and Student Information Systems is available throughout the implementation lifecycle and to the extent required by each client.

d. How are change requests managed?

Blackboard Consulting Services will be ready to begin development of contracting entities implementation of our proposed solution upon execution of a detailed Scope of Work and a Professional Services Agreement that details your specific needs and a timeline for the completion of services. Blackboard Consulting makes every effort to meet the time frame requirements of the customer. To identify resources and set a project schedule, the Blackboard Project Manager assigned to Virginia Tech

e. Describe professional services available.

Please refer to our response to Requirement 10.a of this section.

f. What technical and functional training is provided with your product or service?

The creation of a robust eLearning infrastructure requires the timely and effective education of System Administrators, teaching faculty, instructional technologists, course developers, support staff, and student users. Blackboard Training can provide all of the training programs needed for a successful implementation of the Blackboard Academic Suite. Each onsite workshop focuses on the pedagogy of online learning and shares best practices for teaching online in both distance and Web-enhanced educational environments. The Blackboard Training team instructs clients in the effective implementation of Blackboard products to support online teaching and learning, ensure successful adoption of the platform, increase usage in the community, and maximize the educational returns on the client’s investment.

Training consultants are skilled project managers and professional educators with extensive experience in K-12 teaching, higher education, and commercial training. They provide Blackboard clients with comprehensive educational consulting services that include implementation planning and analysis, training curriculum design, learning materials development, and Blackboard product instruction for all audiences.
Blackboard Training consultants have provided training expertise to thousands of users at over 900 Blackboard client institutions in the higher education, K-12, commercial and government markets.

To best serve our user community, Blackboard Training offers training in three formats: Onsite Workshops, Online Workshops and Regional Training events.

**BLACKBOARD ONSITE WORKSHOPS**

The majority of our clients choose onsite instruction. Blackboard consultants travel to the client site to deliver training workshops and share best practices for teaching and learning online.

- Blackboard Learning System Administration
- Blackboard Learning System Essentials
- Blackboard Content System Administration
- Blackboard Content System Essentials
- Blackboard Community System Administration
- Blackboard Effective Course Design

**BLACKBOARD ONLINE WORKSHOPS**

In circumstances where instructors are obligated during the school day or the institution employs a distance education model, many clients choose facilitated online training. Participants may enroll in six-week long asynchronous courses or brief three-hour synchronous events.

From the early adoption of course management tools in the late 1990s to the present, educational technology leaders have seen Web-based instructional services take on an increasingly strategic position at higher education institutions and in K-12 school districts. Successful development of online teaching and learning programs now requires systematic planning and comprehensive faculty training.

Online learning has evolved past the stage when instructors simply post their class materials to a course site. Today’s teachers and students now develop rich content to support and evidence their teaching and learning. As more faculty members include online components in their instruction, and as Blackboard adoption increases on campus, institutions require performance objectives and standards against which they may measure instructor preparedness for online teaching and learning. Courses in the Teaching and Learning Online series provide the training opportunities and certification necessary to build foundations and ensure success. The courses are asynchronous so the educator has great flexibility even during each course they take.

**CERTIFICATION SERIES OVERVIEW**

Participants in the Teaching and Learning Online certification series will explore basic instructional design principles, learn how to create and organize learning materials, complete course-building exercises, discuss facilitation and communication techniques, and explore methods for assessing student performance. Throughout each course, they will use the tools within the Blackboard Learning System to exchange information and share ideas. The Teaching and Learning Online certification series comprises three
facilitated, asynchronous courses that provide an introduction to the pedagogy of online learning and present best practices for teaching in Web-enhanced and distance education environments.

- **Part 1: Building Courses** 14-day course to teach instructors, administrators, and support personnel how to design, build, and export a custom course within the online environment of the Blackboard Learning System. In this educational experience, participants work independently and collaboratively to investigate the opportunities and challenges of online teaching and learning.

- **Part 2: Enhancing Communication** 14-day course that prepares instructors, administrators, and support personnel to communicate effectively in online course environments and promote communication among students. In this educational experience, participants explore both synchronous and asynchronous communication strategies.

- **Part 3: Assessing Learners** 14-day course trains instructors, administrators, and support personnel to assess student performance through different types of online assessments. In this educational experience, participants use assignment, test, and survey tools as well as the online grade book feature.

Experienced online educators will find that the Teaching and Learning Online certification series pairs a useful reintroduction to the features and tools available in the Blackboard Learning System with an exploration of the best practices for good instruction within Web-enhanced and distance education environments. Enrollment in the Teaching and Learning Online certification series is a perfect follow-up to participation in Blackboard Learning System Essentials onsite training workshop.

**BLACKBOARD REGIONAL EVENTS**

Our consultants also deliver monthly regional events in Washington, DC, and Phoenix, Arizona. These training opportunities are ideal for institutions that need to educate new staff or existing system administrators, course developers, and instructors interested in sharpening their skills. Though not required for the pilot program, Virginia Tech may choose to send one or more participants to regional training on specific topics or in preparation for the move to the full Blackboard Academic Suite.

Blackboard Regional Training varies in length, but the full Blackboard Academic Suite regional training is a five-day series of workshops that provides intensive, hands-on instruction for system administrators, course developers, and faculty. On Monday and Tuesday, participants cover all of the content areas, communications tools, assessment features, and course management settings of the Blackboard Learning System. On Wednesday, Blackboard Training consultants provide participants with an in-depth overview of the System Control Panel and share best practices for managing a Blackboard implementation in various teaching and learning environments. Thursday and Friday focus on the virtual hard drive, learning content management, ePortfolio, and library digital asset management capabilities of the Blackboard Content System. Participants may register for one or more days of the event series.

Regardless of the mode of delivery, all training audiences receive instruction from experienced Blackboard Training consultants who have years of experience working in educational technology in higher education, K-12 schools, or corporate training environments.
g. How much and what type of training is recommended for a system administrator and for faculty to use your product?

Please refer to the response provided for Requirement f of this section.

h. Describe the documentation provided, including on-line resources.

Blackboard Training primarily provides hands-on instruction for end users and system administrators. Any training materials (documents, slide presentations) shared with a training audience will be provided to the institution for future use. There are no charges for these materials unless otherwise noted.

11. System Releases/Upgrades:

a. What is your current release?

Blackboard Academic Suite 8.

b. About how many releases are there each year and what is the timing?

Approximately once a year, application packs are bundled into new releases that include all Application Packs released in the previous version and new features, tools, and capabilities.

c. How long are new releases supported?

Blackboard supports the current release of the Blackboard Academic Suite components as well as the previous release. Within this support process, Blackboard does not consider Application Packs as releases. Releases would include annual releases of the product. Throughout the support of the product, Blackboard will continue to provide bug fixes if necessary. However, if a release is prior to the three most recent releases, Blackboard will discontinue support for the software.

d. How are bug fixes released?

All Product Development issues (includes software defects, issues with Test Cases or Test Automation Scripts, Documentation, Performance, Requirements, etc.) are tracked through 3rd part defect tracking tools; Blackboard uses a tool called JIRA.
(previously used PVCS, and currently migrating the Vista defect tracking from TeamTrack to JIRA).

Similarly, all Client issues are tracked with Product Support through a case management system in PeopleSoft. This ensures all client issues are tracked and addressed with the clients in a timely fashion. Any issues that cannot be resolved by Product Support are escalated to Product Development and have an associated issue tracked in JIRA for Product Development to address and resolve.

All Bug fixes, either internal or client found, are bundled, and distributed via one of three methods:

- Major Release or Application Pack—contains major enhancements as well as maintenance bug fixes
- Service Pack—contains mostly bug fixes and/or a few minor enhancements to address client issues
- Hotfix—temporary patch to address one (or a very few) client issue(s); all hotfixes are rolled into the next Service Pack

All Major Releases, Application Packs, and Service Packs follow the rigorous QA and Performance test process defined above. Hotfixes, because they are very isolated, have a much more focused and limited test that is designed to focus on the specific issue. After completing QA, all bundles are then released to either “Beta” and/or “Early Availability” for a limited time to gain client acceptance prior to releasing the software to “General Availability”.

e. How are customers notified?

Approximately once a year application packs are bundled into new releases that incorporate the Application Packs released in the previous version as well as new features, tools and capabilities. All customers are notified about Application Pack and Releases, their availability dates, and the new features, functions and capabilities through an email. Customers may also be contacted directly by their account manager regarding the Application Packs and Annual Releases to discuss how these upgrades can assist the customers in reaching their e-Education goals.

f. How do customers access upgrades?

Blackboard suggests installing new releases on a test and development server. A Test and Development license is provided free of charge with a Blackboard Learning System license. Specific migration details can be found in Blackboard Learning System Migration Manual that is provided on our company extranet support site, Behind the Blackboard™.

The Blackboard system out-of-the-box is highly configurable by both users and system administrators. Features and functions accessible through the Graphical User Interface
(GUI) by the users and system administrator will transfer when upgraded to a higher revision level.

In addition to our supported Application Programming Interface (API), Blackboard Consulting Services can further customize the Blackboard e-Education software to integrate with back-end systems and interoperate with front-end systems. Blackboard Consulting Services coordinates closely with Blackboard Engineering to design customizations to be as extensible and maintainable as possible. However, future system enhancements may require modifications to the underlying database and code base that may require customizations to be reapplied and/or further customized.

g. Describe the process for transitioning course content to newer versions.

Blackboard develops all of its new releases to ensure that content in existing and older versions of its applications can be easily brought forward. For in place system upgrades, no additional steps are required to transition course content from the older version of the Blackboard application in question to the newer one. The system upgrade release package is installed on the Blackboard system, and after its successful completion, all course content is available on the new version of the product.

For system upgrades, which require a substantive change in technology, (e.g. OS or RDBMS changes, migration from Course Info v.4 to Release 6 of the Blackboard Learning System) a migration process is completed to bring course content over from the older version of the system to the newer version. This automated process brings over, by default, all of the course content on the source system. Alternatively, filters are available to bring over selectively specific data elements. At the completion of a successful migration, all (selected) course content that was previously available on the source system will be available on the new version of the product (target system).

Further, all courses created in Blackboard are compliant with the IMS Content Packaging specification, regardless of the version of Blackboard being used. This means not only that these courses can be individually exported from Blackboard and used in any other IMS compliant CMS but also that these courses can then be imported back into a Blackboard system at any future date and still function properly.

h. Describe how customers can make recommendations for product changes.

The Blackboard Idea Exchange (BIE) is the client advisory program for Blackboard Academic Suite, Blackboard Commerce Suite, and WebCT® clients. The BIE represents the voice of the client community providing direct and structured opportunities for members to interact with Blackboard’s Product Development organization as well as other organizations as the opportunities arise.

BIE is composed of members that reflect the client community, representing diverse demographic criteria. Membership provides a client with direct and regular opportunity to provide feedback directly to Blackboard in a focused and process-oriented manner. Members make a tangible impact on Blackboard’s product development choices and
product quality. The following picture shows the structure of the BIE and the opportunities for member participation in product development.


i. Describe the past processes for upgrading your software from one version to another, converting course content from one version to another, and the effort anticipated to be borne by your customers in these conversions.

Please refer to our response to Requirement g of this current section.

12. Support:

a. Provide details on your company’s support plan(s).

Blackboard Client Support is committed to providing exceptional, real-time support via the phone, internet, and email. With offices in North America, Europe, and Asia Pacific, Blackboard offers around the clock support with an unlimited number of service requests for your institution’s designated System Administrators. Our support plan includes the following features:

- Customized support with an Assigned Technical Support Manager (TSM).
• 24-hour follow-the-sun, unlimited support.
• Surveys, newsletters and other client communication.
• Customer service reviews.
• Proactive notification of the latest Blackboard releases and patches.

b. Describe your company’s approach to responsiveness to problems: initial maximum response time, and the procedure for escalating the problem to reach a solution.

Every Blackboard client is assigned to a dedicated team of three to four Technical Support Managers (TSMs). Each team specializes in one specific product configuration, thereby allowing them to become very familiar with the questions that may come up for the relevant platform. We have found that very often, even complex problems can be resolved swiftly at this first level of support, due to the specialized knowledge of the TSM teams. Any new Severity 1 or 2 issues that are reported to Client Support are responded to within 1 hour. All severity 3 and 4 issues are responded to within one business day.

In the event that a Technical Support Manager cannot resolve an issue to the customer’s satisfaction within a given timeframe, the TSM is then required to escalate the case to our Tier II Support team, the Client Support Engineers (CSEs). This escalation happens automatically as a matter of internal process, and does not require any initiation by the client. Each CSE specializes in a given aspect or component of the Blackboard product line, and cases are assigned to the appropriate CSE based on the component affected in a given case. The vast majority of issues brought to us by clients are resolved either at the TSM or CSE level.

In those unusual cases where even our CSEs are unable to achieve a satisfactory resolution to a case, a third, highly advanced tier will be brought in for continued assistance and resolution. This third tier consists of highly experienced database administrators and expert software engineers with access to the same Blackboard Product Development team. Almost every issue that cannot be resolved by the first two levels of Support can be resolved by this third tier. Escalation from a CSE to a Tier III engineer is also initiated internally as needed by the CSE, and no intervention by the client is required for this escalation to occur.

Even with this systematic approach to case escalation, we realize that some situations may cause clients to desire a second path to escalation. After opening a support case by phone or online, clients may send a message directly to the entire Client Support management team by simply sending an email to supportmanagers@blackboard.com. This address is monitored by Blackboard Client Support managers 24 hours a day, 7 days a week, and a response from a member of our management team can be expected in approximately one hour or less.

Additionally, each client has access to a dedicated Client Manager and Regional Sales Manager to escalate support related concerns if all other avenues have failed. Even so, the Blackboard Support team is committed to making any client-initiated escalations
unnecessary by providing swift resolutions to client inquiries, and a high level of customer satisfaction.

Additional details of our response policies and escalation procedures are included in the Client Support Guide in Appendix 5.

13. Professional Services:

a. Describe and give examples of the professional services available from the company.

Blackboard Consulting has been augmenting the capabilities of Blackboard software since its inception. Among other service offerings, Consulting extends the Academic Suite by developing small and large-scale solutions, tightly integrated with the Blackboard platform. These projects include both augmenting existing functionality as well as creating entirely new features for the platform. Blackboard Consulting develops software solutions for literally hundreds of clients each year. A small sample of development projects include:

- Course Grafting Tool: Enables instructors to combine the users and grade records of multiple sections into a single course-space in Blackboard.
- Attendance Module: Provides instructors with an online attendance-tracking tool. Provides administrators with reporting capabilities to identify low or non-attendance.
- Facebook: Integration with Open LDAP to present instructors with student photographs with online course roster.
- Web Services Layer: Developed Web Services to access Blackboard information and functionality from outside systems.

Additional services offerings are detailed in our Consulting Services Catalog in Appendix 6.

b. Describe what measures are taken to develop price estimates, and what steps are taken to insure actual work does not exceed estimates.

Blackboard Consulting staff work on a time and materials basis. It is the responsibility of the Blackboard Project Manager to apprise Virginia Tech of the project budget status on a monthly basis at minimum. Project budget status will also be provided upon client request. Should project scope change or requirements exceed current budget expectations Virginia Tech will be notified clearly.
14. Hosting (ASP):

a. Describe your hosting capabilities.

Blackboard is the leading e-Education infrastructure company developing licenses and supporting enterprise software platforms that bring the educational experience online. Therefore, we are uniquely qualified to offer hosting services because the same professionals who helped to develop our industry-leading software are the same professionals who implement, support, and maintain the hosted environment.

There are more than 6,000 licenses of Blackboard products used daily by K-12 school districts, businesses and associations, and academic institutions in the U.S. and abroad. Combining Blackboard Managed Hosting with our e-Education platform provides clients with the necessary hardware and software, as well as the technological services, to keep the product operational, competitive, and secure. This allows clients to focus on their core competencies as well as their business and administrative objectives.

For clients who think that implementing the Blackboard software platform is beyond their current budget, or for those who are considering upgrading their existing Blackboard platform, combining the Managed Hosting service with the platform license may prove more affordable and manageable, minimizing the total cost of ownership. A recent Application Service Provider consortium survey found that hosted services, such as those offered by Blackboard, save clients 33-53% over the total cost of outsourcing applications to establish or advance e-Education initiatives. A single purchase of hardware alone typically requires the necessary budget and personnel to configure, integrate, support, and maintain it before implementation is set to begin. What happens when an organization loses an IT staff member that normally performs those functions? With Blackboard Managed Hosting, it is not an issue.

Our Managed Hosting offering includes all costs for the hardware and software needed to deploy an enterprise implementation of any of the Blackboard software applications. In addition, Blackboard maintains responsibility for supporting application administrators on campus as well as managing application and infrastructure security, redundant data backup, system and application upgrades and maintenance, application tuning, and all other aspects of a complete enterprise management solution. Our hosted offerings include the following:

- The Blackboard Academic Suite—comprised of the Blackboard Learning System, The Blackboard Community System, and the Blackboard Content System
- The Blackboard Learning System—CE and Vista Licenses
- The Blackboard Outcomes System
- The Blackboard Commerce Suite – Standalone Community System
- Various third-party software that compliments the Blackboard offerings
b. Include details on security, redundancy, uptime %, backup, and recovery.

The Blackboard Managed Hosting annual fee includes:

▪ Client-dedicated environments with associated storage and bandwidth
▪ Redundant Internet connections through multiple Tier-1 Internet Service Providers (ISP)
▪ Managed firewall and intrusion detection network security services
▪ Fully redundant and conditioned power with four levels of utility power backup
▪ Redundant data and content backups
▪ A secure Tier-4 datacenter
▪ A dedicated client Technical Support Manager (TSM) serving only Blackboard Managed Hosting clients for all Blackboard issues
▪ 24 x 7 support and operations
▪ Oracle licensing
▪ A 99.7% application availability Service Level Agreement (SLA)

c. Describe and provide samples of service level agreements (SLA) you offer.

Possibly the two most important benefits of choosing to utilize Blackboard Managed Hosting services are our tight service level guarantees and fixed-price offerings. Our Blackboard Managed Hosting SLA includes an availability guarantee of 99.7% excluding scheduled maintenance. This means we guarantee that the client’s environment that is within Blackboard Managed Hosting control will be up for at least 99.7% of the time in a given month. Coupled with this SLA is a remedy for failure that includes credits to the client in the event Blackboard is out of compliance with those stated service guarantees.

We have provided a sample Managed Hosting SLA in Appendix 7.

d. Provide the ASP average uptime per month.

Blackboard Managed Hosting guarantees that on a 24/7 clock, a client’s production environment hosted by Blackboard Managed Hosting will be “available” to the client’s end users 99.7% or higher percentage of the time. A site that is not available to an end user due to connectivity issues on the end user’s end or due to an authentication system (e.g. LDAP server) failure issue on the client’s end will not be considered unavailability from Blackboard Managed Hosting.
e. **Describe the extent of scheduled maintenance windows that could disrupt service.**

The Blackboard Managed Hosting standard maintenance window occurs weekly on Friday from 3 a.m. to 5 a.m. Eastern Standard Time. Should any scheduled maintenance require application unavailability, Blackboard will provide client notification of scheduled maintenance five business days in advance of the application of the change. The exception to that rule are maintenance procedures performed in order to remedy a problem that poses a serious risk to our clients that was not previously recognized. This exception is primarily related to security threats to core hardware or software platforms. Often these threats become known to our engineering team at the same time they become widely available to anyone wishing to compromise our systems. Standard maintenance not affecting core infrastructure components can be scheduled to run in an alternate maintenance window defined by the affected client.

f. **How much notice is given for unscheduled maintenance?**

Please refer to the response provided to Requirement e directly above.

15. **Price:**

a. **Provide all pricing that will apply to your offer over the period of the contract.**

Blackboard is pleased to provide Virginia contracting agencies the pricing options included in Appendix 8.
16. **Warranty:**

   a. 

   **Describe the terms and conditions of any warranty on the software and professional services available.**

   Please refer to Blackboard’s Sample License and Services Agreement provided in Appendix 7 for detailed information regarding our software and services warranties.

   b. 

   **Describe how such warranty is implemented to provide problem resolution services.**

   Problem resolution procedures and escalation protocols for software issues are detailed in our Client Support Guide provided in Appendix 5.
ATTACHMENT B

Virginia Tech Security Questionnaire For Technology-based Procurements

If purchased, Virginia Tech reserves the right to conduct an IT security assessment on the product(s), system(s) and/or service(s) once delivered to validate the answers to the questions below. If evaluation copies or instances are available for testing, they should be provided to the IT Security Office when requested.

In the space following each question, please provide a Yes, No or a “no answer” (N/A), and add any appropriate comments. If the answer is No or N/A, please provide comments indicating how this question/concern is addressed elsewhere or why it is not applicable.

1. Does your product(s), system(s) and or service(s) protect against the SANS Top 20 security vulnerabilities [http://www.sans.org/top20]?

Yes. While Blackboard does not specifically track its systems or software against this list Blackboard uses established processes and conducts internal security reviews to verify the security of our software before it is released. Upon review of the current list, all appropriate items are addressed in our software and/or hosting services.

We are aware of the sensitive nature of the data that resides within Web-based course management software and have dedicated Quality Assurance and Software Engineering teams to perform rigorous testing in advance of product releases. We have a contract in place with a company that has reviewed some of the parts of the Blackboard Academic Suite that house sensitive information. We are in a position to extend this relationship to the remaining components of our product suite. In addition, we have formed an alliance with the EDC Corporation, through which we can offer clients a set of penetration and security testing specific to their environment.

2. Does your product(s), system(s) and or service(s) protect against the OWASP [http://www.owasp.org/index.php/OWASP_Top_Ten_Project]?

Yes. Please refer to the response to item #1 of this section.
3. What specific encryption algorithms are employed for your product(s), system(s) and/or service(s)?

HTTP transactions are optionally protected using SSL. Passwords required for authentication and access are stored in the database, encoded using MD5.

4. Is all sensitive data (i.e. Social Security Numbers, Credit Card Numbers, Health Information, etc.) encrypted in transit and at rest? If not, please explain? (NOTE: Please see the Sensitive Information page at http://www.security.vt.edu/sensitiveinfo.html for specifics).

Generally, there are no requirements for the Blackboard system to maintain any Sensitive Information as defined by the referenced website. All data can be secured using SSL for transmission.

Numerous system security configurations are possible with Blackboard Academic Suite SSL Choice allows the system to selectively utilize Secure Socket(s) Layer to further protect the system data via encryption. SSL Choice allows the System Administrator to determine exactly when the application will use SSL and when it will not. For example, the application can be configured to use SSL during the login, assessment, and grade book functions, but not during the presentation of general content or portal tools. This has the benefit of balancing the need to prevent this data from being transmitted in clear text with the equally important need to minimize or eliminate unnecessary server performance limiters.

The components that can be SSL-enabled are: (1) The entire application, including all commercially bundled components, (2) All pages that include passwords or sensitive personal information, (3) Web-based email, (4) Send email, (5) Virtual Classroom, (6) The grade book (all roles, all rows), (7) Address book, (8) Digital dropbox, (9) Group pages, (10) All system administrator control panel pages, and (11) Building Blocks tools.

5. Is login information such as user name and password encrypted during transmission from the client to the server? NOTE: Base-64 encoding is not acceptable.

Yes. The standard authentication method encodes the password using MD5. SSL is also an option for securing the username/password transmission.
6.

Are operating systems (e.g. Windows or Linux), programming and scripting languages (e.g. Java or PHP), web servers (e.g. Apache or IIS), database servers (e.g.. Oracle or MySQL), application servers, etc. always promptly patched and current with security updates? If not, please explain.

Yes.

The following outlines Blackboard’s policy regarding Operating System (OS) and Database Management System (DBMS) security patches and service packs.

- Blackboard’s policy with regard to OS and DBMS service packs and security patches has been a topic of great concern to many of our clients lately. Recently, based on feedback from our clients and our ongoing commitment to making security a priority for our development team we began implementing a policy change. Today, Blackboard supports OS and DBMS service packs and security patches for the operating systems and databases supported for use with the Blackboard Learning System, Blackboard Community System, and the Blackboard Transaction System™. Please check with Blackboard Product Support regarding support for any other fixes or updates.

- We have implemented this policy as part of the creation of a new team within our Product Development organization. The Engineering Services team is tasked with supporting the escalation process for our products in the field, including the testing and certification (and, if necessary, remediation) necessary for Blackboard products to operate correctly with newly released OS and DBMS service packs or security patches. There is, necessarily, a short lag time between a service pack release and the completion of testing by the Engineering Services team. Even during this interim testing period, however, we will provide support for just released OS and DBMS service packs and security patches.

For customers who are self-hosted, the responsibility of applying these patches is the customers’. For customers hosted by Blackboard, the application of security updates is dependent on the nature of the update. Any update that will impact or interrupt service to end users is communicated in advance and, depending on the nature of the update, the schedule of the update may be dictated by the customer.

7.

Is all access, including administrative accounts, controlled and logged (i.e. firewalls, file system permissions, ACLs, database table permissions, packet logs, etc.)? If not, please explain.

All access to the primary user interface is controlled and logged. Access to the “back end” systems (server, database, etc.) is maintained by the host organization according to their standards. Blackboard Managed Hosting controls and logs access to their managed systems carefully and completely. Self-hosted customers are provided recommended best practices.
8.

**Does your product(s), system(s) and/or service(s) prevent the use of shared credentials or accounts including administrative accounts?**

No. The system does not prevent multiple users from accessing the system using the same account if the account “owner” shares his or her password. However, Blackboard expects customers will maintain secure policy standards that eliminate or greatly reduce this possibility.

9.

**Describe how your product(s), system(s) and/or service(s) authenticates and authorizes users?**

The Blackboard System provides a module authentication infrastructure that accommodates most standard and many custom configurations.

- Default Authentication: User IDs and passwords are maintained in the Blackboard database (passwords are encoded). Users submit their credentials to the Blackboard login form for verification against the Blackboard Database.
- LDAP Authentication: The system can be configured such that credentials submitted to the login form are verified by the customer’s LDAP compliant directory. User accounts are still provisioned in the Blackboard database with usernames and passwords, but the local Blackboard passwords are not used.
- WebServer Delegation: The system can be configured to delegate the authentication of users to the web server (Apache or IIS) layer of the system. This allows customers to implement a variety of commercial and custom authentication methods easily without developing additional software.
- Custom Authentication: Customers, partners and Blackboard Consulting all use the modular authentication design and available documentation to develop and deploy a variety of solutions.

The Blackboard System has been configured or customized to work with virtually all widely adopted technologies.

10.

**Does your product(s) and/or system(s) facilitate compliance with Federal and State laws, such as FERPA, HIPPA and PCI?**

Blackboard considers compliance with applicable federal regulations in all of its product development efforts including upgrades and new releases. Blackboard periodically reviews changes in applicable regulations to ensure continued compliance with the relevant laws.
11. 

Does your company alert customers to vulnerabilities and security issues in a timely fashion? If so, please describe your process.

Yes. Blackboard maintains contact information and detailed information about the software and operating systems that our customers are running. When such vulnerabilities and issues arise, Blackboard works to evaluate the risk, note any remedies, and communicate critical information via email to named contacts at potentially affected clients.

For hosted services, in addition to questions above

1. 

Are intrusion detection technologies and firewalls utilized on the hosted system(s)?

NETSCREEN 500 FIREWALLS

The NetScreen-500 is a purpose-built, security system designed to provide a flexible, high performance solution for large enterprise central sites and service providers. The NetScreen-500 security system integrates firewall, DoS, VPN, and traffic management functionality in a low profile, modular chassis. It provides high levels of total throughput for firewall and VPN plus support for virtual systems and security zones. With a flexible and resilient hardware architecture that incorporates modular physical interfaces, redundant power supplies, fans, and high availability interfaces, the NetScreen-500 capacity by far exceeds Blackboard’s typical traffic conditions.

TIPPING POINT UNITYONE INTRUSION PREVENTION SYSTEM

Tipping Point’s UnityOne Intrusion Prevention System (IPS) delivers the most powerful network protection in the world. The UnityOne is an in-line device that is inserted seamlessly and transparently into the network. As packets pass through the IPS, they are fully inspected to determine whether they are legitimate or malicious. This instantaneous form of protection is the most effective means of preventing attacks from ever reaching their targets.

The system is built upon TippingPoint’s Threat Suppression Engine - a highly specialized hardware-based intrusion prevention platform consisting of state-of-the-art network processor technology and TippingPoint’s own set of custom ASICs.

The UnityOne ASIC-based Threat Suppression Engine is the underlying technology that has revolutionized network protection. Through a combination of pipelined and massively parallel processing hardware, the TSE is able to perform thousands of checks on each packet flow simultaneously. The TSE architecture utilizes custom ASICs, a 20 Gbps backplane and high-performance network processors to perform total packet flow inspection at Layers 2-7. Parallel processing ensures that packet flows continue to move through the IPS with a latency of less than 215 microseconds, independent of the number of filters that are applied.
An integral part of the UnityOne solution is the Digital Vaccine Service that delivers new filters on a weekly or even daily basis to maintain evergreen protection for the latest vulnerabilities, exploits, viruses, and rogue applications. TippingPoint’s Intrusion Prevention System is the first and only product to win the coveted NSS Gold Award in the IPS space.

**NETAPP NETWORK ATTACHED STORAGE (NAS) FILERS**

Blackboard’s Managed Hosting hosted clients application data resides on NetApp Filers. NetApp filers are reliable, fast, and scalable systems that simplify and unify enterprise data storage. Key features that enhance the reliability and availability of NetApp storage systems include:

- Built-in RAID for protection from data loss due to disk failures
- Hot spare disks for fast failure recovery
- Redundant hot-pluggable power supplies and cooling fans
- Battery-backed NonVolatile RAM (NVRAM) for guaranteed writes and improved performance

The newest filers in use by Blackboard Managed Hosting deliver industry-leading throughput and quick response times to meet the needs of even the most demanding applications. With the ability to scale up to 64TB (cluster model), the newest model can support an enormous amount of enterprise data and is the perfect storage system for storage consolidation.

2. **Describe how your facility is physically secured?**

Blackboard Managed Hosting is hosted in two physically separate AboveNet facilities referred to as VA1 and VA2 in the United States. The VA1 facility is located in Tyson’s Corner, Virginia. The VA2 facility is located in Reston, Virginia. A third facility, known as VA3, will be opened in Chantilly, Virginia, and will replace the current VA1 facility.

AboveNet is an Enterprise – Class provider with a high performance global optical network. AboveNet has six datacenter facilities located in North America as well as a London facility. Each data center is connected directly to AboveNet’s global all-optical IP architecture over a dedicated fiber optic network that reaches across the globe. With a commitment to providing uninterrupted service to its customers, AboveNet uses the highest standards for building and designing each data center to withstand natural disasters, security breaches (physical and cyber), power outages, and networking and computing failures.

Comprehensive security measures include 24/7 monitoring by on-site AboveNet staff including a guarded single point of entry. All employees and guests to the datacenter must wear identification badges at all times. In addition, Blackboard’s servers are stored in locked cages and vaults that are monitored using full-motion surveillance cameras.

Power redundancy includes a Continuous Power Supply (CPS) that protects against degraded commercial power and interruptions through the use of flywheel online.
generators and diesel backup generators that have enabled AboveNet to have 100% power availability. These state-of-the-art generators are part of an overall power system that clean and condition commercial electrical power to remove any irregularities in the signal. The CPS flywheel generators also eliminate the operational time restraints and unreliability of legacy battery-powered UPS (uninterruptible power supply) systems—which are often the cause of power failures in co-location facilities. According to analysts, the use of flywheel generators is also more environmentally friendly. All power is run through the CPS generators before being passed into the facility; this builds up momentum in high-efficiency turbines. In the event of a loss of power from the grid, the momentum in the turbine ensures continuous power while the back-up generators come online. The back-up diesel generator can power the facilities at full power for several days before fuel re-supply is necessary.

In addition, AboveNet supplies a superior cooling system that ensures climate temperatures do not affect computing power; a Very Early Smoke Detection Alarm (VESDA) that constantly samples the air for dangerous particles; as well as state of the art fire suppression.

Blackboard Managed Hosting owns and operates all of network appliances and systems within the network environment inside the AboveNet facilities.

3. Does your network or facility undergo vulnerability scanning and penetration testing?

Blackboard Managed Hosting currently holds a security engagement with Jefferson Wells, which is a 3rd party security and risk management vendor. During Q2 of 2007, Jefferson Wells performed a scheduled security vulnerability assessment, including social engineering testing, of the Blackboard Managed Hosting network.

The purpose was to provide a holistic view of Blackboard’s security state. Techniques including foot printing and IP scans were used to determine vulnerabilities. Once such scans were run, Jefferson Wells provided a list of any possible vulnerability to Blackboard Managed Hosting for remediation.

Security auditing is an ongoing project.

SIMULATION DETAILS

During the footprint stage, sophisticated hacker techniques are utilized to simulate a security attack on Blackboard Managed Hosting network. Just like a seasoned hacker would utilize public information about Blackboard posted on the Internet or in other databases, Jefferson Wells gathers this information in an attempt to use it for malicious purposes. Possible examples of public information could include: domain names, IP ranges, application information, infrastructure platform information, etc. Potential hackers could then use DNS querying applications, SNMP sweepers or port listening devices, just to name a few, to gather information about a network.

Once a footprint of the network is established, penetration scans begin in an attempt to find “holes” in the environment. All public IP ranges are scanned and reviewed for
vulnerabilities by Jefferson Wells. Once the vulnerability is determined, controlled
tests are performed to determine the risk level of a breach.

In addition to network vulnerability testing, the human element of security, social
engineering, is assessed. Unbeknownst to all Blackboard employees except the
Security Manager, Jefferson Wells attempts to find sensitive information or
weaknesses regarding Blackboard physical security by sending a physical body to
Blackboard locations. Jefferson Wells’ personnel attempt to gain access to key areas
including datacenters and attempt to compromise systems.

POSITIVE FINDINGS
- Attempts to exploit vulnerabilities that were found during the scan were not
  successful due to Blackboard’s tight perimeter security
- Several exploit attempts resulted in errors that displayed less than typical
  information. This means more effort has been put into preventing hackers from
  learning the message information
- Social engineering attempts to gain access to datacenters were uneventful

CONCLUSIONS
Blackboard Managed Hosting takes network and social engineering security extremely
seriously and maintains a dynamic Security Program of best practices. Although some
vulnerabilities were found during the security analysis in Q2 of 2007, none were
substantial enough to allow Jefferson Wells a successful attack. Based on assessment
results, Blackboard ranks highly among its top peers in regards to network security.

4.

Do your employees hold Information Technology Security certifications
and/or secure coding certifications? If so, please describe them.

We have provided an overview of the Blackboard Managed Hosting Security Policies in
Appendix 9. Any individual hired into Blackboard Managed Hosting undergoes a
background check following a conditional offer of employment and may be denied
employment based upon the results of the background check. Violations of any
Security Policy and/or its implementing policies and procedures result in disciplinary
action, up to and including immediate termination of employment.
ADDITIONAL MATERIAL

Blackboard Comments, Clarifications, and Exceptions

IV. CONTRACT PARTICIPATION:

It is the intent of this solicitation and resulting contract(s) to allow for cooperative procurement. Accordingly, any public body, public or private health or educational institutions, or Virginia Tech’s affiliated corporations may access any resulting contract(s) if authorized by the contractor.

Participation in this cooperative procurement is strictly voluntary. If authorized by the Contractor, the resultant contract(s) may be extended to the entities indicated above to purchase at contract prices in accordance with contract terms. The Contractor shall notify Virginia Tech in writing of any such entities accessing the contract. The Contractor will provide semi-annual usage reports for all entities accessing the Contract. Participating entities shall place their own orders directly with the Contractor and shall fully and independently administer their use of the contract to include contractual disputes, invoicing and payments without direct administration from Virginia Tech. Virginia Tech shall not be held liable for any costs or damages incurred by any other participating entity as a result of any authorization by the Contractor to extend the contract. It is understood and agreed that Virginia Tech is not responsible for the acts or omissions of any entity, and will not be considered in default of the contract no matter the circumstances.

Blackboard acknowledges, however, we request to be provided notice of entities accessing the contract via the semi-annual usage reports.

VI. STATEMENT OF NEEDS:

Learning Management Systems are needed that will allow any state college or university, state agency, independent, non-profit college or university, or K-12 school system in the Commonwealth to purchase a license. These LMS provide the software platform for providing online course content to students in an efficient and cost effective manner.

A. The goal is to negotiate a multi-year contract.
B. Institutions should have the ability to renew initially in increments to reach a July 1 contract date, and be able to renew in twelve month or greater increments thereafter.

C. The contractor must provide documentation of all work performed for any work agreement.

D. If a problem is discovered where the software does not perform according to the documentation or representation of the contractor’s staff, the contractor shall fix the problem, at its own expense, including any required work-around solutions that may be necessary to ensure a successful implementation.

Blackboard respectively takes exception to this section and, if selected for award, agrees to negotiate mutually agreeable terms and conditions that are in accordance with Blackboard’s Sample Agreement, which reflects the same Terms and Conditions (T&C) from our current agreement, Commonwealth of Virginia Contract UCP-VTCMS02-04.

E. Acceptance testing will be based on a plan developed jointly by the institution and the contractor and will be performed by the institution for a minimum period of thirty (30) days.

F. Testing will commence upon completion of installation.

G. The contractor shall participate in the acceptance test, in accordance with the jointly developed plan, until the acceptance of the software is complete to the institution’s satisfaction.

Blackboard respectfully takes exception to all provisions of Acceptance Terms and specifically requests the opportunity to negotiate, in good faith, mutually agreeable and reasonable terms and conditions that are in accordance with the Sample Agreement, which reflects the same Terms and Conditions from our current agreement, Commonwealth of Virginia Contract UCP-VTCMS02-04. To this end, if selected for award, Blackboard looks forward to reaching agreement on commercially reasonable terms and conditions under a resulting final contract, based upon the sample agreement provided by Blackboard.

2. Proposal Preparation:

e. Ownership of all data, material and documentation originated and prepared for Virginia Tech pursuant to the RFP shall belong exclusively to Virginia Tech and be subject to public inspection in accordance with the Virginia Freedom of Information Act. Trade secrets or proprietary information submitted by an Offeror shall not be subject to public disclosure under the Virginia Freedom of Information Act. However, to prevent disclosure the Offeror must invoke the protections of Section 2.2-4342F of the Code of Virginia, in writing, either before or at the time the data or other
materials is submitted. The written request must specifically identify the data or other materials to be protected and state the reasons why protection is necessary. The proprietary or trade secret material submitted must be identified by some distinct method such as highlighting or underlining and must indicate only the specific words, figures, or paragraphs that constitute trade secret or proprietary information. The classification of an entire proposal document, line item prices and/or total proposal prices as proprietary or trade secrets is not acceptable and may result in rejection of the proposal.

Blackboard believes that the disclosure of its financial data (such as pricing) and Sample Contracts in its proposal would provide an unfair competitive advantage to its competitors. As such, Blackboard respectively requests that Virginia Tech and the Commonwealth understand the critical nature of preserving the confidentiality of its financial data and will not allow the public to have access any financial data included in its proposal. As a software company, I am sure you can appreciate the fact that we have to be very careful in our protection of our software as it is the heart of our business. If our software were to be released to the public, it would disseminate Blackboard’s entire business. If that were to happen, then the loss to Blackboard would be incalculable.

B. Specific Requirements:

3. Small, Women-owned and Minority-owned Business (SWAM) Utilization:

If your business can not be classified as Small, Women-owned, or Minority-owned, describe your plan for utilizing SWAM businesses if awarded a contract. Describe your ability to provide statistical reporting on actual SWAM subcontracting when requested. If your firm or any business that you plan to subcontract with can be classified as SWAM, but has not been certified by the Virginia Department of Minority Business Enterprise (DMBE), it is expected that the certification process will be initiated no later than the time of the award, and the final DMBE certification decision and certification number provided.

Blackboard takes exception to this entire section and respectfully requests that it be deleted in its entirety as it is not applicable to this type of commodity.

VIII. SELECTION CRITERIA AND AWARD:

B. Award: Selection shall be made of two or more offerors deemed to be fully qualified and best suited among those submitting proposals on the basis of the evaluation factors included in the Request for Proposal, including price, if so stated in the Request for Proposal. Negotiations shall be conducted with the offerors so selected. Price shall be considered, but need not be the sole determining factor. After negotiations have been conducted with each offeror so selected, Virginia Tech shall select the offeror(s) who, in its opinion, have
made the best proposal(s), and shall award the contract(s) to that offeror or offerors. Virginia Tech may cancel this Request for Proposal or reject proposals at any time prior to an award. Should Virginia Tech determine in writing and in its sole discretion that only one offeror is fully qualified, or that one offeror is clearly more highly qualified than the others under consideration, a contract may be negotiated and awarded to that offeror. The award document will be a contract incorporating by reference all the requirements, terms and conditions of this solicitation and the Contractor’s proposal as negotiated. See Attachment C for sample contract form.

If selected for award, Blackboard agrees to negotiate mutually agreeable terms and conditions in accordance with our Sample Agreement which reflects the same Terms and Conditions from our current agreement, Commonwealth of Virginia Contract UCP-VTCMS02-04.

ATTACHMENT A: TERMS AND CONDITIONS

2. AVAILABILITY OF FUNDS: It is understood and agreed between the parties herein that Virginia Tech shall be bound hereunder only to the extent of the funds available or which may hereafter become available for the purpose of this agreement.

Blackboard acknowledges Virginia Tech’s availability of funds requirement, however, Blackboard requests Virginia Tech to provide written notice 60 days prior to the end of each term if funds are not available.

3. CANCELLATION OF CONTRACT: Virginia Tech reserves the right to cancel and terminate any resulting contract, in part or in whole, without penalty, upon 60 days written notice to the Contractor. In the event the initial contract period is for more than 12 months, the resulting contract may be terminated by either party, without penalty, after the initial 12 months of the contract period upon 60 days written notice to the other party. Any contract cancellation notice shall not relieve the Contractor of the obligation to deliver and/or perform on all outstanding orders issued prior to the effective date of cancellation.

Blackboard respectively takes exception to this section and, if selected for award, agrees to negotiate mutually agreeable terms and conditions that are in accordance with Blackboard’s Sample Agreement, which reflects the same T&C from our current agreement, Commonwealth of Virginia Contract UCP-VTCMS02-04.

6. INSURANCE: By signing and submitting a proposal under this solicitation, the Offeror certifies that if awarded the contract, it will have the following insurance coverages at the time the work commences. Additionally, it will maintain these during the entire term of the contract and that all insurance coverages will be provided by insurance companies authorized to sell insurance in Virginia by the Virginia State Corporation Commission.
During the period of the contract, Virginia Tech reserves the right to require the Contractor to furnish certificates of insurance for the coverage required.

INSURANCE COVERAGES AND LIMITS REQUIRED:

A. Worker’s Compensation - Statutory requirements and benefits.

B. Employers Liability - $100,000.00

C. General Liability - $500,000.00 combined single limit. Virginia Tech and the Commonwealth of Virginia shall be named as an additional insured with respect to goods/services being procured. This coverage is to include Premises/Operations Liability, Products and Completed Operations Coverage, Independent Contractor’s Liability, Owner’s and Contractor’s Protective Liability and Personal Injury Liability.

D. Automobile Liability - $500,000.00

E. Professional Liability to include errors and omissions-$500,000.00/occurrence.

Blackboard maintains insurance policies and conditions as required within its industry standards and if requested (or upon award of the contract) by the University, Blackboard will provide a copy of its insurance certificate.

The contractor agrees to be responsible for, indemnify, defend and hold harmless Virginia Tech, its officers, agents and employees from the payment of all sums of money by reason of any claim against them arising out of any and all occurrences resulting in bodily or mental injury or property damage that may happen to occur in connection with and during the performance of the contract, including but not limited to claims under the Worker’s Compensation Act. The contractor agrees that it will, at all times, after the completion of the work, be responsible for, indemnify, defend and hold harmless Virginia Tech, its officers, agents and employees from all liabilities resulting from bodily or mental injury or property damage directly or indirectly arising out of the performance or nonperformance of the contract.

Blackboard respectively takes exception to this paragraph above and, if selected for award, agrees to negotiate mutually agreeable terms and conditions that are in accordance with Blackboard’s Sample Agreement, which reflects the same T&C from our current agreement, Commonwealth of Virginia Contract UCP-VTCMS02-04.

13. RENEWAL OF CONTRACT: This contract may be renewed by Virginia Tech upon written agreement of both parties for up to five successive one year periods only under the terms and conditions of the original contract except as stated in A and B below. Price increases may be negotiated only at the time of
renewal. Written notice of Virginia Tech’s intention to renew shall be given (approximately 90 days) prior to the expiration date of each contract period.

A. If Virginia Tech elects to exercise the option to renew the contract for an additional one-year period, the contract price(s) for the additional year shall not exceed the contract prices of the original contract increased/decreased by no more than the percentage increase/decrease of the other services category of the CPI-W section of the Consumer Price Index of the United States Bureau of Labor Statistics for the latest twelve months for which statistics are available.

B. If during any subsequent renewal period Virginia Tech elects to exercise the option to renew the contract, the contract price(s) for the subsequent renewal period shall not exceed the contract price(s) of the previous renewal period increased/decreased by more than the percentage increase/decrease of the other services category of the CPI-W section for the Consumer Price Index of the United States Bureau of Labor Statistics for the latest twelve months for which statistics are available.

Blackboard respectively takes exception to sub-section A. and B. and, if selected for award, agrees to negotiate mutually agreeable terms and conditions that are in accordance with Blackboard’s Sample Agreement, which reflects the same T&C from our current agreement, Commonwealth of Virginia Contract UCP-VTCMS02-04.

15. CERTIFICATION TESTING AND ACCEPTANCE: The system specified in the contract shall be considered ready for production testing upon receipt of documentation from the Contractor that a successful system audit or diagnostic test was performed at the site demonstrating that the system meets the minimum design/performance capabilities stipulated by the contract. The system shall be deemed ready for production certification testing on the day following receipt of this documentation. Virginia Tech shall provide written confirmation of its acceptance following successful completion of the production certification test. System (software and/or hardware) payment will be authorized after the successful completion and certification test(s).

Blackboard respectfully takes exception to all provisions of Acceptance Terms and specifically requests the opportunity to negotiate, in good faith, mutually agreeable and reasonable terms and conditions that are in accordance with the Sample Agreement, which reflects the same T&C from our current agreement, Commonwealth of Virginia Contract UCP-VTCMS02-04. To this end, if selected for award, Blackboard looks forward to reaching agreement on commercially reasonable terms and conditions under a resulting final contract, based upon the sample agreement provided by Blackboard.
Exceptions to RFP GENERAL TERMS AND CONDITIONS

2. ANTITRUST;

Blackboard requests to insert the word “Contractor” after the word “action” and before the word “may” in the paragraph.

4. ASSIGNMENT OF CONTRACT:

If selected for award, Blackboard agrees to negotiate mutually agreeable terms and conditions in accordance with our Sample Agreement that reflects the same T&C from our current agreement, Commonwealth of Virginia Contract UCP-VTCMS02-04.

5. B.3.)

If selected for award, Blackboard agrees to negotiate mutually agreeable terms and conditions in accordance with our Sample Agreement that reflects the same T&C from our current agreement, Commonwealth of Virginia Contract UCP-VTCMS02-04.

6. Claims:

Blackboard respectfully takes exception to all provisions of Acceptance Terms and specifically requests the opportunity to negotiate, in good faith, mutually agreeable and reasonable terms and conditions that are in accordance with the Sample Agreement, which reflects the same T&C from our current agreement, Commonwealth of Virginia Contract UCP-VTCMS02-04. To this end, if selected for award, Blackboard looks forward to reaching agreement on commercially reasonable terms and conditions under a resulting final contract, based upon the sample agreement provided by Blackboard.

12. DEFAULT:

Blackboard respectively takes exception to this section and, if selected for award, agrees to negotiate mutually agreeable terms and conditions that are in accordance with Blackboard’s Sample Agreement, which reflects the same T&C from our current agreement, Commonwealth of Virginia Contract UCP-VTCMS02-04.

19. INDEMNIFICATION:

Blackboard respectively takes exception to this section and, if selected for award, agrees to negotiate mutually agreeable terms and conditions that are in accordance with Blackboard’s Sample Agreement, which reflects the same T&C from our current agreement, Commonwealth of Virginia Contract UCP-VTCMS02-04.

22. MANDATORY USE OF VIRGINIA TECH FORMS AND TERMS AND CONDITIONS:

Blackboard respectively takes exception to this section and, if selected for award, agrees to negotiate mutually agreeable terms and conditions that are in accordance with
Blackboard’s Sample Agreement, which reflects the same T&C from our current agreement, Commonwealth of Virginia Contract UCP-VTCMS02-04.

24. NONVISUAL ACCESS TO TECHNOLOGY

Blackboard warrants that the Software and/or Service shall substantially enable Customer to comply with its obligations under Section 508 of the Rehabilitation Act to the extent applicable to the Software and/or Service. In the event of a failure of Blackboard to comply with the foregoing warranty, Customer shall notify Blackboard in writing with a list of specific deficiencies and Blackboard shall use commercially reasonable efforts to remedy such deficiencies subject to Blackboard’s standard support policies. Customer’s sole remedy in the event that Customer is not satisfied with Blackboard’s performance relating to the foregoing warranty shall be to terminate the Agreement by written notice to Blackboard and to receive a pro-rata refund of prepaid fees unused after the termination date.

26. A) TO PRIME CONTRACTORS:

Blackboard respectively takes exception to this section and, if selected for award, agrees to negotiate mutually agreeable terms and conditions that are in accordance with Blackboard’s Sample Agreement, which reflects the same T&C from our current agreement, Commonwealth of Virginia Contract UCP-VTCMS02-04.

27. PRECEDENCE OF TERMS:

Blackboard respectively takes exception to this section and, if selected for award, agrees to negotiate mutually agreeable terms and conditions that are in accordance with Blackboard’s Sample Agreement, which reflects the same T&C from our current agreement, Commonwealth of Virginia Contract UCP-VTCMS02-04.

31. TAXES:

If selected for award, Blackboard agrees to negotiate mutually agreeable terms and conditions in accordance with our Sample Agreement that reflects the same T&C from our current agreement, Commonwealth of Virginia Contract UCP-VTCMS02-04.
Appendix 1: Blackboard’s Hardware Sizing Guide
Introduction

Today’s educational institutions increasingly depend on enterprise course management software systems to service the needs of their students, faculty, and administrators. It is important to deliver a high quality of service to this community of users through optimizing an e-Learning platform for maximum performance and availability. This sizing guide is designed to help clients of Blackboard achieve high service levels and reduce risk by properly configuring and sizing the implementation of Blackboard Academic Suite™ software on Sun application and database servers.

The Blackboard Academic Suite™ provides the critical enabling technologies to help institutions evolve into Blackboard’s vision for the 21st Century Learning Institution, which is unconstrained by time and place, and can operate simultaneously in a local and global context.

Blackboard’s enterprise course management solutions have been proven at thousands of educational institutions worldwide. As institutions have continued to embrace the need for course management and other enabling technologies for 21st century learning, Blackboard solutions have become a critical part of the IT infrastructure that enables success in today’s global marketplace.

The Blackboard Academic Suite includes Blackboard’s flagship course management system, the Blackboard Learning System™ as well as four other core applications. Additional components include Blackboard Community System™, Blackboard Content System™, Blackboard Outcomes System™, and Blackboard Portfolio System™.

Recommended Configurations

The recommended configuration pictured in Figure 1 is based on a scalable entry-level configuration for the Blackboard Reference Architecture on Sun hardware. The information in this section is based on joint performance testing and benchmarking between Blackboard and Sun in order to achieve maximum performance throughput for each configuration.

![Figure 1 Blackboard Reference Architecture on Sun Hardware](image-url)
Methodology

Sizing is a three-step process consisting of two modeling exercises and performance testing. The modeling exercises are used to gather statistical evidence regarding how users interact with the system. The data generated from these exercises is subsequently used in a series of performance tests. Performance tests help quantify what the system will look like under hypothesized workloads and scenarios.

The process begins with understanding how Blackboard clients have used the product in the past. This form of sampling is called behavior modeling. The objective of this form of sampling is to gather meaningful data representing the following:

- Who is using the system?
- What is being done?
- Where are they performing their operations?
- When are they performing their operations?
- How long are users spending performing their operations?

Predictive modeling is used for new performance testing new features. Little information can be collected about a feature that has never been built. Because of this, we hypothesize the expected behavior of users interacting with these new features.

The data collected from both modeling exercises is then used for performance testing and benchmarking. Performance benchmarking is conducted by Blackboard with a selected partner of choice such as Sun Microsystems, Dell, Microsoft, or Oracle at the Blackboard Performance Laboratory using a combination of purchased and donated equipment from a partner. Performance testing and benchmark activities focus primarily on the performance (response times exhibited by users) and scalability of the system (utilization of system resources such as CPU, memory, and I/O). HP/Mercury LoadRunner is the simulation tool of choice for generating workload.

Sizing the Blackboard Academic Suite

Sizing the Application

Customers that deploy Blackboard on Sun hardware have the flexibility to choose from a variety of server architectures that support Solaris, Linux and Windows. Sun offers hardware models built on UltraSPARC T2/T1, AMD Opteron and Intel Xeon processor platforms.

The UltraSPARC architecture is well suited for the Blackboard Academic Suite. Clients can deploy either the Sun Fire™ T1000/T2000 server for price performance or the Sun Fire™ T5120/5220 for throughput performance. All four units have the capacity to scale to six or eight cores with a minimum of 8GB of memory.

To achieve maximum throughput, each Sun Fire server should run four clustered Java Virtual Machines (JVM) of the Blackboard Academic Suite to take advantage of all six to eight cores (24 to 32 threads on T1 and 48 to 64 threads on T2) available on this configuration. Performance benchmarking has shown that this server can reach 85 percent CPU utilization when running four clustered instances of the Blackboard Academic Suite before user response time degrades.

The UltraSPARC servers scale horizontally in a load-balanced configuration and vertically in a clustered JVM configuration. Clustering is a deployment feature introduced in Release 7, Application Pack 2 and included in all subsequent releases. The memory requirements of the server vary depending on the number of clustered instances running. Typically, each JVM is configured for roughly 1.5GB of memory. An additional 1Gb is required for the Apache components of the Blackboard deployment. The remaining 1GB is available for the operating system and trivial applications running on the system such as monitoring agents. Memory can be added to the server for additional clustered instances of Blackboard to run barring CPU resources are not saturated.
Sizing the Database

Sun Configuration Information

<table>
<thead>
<tr>
<th>Description</th>
<th>Small Institution Configuration</th>
<th>Medium Institution Configuration</th>
<th>Large Institution Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Community Size</td>
<td>1,000 to 10,000</td>
<td>10,000 to 25,000</td>
<td>25,000 to 50,000</td>
</tr>
<tr>
<td>Sizing Assumptions</td>
<td>• 500 to 1,000 active courses</td>
<td>• 1,000 to 5,000 active courses</td>
<td>• 5,000 to 25,000 active courses</td>
</tr>
<tr>
<td></td>
<td>• Up to 1,200 active users with two application servers</td>
<td>• Up to 2,400 active users with four application servers</td>
<td>• Up to 3,600 active users with eight application servers</td>
</tr>
<tr>
<td></td>
<td>• Assumes application layer clustering and hardware load-balancing</td>
<td>• Assumes application layer clustering and hardware load-balancing</td>
<td>• Assumes application layer clustering and hardware load-balancing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Candidate for Oracle RAC</td>
<td>• Candidate for Oracle RAC</td>
</tr>
<tr>
<td>Application Tier</td>
<td>• 1 to 2 Sun Fire T1000 Servers</td>
<td>• 2 to 4 Sun Fire T1000 Servers</td>
<td>• 4 to 8 Sun Fire T1000 Servers</td>
</tr>
<tr>
<td></td>
<td>• 6 Core UltraSPARC T1 Processor</td>
<td>• 8 Core UltraSPARC T1 Processor</td>
<td>• 8 Core UltraSPARC T1 Processor</td>
</tr>
<tr>
<td></td>
<td>• 8 to 16GB memory</td>
<td>• 8 to 16GB memory</td>
<td>• 8 to 16GB memory</td>
</tr>
<tr>
<td>Cluster Capacity</td>
<td>• Calibrated to 3 Java Virtual Machines per 6 core Server</td>
<td>• Calibrated to 4 Java Virtual Machines per 8 core Server</td>
<td>• Calibrated to 4 Java Virtual Machines per 8 core Server</td>
</tr>
</tbody>
</table>

The Sun Fire™ T2000 or T5220 is ideal for running Oracle 10G for small and medium size institutions. Six and eight core configurations are available for both. We recommend 16GB to 32GB of memory per system. Each of these systems can be used for availability purposes in an Oracle RAC configuration. Contact the Blackboard Professional Services organization for more information about deploying Blackboard on Oracle RAC.

For large campus configurations, a Sun SPARC® Enterprise M5000 server is used instead of the Sun Fire T2000 or T5220 server to provide increased capacity. A high availability option is supported through an optional cluster configuration with a redundant instance of the database running on a second server using Oracle RAC to provide the redundant database functionality.

Test results showed that a single Sun Fire T2000 server with 8 processor cores and 16 GB of memory can provide sufficient database server capacity to deliver consistent throughput performance for up to four load balanced application servers configured for application clustering. Sun recently released the Sun Fire™ T5220 before the benchmarking activities used for the contents of this guide were collected. Given the increase in clock speed and threading capabilities, additional throughput performance beyond four application servers is expected to prevail.

For configurations that require well beyond four application servers to meet the throughput requirements, a larger database server is recommended. The rack mountable Sun SPARC Enterprise M5000 server configured with eight dual-core SPARC64 VI processors and 32 GB of memory delivers enough performance to serve six fully configured application servers. Customers who prefer a desk side server over a rack mount server can substitute a Sun Fire V890 server for the Sun SPARC Enterprise M5000 server.

For the Blackboard Academic Suite application, the most important performance criterion in the database tier is I/O throughput from the storage subsystem. The section below provides guidelines for configuring the storage tier for proper capacity and throughput.

Sizing Storage

Media and Content Storage

The Blackboard Academic Suite makes use of a non-relational file system for the storage of multimedia and binary files such
as text files, images, word processing documents, spreadsheets, and other file types used in teaching and learning. Blackboard recommends clients make use of a network file share (NFS) on Unix platforms or a common internet file system (CIFS) on Windows. Both of these network-based file system protocols allow for simplified management, ease of data expansion and multiple access points from applications servers. Load balanced installations can quickly make use of both file system types. Deploying storage on a local application server can also be implemented, but is not recommended.

File system content can range from two to five times database content. File system content from a block perspective is touched less frequently then the database file system. Clients can opt to configure their systems to a lesser performing RAID configuration with slower spindles as I/O performance is less of a concern. The exception would be streaming content and media.

Typically, we recommend that clients determine a storage quota per student and faculty member as well as account for passive users that require less storage quota. Assume that faculty will have greater storage requirements. Below is a simple example:

<table>
<thead>
<tr>
<th>Profile</th>
<th>Quota</th>
<th>Users</th>
<th>Storage Needs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty</td>
<td>5GB</td>
<td>500</td>
<td>2.5 TB</td>
</tr>
<tr>
<td>Student</td>
<td>500MB</td>
<td>10,000</td>
<td>5TB</td>
</tr>
<tr>
<td>Observer</td>
<td>20MB</td>
<td>1,000</td>
<td>20GB</td>
</tr>
</tbody>
</table>

Sizing the file system is dependent on archival strategies, data management policies, RAID configuration and I/O performance standards. We typically assume that the file system will require about 100 I/O per second per application server at peak. To calculate your I/O per second need, multiply this metric against the number of application servers in your deployment.

**Database Data File Storage**

The Blackboard Academic Suite makes use of a relational database system (Oracle and SQL Server) for the storage of database content. Clients may make use of a network file share (NFS), ISCSI (networked block-level) or direct attached storage (block-level) on Unix platforms. Windows SQL Server clients may only use ISCSI (networked block-level) or direct attached storage (block-level).

The database storage requirements of institutions can vary. Typically, database content can range from two to five times less then file system content. Sizing the database is dependent on archival strategies, data management policies, RAID configuration, and, most importantly, I/O performance standards. We typically assume that the file system will require about 500 I/O per second per application server at peak. To calculate your I/O per second need, multiply this metric against the number of application servers in your deployment. The primary driver for database storage should be performance.

<table>
<thead>
<tr>
<th>Description</th>
<th>Small Institution Configuration</th>
<th>Medium Institution Configuration</th>
<th>Large Institution Configuration</th>
</tr>
</thead>
</table>
| Database Tier | • 1 Sun Fire T5220 Server  
• 6 Core UltraSPARC T2 Processor  
• 8 to 16GB memory | • 1 Sun Fire T5220 Server  
• 8 Core UltraSPARC T2 Processor  
• 16GB to 32GB memory | • 1 Sun SPARC Enterprise M5000 Server  
• 8 Dual-Core SPARC64 Processors (~2.15GHz)  
• 32GB memory |

**Storage Performance**

The database tier requires very high I/O performance and thus utilizes fibre channel drives with 10,000 to 15,000 RPMs. In order to deliver adequate I/O throughput, it also should make use of smaller capacity drives so that there will be more spindles to reduce seek times and improve data transfer rates. The configurations defined in this guide have been validated to support adequate I/O throughput for the user loads defined for each configuration. When sizing storage, please be sure to first determine how much storage your institution will need. Second, determine how this storage can be spread across multiple trays and
disks to optimize performance throughput. Remember that the shared file system can require upwards of five times the storage of the database, however the database can utilize five times the number of I/O operations per second than the file system.

<table>
<thead>
<tr>
<th>Description</th>
<th>Small Institution Configuration</th>
<th>Medium Institution Configuration</th>
<th>Large Institution Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Content Storage Tier</strong></td>
<td>• Network Attached Storage Architecture or ZFS for Solaris</td>
<td>• Network Attached Storage Architecture or ZFS for Solaris</td>
<td>• Network Attached Storage Architecture or ZFS for Solaris</td>
</tr>
<tr>
<td></td>
<td>• Up to 2.2 TB of usable storage</td>
<td>• Up to 5 TB of usable storage</td>
<td>• Up to 10 TB of usable storage</td>
</tr>
<tr>
<td></td>
<td>• 7.2k to 10k RPM SATA or FC</td>
<td>• 7.2k to 10k RPM SATA or FC</td>
<td>• 7.2k to 10k RPM SATA or FC</td>
</tr>
<tr>
<td><strong>Database Storage Tier</strong></td>
<td>• Network Attached Storage Architecture, iSCSI or FC-SAN</td>
<td>• Network Attached Storage Architecture, iSCSI or FC-SAN</td>
<td>• Network Attached Storage Architecture, iSCSI or FC-SAN</td>
</tr>
<tr>
<td></td>
<td>• Up to 300 GB of usable storage</td>
<td>• Up to 600 GB of usable storage</td>
<td>• Up to 1 TB of usable storage</td>
</tr>
<tr>
<td></td>
<td>• 10k to 15k RPM FC</td>
<td>• 10k to 15k RPM FC</td>
<td>• 10k to 15k RPM FC</td>
</tr>
</tbody>
</table>

**Conclusion**

The information in this sizing guide is based on analysis and benchmarking models from the Blackboard Performance Team. It is intended to provide guidance. It is not intended as a service level agreement. Deployments will differ from institution to institution based on a variety of factors including the usage of the application. Contact Blackboard Technical Solutions Engineering for more information on systems architecture design and detailed sizing questions.

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+ 1-202-463-4860 ext 4

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Introduction

Today's educational institutions increasingly depend on enterprise course management software systems to service the needs of their students, faculty, and administrators. It is important to deliver a high quality of service to this community of users through optimizing an e-Learning platform for maximum performance and availability. This sizing guide is designed to help clients of Blackboard achieve high service levels and reduce risk by properly configuring and sizing the implementation of Blackboard Academic Suite™ software on Dell application and database servers.

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Recommended Configurations

The recommended configuration pictured in Figure 1 is based on a scalable entry-level configuration for the Blackboard Reference Architecture on Dell hardware. The information in this section is based on joint performance testing and benchmarking between Blackboard and Dell in order to achieve maximum performance throughput for each configuration.
Methodology

Sizing is a three-step process consisting of two modeling exercises and performance testing. The modeling exercises are used to gather statistical evidence regarding how users interact with the system. The data generated from these exercises is subsequently used in a series of performance tests. Performance tests help quantify what the system will look like under hypothesized workloads and scenarios.

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Sizing the Blackboard Academic Suite

Sizing the Application

The Dell server platform architecture is capable of supporting Linux and Windows deployments on Intel and AMD processor lines. Rack mount and highly dense blade servers are both available.

The Blackboard Academic Suite has been benchmarked on a variety of Dell dual and quad core systems. Most often these systems contain two or four sockets and 8GB to 16GB of memory. Throughput performance increases depending on which CPU model is chosen. At the time of this publishing, the Dual Core Intel® Xeon® 5150 2.66GHz processor offers the best overall price performance. The Dual Core Intel® Xeon® 5160, 4MB Cache, 3.00GHz processor offers the best throughput performance. Quad core systems can also be deployed for additional performance.

To achieve maximum throughput, each Dell PowerEdge server should run two clustered Java Virtual Machines (JVM) of the Blackboard Academic Suite to take advantage of all four cores available on this configuration. Performance benchmarking has shown that this server can reach adequate CPU saturation when running two clustered instances of the Blackboard Academic Suite before user response time degrades. The calibration of clustered instances does not vary by much with the current quad core systems versus the dual core systems. The balancing of workload across multiple Java Virtual Machines is preferred. If you choose to deploy on quad core systems, you will be able to achieve slightly higher throughput performance.

The Dell PowerEdge servers scale horizontally in a load-balanced configuration and vertically in a clustered JVM configuration. Clustering is a deployment feature introduced in Release 7, Application Pack 2 and available in all subsequent releases. The memory requirements of the server vary depending on the number of clustered instances running. Typically, each JVM is configured for roughly 1.5GB of memory. An additional 1GB is required for the Apache or IIS web server. The remaining 1GB
is available for the operating system and trivial applications running on the system such as monitoring agents.

# Sizing the Database

## Dell Configuration Information

<table>
<thead>
<tr>
<th>Description</th>
<th>Small Institution Configuration</th>
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</tr>
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<td>25,000 to 50,000</td>
</tr>
<tr>
<td>Sizing Assumptions</td>
<td>• 500 to 1,000 active courses</td>
<td>• 1,000 to 5,000 active courses</td>
<td>• 5,000 to 25,000 active courses</td>
</tr>
<tr>
<td></td>
<td>• Up to 1,200 active users with two application servers</td>
<td>• Up to 2,400 active users with four application servers</td>
<td>• Up to 3,600 active users with eight application servers</td>
</tr>
<tr>
<td></td>
<td>• Assumes application layer clustering and hardware load-balancing</td>
<td>• Assumes application layer clustering and hardware load-balancing</td>
<td>• Assumes application layer clustering and hardware load-balancing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Candidate for Oracle RAC</td>
<td>Candidate for Oracle RAC</td>
</tr>
<tr>
<td>Application Tier</td>
<td>• 1 to 2 Dell PowerEdge 1950 or 1955 Blade Servers</td>
<td>• 4 to 6 Dell PowerEdge 1950 or 1955 Blade Servers</td>
<td>• 6 to 10 Dell PowerEdge 1950 or 1955 Blade Servers</td>
</tr>
<tr>
<td></td>
<td>• 2 x Dual Core Intel® Xeon®</td>
<td>• 2 x Dual or Quad Core Intel® Xeon®</td>
<td>• 2 x Dual or Quad Core Intel® Xeon®</td>
</tr>
<tr>
<td></td>
<td>• 8GB memory</td>
<td>• 8 to 16GB memory</td>
<td>• 8 to 16GB memory</td>
</tr>
<tr>
<td>Cluster Capacity</td>
<td>• Calibrated to 2 Java Virtual Machines per dual core Server</td>
<td>• Calibrated to 2 Java Virtual Machines per dual core Server</td>
<td>• Calibrated to 2 Java Virtual Machines per dual core Server</td>
</tr>
<tr>
<td></td>
<td>• Calibrated to 4 Java Virtual Machines per quad core Server</td>
<td>• Calibrated to 4 Java Virtual Machines per quad core Server</td>
<td>• Calibrated to 4 Java Virtual Machines per quad core Server</td>
</tr>
</tbody>
</table>

The PowerEdge 2950 is ideal for running both Microsoft SQL Server 2005 and Oracle 10G for small and medium size institutions. Two and four core configurations are available for both. We recommend 16GB to 32GB of memory per system. Each of these systems can be used for availability purposes in an Oracle RAC configuration or Microsoft SQL Server Active/Passive Failover Cluster. Contact the Blackboard Professional Services organization for more information about deploying Blackboard on Oracle RAC or SQL Server Failover capabilities.

For large campus configurations, Dell PowerEdge 6850, 6950 and R900 servers are used in lieu of the PowerEdge 2950 server to provide increased capacity. A high availability option is supported through an optional cluster configuration with a redundant instance of the database running on a second server using Oracle RAC or SQL Server Failover capabilities to provide the redundant database functionality.

The PowerEdge 2950 with dual sockets and quad core has been calibrated to handle about three to four PowerEdge 1950 or 1955 blade application servers. Each of these systems would also be calibrated for two Java Virtual Machines. The 6850/6950/R900 models will support about five to eight PowerEdge 1950 or 1955 blade application servers. Each of these systems would also be calibrated for two Java Virtual Machines.

For the Blackboard Academic Suite application, the most important performance criterion in the database tier is I/O throughput from the storage subsystem. The section below provides guidelines for configuring the storage tier for proper capacity and throughput.

# Sizing Storage

## Media and Content Storage

The Blackboard Academic Suite makes use of a non-relational file system for the storage of multi-media and binary files such as text files, images, word processing documents, spreadsheets, and other file types used in teaching and learning. Blackboard
recommends clients make use of a network file share (NFS) on Unix platforms or a common internet file system (CIFS) on Windows. Both of these network-based file system protocols allow for simplified management, ease of data expansion and multiple access points from applications servers. Load balanced installations can quickly make use of both file system types. Deploying storage on a local application server can also be implemented, but is not recommended.

File system content can range from two to five times database content. File system content from a block perspective is touched less frequently than the database file system. Clients can opt to configure their systems to a lesser performing RAID configuration with slower spindles as I/O performance is less of a concern. The exception would be streaming content and media.

Typically, we recommend that clients determine a storage quota per student and faculty member as well as account for passive users that require less storage quota. Assume that faculty will have greater storage requirements. Below is a simple example:

<table>
<thead>
<tr>
<th>Profile</th>
<th>Quota</th>
<th>Users</th>
<th>Storage Needs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty</td>
<td>5GB</td>
<td>500</td>
<td>2.5 TB</td>
</tr>
<tr>
<td>Student</td>
<td>500MB</td>
<td>10,000</td>
<td>5TB</td>
</tr>
<tr>
<td>Observer</td>
<td>20MB</td>
<td>1,000</td>
<td>20GB</td>
</tr>
</tbody>
</table>

Sizing the file system is dependent on archival strategies, data management policies, RAID configuration, and I/O performance standards. We typically assume that the file system will require about 100 I/O per second per application server at peak. To calculate your I/O per second need, multiply this metric against the number of application servers in your deployment.

**Database Data File Storage**

The Blackboard Academic Suite makes use of a relational database system (Oracle and SQL Server) for the storage of database content. Clients may make use of a network file share (NFS), iSCSI (networked block-level) or direct attached storage (block-level) on Unix platforms. Windows SQL Server clients may only use iSCSI (networked block-level) or direct attached storage (block-level).

The database storage requirements of institutions can vary. Typically, database content can range from two to five times less than file system content. Sizing the database is dependent on archival strategies, data management policies, RAID configuration, and, most importantly, I/O performance standards. We typically assume that the file system will require about 500 I/O per second per application server at peak. To calculate your I/O per second need, multiply this metric against the number of application servers in your deployment. The primary driver for database storage should be performance.

<table>
<thead>
<tr>
<th>Description</th>
<th>Small Institution Configuration</th>
<th>Medium Institution Configuration</th>
<th>Large Institution Configuration</th>
</tr>
</thead>
</table>
| Database Tier | • 1 Dell PowerEdge 2950 Server  
• 2 x Quad Core Intel® Xeon  
• 8 to 16GB memory | • 1 Dell PowerEdge 6850 Server  
• 4 x Dual Core Intel® Xeon  
• 16GB to 32GB memory | • 1 Dell PowerEdge R900 Server  
• 4 x Quad Core Intel® Xeon  
• 32GB memory |

**Storage Performance**

The database tier requires very high I/O performance and thus utilizes fibre channel drives with 10,000 to 15,000 RPMs. In order to deliver adequate I/O throughput, it also should make use of smaller capacity drives so that there will be more spindles to reduce seek times and improve data transfer rates. The configurations defined in this guide have been validated to support adequate I/O throughput for the user loads defined for each configuration. When sizing storage, please be sure to first determine how much storage your institution will need. Second, determine how this storage can be spread across multiple trays and disks to optimize performance throughput. Remember that the shared file system can require upwards of five times the storage of the database, however the database can utilize five times the number of I/O operations per second then the file system.
### Conclusion

The information in this sizing guide is based on analysis and benchmarking models from the Blackboard Performance Team. It is intended to provide guidance. It is not intended as a service level agreement. Deployments will differ from institution to institution based on a variety of factors including the usage of the application. Contact Blackboard Technical Solutions Engineering for more information on systems architecture design and detailed sizing questions.

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Appendix 2: Blackboard’s Performance and Capacity Planning Guide
Performance and Capacity Planning Guidelines for the Blackboard Academic Suite

Introduction

The adoption of the Blackboard Academic Suite has grown significantly dating back to the first edition of *CourseInfo*, circa 1998. Adoption has grown from a few hundred users to several million students, faculty and administrators dependent on Blackboard to solve everyday problems that exist in the academic computing environment. These growth rates are astounding, as many learning institutions not only see their course and data volume double, but have to manage three to four to sometimes ten times the amount of traffic on their Blackboard site from the previous year.

This paper was written to help administrators deal with the growing adoption in use of their Blackboard site by the academic community. It is not a tell all guide on how to manage your Blackboard site, but will offer some prudent guidance on “Best of Breed” strategies and tactics for managing performance and capacity.

Who Should Read this Paper?

Blackboard administrators (system and database) responsible for the day to day management of their Blackboard system, or individuals targeted with solving performance or capacity issues that arise. This paper assumes that you are familiar with the basic architectural components of your Blackboard site and have participated in the setup and configuration of the application environment. Additionally, the reader should be familiar with basic networking, operating system management, web server configuration and relational database management.

How this Paper should be used

This paper should be used for understanding the fundamental principles of capacity planning and management for your Blackboard system. We provide supplemental guidance on troubleshooting performance issues that might arise in order for administrators to be more independent with problem resolution. It is not intended as a tuning guide. We provide some basic premises about tuning, but expect administrators to use the resources provided in the guide to assist with the tuning process. No environment is the same; therefore we have chosen not to provide tuning recommendations in this article. In release 6.1, starting with Application Pack 2, there is a section in the System Control Panel regarding system configuration settings. Recommendations are made here for each possible tuning area of the application.

Assumptions Made by the Author

Administrators may modify various areas of their Blackboard system to improve system performance and capacity. Administrators are responsible for any changes made to their Blackboard system irregardless of examples or notations in this paper. Changes should be made with not only caution, but understanding of what exactly is being changed. Changes should be made incrementally (one at a time) and should be monitored and instrumented in order to understand the impact of change. This document was released as part of the final application pack of 6.X. The author assumes all readers have upgraded their system to Application Pack 3 and all subsequent service packs. However, contents in this paper will apply to earlier releases of Blackboard. Until revisions are made to this document, the author assumes that all future versions of Blackboard will apply.
How’s My System Today: A Performance and Capacity Maturity Model

In this section we introduce the concept of a performance and capacity maturity model to be used as a benchmark or barometer for measuring the management of your Blackboard deployment. Maturity models are often used to describe progression of process and structure. This model will be used to show the progression or maturity of your Blackboard implementation from supported to enterprise critical. Five phases will be introduced below with the intent that you will be able to categorize your Blackboard implementation today as well as set your sites for progressing throughout the model. Below are the five phases:

- Phase 1: Reactionary and Firefighting
- Phase 2: Metrics and Management Oriented
- Phase 3: Performance Aware and Optimizing
- Phase 4: Business Process Optimizing
- Phase 5: Enterprise Process Optimizing

Review the descriptions of each phase listed below, focusing on the key points to note. Work with others in your organization to obtain the information if it is not readily available or known.

Phase 1: Reactionary and Firefighting

Institutions categorized as Phase 1 deployments have little awareness of the challenges that are involved in managing a high-performing and operationally reliable Blackboard system. The institution or enterprise has made a decision to implement Blackboard. This implementation might fall under the classification of a beta-program or simply a small-scale roll-out. In many cases, the implementation is not the critical system on campus.

Key Points to Note:
- Lack of automated and repeatable processes
- Monitoring and management is an afterthought
- Issues are resolved primarily through escalation
- Limited problem solving techniques
- No proactive capacity planning initiatives
- Uptime of the system is not reliable (SLA)
- No performance requirements (response time and processing execution expectations)
- Little to no business intelligence measured from the usage of the system
- No communication of the business initiatives with the technical/operational initiatives

Phase 2: Metrics and Management Oriented

Institutions categorized as Phase 2 deployments have taken the necessary precautions to react to issues. In some cases proactive capacity planning is in place and executed. Still, capacity planning is primarily reactive, other then operational planning. At this phase status quo is the operational norm. The effort to grow to Level 3 will be dependent on the organizations desire to become more process and operationally efficient from a proactive standpoint.

Key Points to Note:
- Basic automated and repeatable processes
  - Back-Ups
- Monitoring and management
- Autonomy of Issues resolution BUT
- Trial and Error problem solving techniques
- Capacity planning initiatives based on events
- Uptime of the system is measurable (SLA)
- No performance requirements
- Not sure what to do with business intelligence from the usage
- Minimal communication of the business initiatives with the technical/operational initiatives

Phase 3: Performance Aware and Optimizing

Institutions categorized as Phase 3 deployments have the necessary resources and tool sets to not only identify the affects of performance and process issues, but are proactive in preventing, as well
as resolving issues when the subside. Organizations at this phase emphasize the importance of not only the infrastructure, but the execution of business process in order to achieve success.

Key Points to Note:
- Roll-Up of Phase 2 Efficiencies
- Advanced Automated and Repeatable Processes
- Method R Problem Solving Techniques
  - Ability to identify
  - Ability to resolve
  - Highly autonomous
- Formalized Capacity Planning Initiatives
- Measurable Performance Requirements
- Ability to make key decisions based on business intelligence
  - Understanding of adoption patterns
  - Understanding of growth patterns
  - Modeling and Planning activities around adoption and growth data
- Open communication line around business initiatives
  - New Features
  - New Products
  - New Adoption
  - Growth

**Phase 4: Business Process Optimizing**

Institutions categorized as Phase 4 deployments emphasize the role of Blackboard as only a cog in a large wheel of integrated processes. These processes are defined in many perspectives tied to operational success.

Key Points to Note:
- Roll-Up of Phase 3 Efficiencies
- Use Productivity in the Application is understood and highest priority
- Changes to the application are weighed based on the impact to the user and the process
- Formalized workflow and problem resolution system
- Tradeoffs

**Phase 5: Enterprise Process Optimizing**

Institutions categorized as Phase 5 deployments have the necessary processes in place to emphasize and execute towards the strategic growth of the enterprise. These organizations have been successful in establishing and executing advanced process-oriented norms on a routine basis. Now the emphasis is growing the enterprise.

Key Points to Note:
- Roll-Up of Phase 4 Efficiencies
- Emphasis on the efficiency and execution of the Enterprise’s goals and processes.
- Operational efficiencies are understood and executed.
- Emphasis on organizational growth.
Invest the Time in Understanding your Performance and Capacity Needs

Understand Your Performance and Capacity Objectives

Performance optimization and capacity planning can be an intuitive and complex process. When beginning a performance optimization project, you should have clearly defined objectives of what problem or issue you are tackling and the expected end result should be from the optimization project.

The same approach should be treated in managing the capacity of your Blackboard system. Fortunately, understanding capacity planning objectives can be more straightforward then defining performance objectives. For one, you have more tangible variables (budget, bandwidth, growth and usage) at your finger tips for analysis. Second, as an administrator you are probably more familiar or experienced in planning for capacity.

Your number one objective might be to mitigate the number of calls or emails from your direct supervisor or an academic advisor complaining about the performance and/or uptime of your Blackboard system. Possibly, your primary objective is to avoid having your name, picture, e-mail or phone number showered over the school message board. Whatever your objective(s) may be, make sure they are achievable and acceptable to your user community.

You might have a project such as performing a batch copy of several courses prior to the start of the academic calendar. Past performance of this operation proved to be slow, and the window of opportunity you scheduled wasn't met last go round. The same could be said about capacity. The available resources (network, processing, storage and memory) might have become saturated based on the workload you needed to process. All you know is that you need to be able to process the job with the resources on-hand or in a certain time window, but how? Will you need more hardware, thus more budget funding? Will you need more time to process?

Whatever the case maybe, it is never too late to define performance and capacity objectives. The can be the result any of the following:

- The result of a recently identified issue or problem.
- Scheduling a maintenance window.
- Planning for an upgrade.
- Planning a rollout to new users.
- Planning a rollout of new features.
- Integrating with other systems.

Define your performance and capacity planning objectives as clear and concise as possible. In this case, your performance objective is to improve the processing time of a batch course copy operation in order to fit in your maintenance window. Your capacity objectives could be to utilize less than 30% of existing resources during peak usage and 70% during off-peak usage based on the available hardware you have for your Blackboard site.

Your processing window should be a defined interval of time, as well as the workload (number of courses to be processed via a copy operation). As we go further in this document, we will discuss further how to identify the performance symptoms of this example and then diagnose the reasons for the symptoms. We will then offer up guidance on resolving this example and others like this example.

Optimize Your Infrastructure

Most Blackboard sites are operationally moving from supported to mission critical. There used to be a time when email was one of a handful of applications at a learning institution that needed 24 X 7 operational uptime. In today’s Internet-driven economy, your Blackboard implementations are becoming equally important as your back-office and messaging applications. As result of this increased uptime demand, many customers are dedicating full-time staff to manage both the functional and technical needs of the system. Deployments are spanning dedicated, often redundant equipment for availability and performance needs of an adopted system to support the usage behavior of their user community.
The days of installing software, crossing your fingers and letting your users have free will on your Internet systems are essentially over, or in this author’s option should be. Your users are becoming more sophisticated in how they communicate and use Blackboard to simulate academic conditions or needs in a digital environment rather than in the class or on paper. Their expectations of their Internet experience have changed as well. Their patience with Blackboard response times is indistinguishable from their experiences on external web sites such as eBay, Google or Yahoo. As you might figure, the companies mentioned above put a lot of effort and money in managing the performance and stability of those sites.

Understand the working parts of your Blackboard system. Nobody expects you to be a guru in all of the sub-systems, but you are expected to know enough to be dangerous. The parts are pretty simple. Basic installations have a web server component (IIS or Apache), the application server (Tomcat) and the relational database (SQL Server or Oracle). More complicated installations have all of the basic installation components, load balancers, shared storage, integrated authentication models, database clustering/failover, etc.

Nothing is holding a Blackboard administrator back from learning the working parts other than themselves. Build up your skills slowly, using Internet research and books to fill certain knowledge gaps. Install the product on a sandbox or development environment strictly for you to play around with various configurations and settings.

Optimize your environment from the start based on knowledge of the various sub-systems part of your Blackboard architecture. Monitor early and often. Test early and often. Realize that finding the optimal configuration for your current performance and capacity needs and/or to support future needs and behavior requires time, measurement and effort. Try to maintain a static configuration for a defined time period for measurement purposes, such as one month, one school period (semester, trimester or grading period) or even one year.

Make the investment as soon as you can in understanding how well your Blackboard site performs. Ask yourself, your teammates and your user community if it’s performing up to snuff, or if there is something you could do to improve the performance. You might be surprised that you are meeting your users’ expectations, or you might find out that your users were so disappointed in the performance of the site that they stopped using it entirely. Nobody wants your adoption to decline, especially you since your job is to manage your learning institution’s Blackboard environment. It’s never too late to make performance or capacity improvements.
Capacity Planning: Building an Ideal Blackboard Environment from the Start

As a Blackboard system administrator, your responsibilities expand beyond keeping the site up and running. These responsibilities range from making sure you have proper back-ups of all critical data to ensuring your network can handle the bandwidth needs of your users. Capacity planning is a critical component in maintaining the health and performance of your Blackboard system. It is a practice or trade that everyone can do with little to no formal training. Everyone responsible for managing a Blackboard site should be well equipped in performing this responsibility. As we said before, it's never too late to apply the principles and techniques we discuss in this article.

Introduction to Capacity Planning

Let us start off by saying that capacity planning is not load testing. It's often mistaken by administrators as an item to check off before deployment or after an upgrade as a task to be performed in the form of a load or stress test. In fact capacity planning bears no resemblance to load testing.

Capacity planning is the analysis of historical and present-day artifacts of application and system resource usage and trends used to predict the future resource needs of the application and system based on static, steady or exponential growth. It is also about understanding the management of the system today to accurately handle the needs of the system for the future. In lay terms, it's studying the past performance of your Blackboard system to predict the future.

Capacity Planning Factors

The number of factors involved in managing the capacity of your Blackboard system can become overwhelming; almost like spinning plates or juggling fire. As an administrator you have to deal with network bandwidth, storage, processing utilization, data back-ups, equipment, let alone the various parts of your Blackboard system (Web Servers, Application Servers and Relational Database Systems). The system capacity required to support your Blackboard site depends on the specifics of past, present and future user behavioral patterns, growth rates and system resource consumption.

The following sections discuss several of these factors. Understanding these factors and considering the requirements of your Blackboard site will assist you in determining the ideal configuration. You will notice that many of the factors are inter-related and referenced quite frequently.

<table>
<thead>
<tr>
<th>Determining an Initial Deployment Architecture</th>
<th>Handling Adoption and Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Archiving Data</td>
<td>Back-ups and Restoration</td>
</tr>
<tr>
<td>Maintenance Windows and Tasks</td>
<td>Integrating with External Systems</td>
</tr>
<tr>
<td>Redundancy and Failover</td>
<td>Upgrades (Software and Hardware)</td>
</tr>
</tbody>
</table>

Determining an Initial Deployment Architecture

Most administrators who are reading this document have already deployed and managed their Blackboard system for quite some time. In some cases, years covering many different releases of the product as it has matured. For those special few who are new to Blackboard or plan to roll-out a brand new implementation then this section can be quite beneficial. The best advice we can give you is to understand the key factors that will affect performance and capacity. Specifically, try to identify the following:

- Eventual user deployment (not your Beta deployment)
  - Will you deploy to the whole community or just a sub-set?
- Will the hardware you deploy be used for the length of the deployment or have you budgeted for growth?
- Has your business community defined user behavior within the application?
  - Session patterns
    - Length of sessions access
    - Frequency of access (hourly, daily, monthly, quarterly, etc.)
    - Transactional nature of user sessions.
    - Patterns of concurrency.
  - Features to be rolled-out
- Storage Needs

© 2006 Blackboard Inc. Proprietary and Confidential
• Uptime Requirements
• Network Access and Security
• Business Processing Needs
• Integrations with other systems
  ▪ Perpetual or Real-Time
  ▪ Scheduled
  ▪ Unpredictable based on ad-hoc need

As administrators it is important to understand that managing Blackboard should not be treated like managing a black box. Use your knowledge and experience with all of the working parts (network, hardware, file servers, web servers, application servers and relational database systems when baselining your initial configuration. Refer to Blackboard documentation (installation and administration manuals) for specific configuration settings that might differ from the configuration(s) you are historically familiar with.

Handling Adoption and Growth
Adoption and growth are two capacity planning factors that as an administrator you have the most amount of control in managing. Adoption can occur in several ways. The first could involve existing users increasing the frequency of use and the transactional nature of their behavior on the system. The second could involve new segments of the user community adopting Blackboard and/or features within Blackboard that were not traditionally utilizing the application. We correlate growth to data. Over time Blackboard environments grow in composition of both file system and relational data.

We suggest that administrators do their best to get visibility with key decision makers in charge with the functional deployment of Blackboard. Specifically, we suggest they work with the individuals responsible for the making strategic decisions about feature and functional roll-out, deployment audiences and integration with ERP and legacy systems in order to understand plans for the present year, the upcoming year and beyond. Without this type of communication, you will find it nearly impossible to make important decisions tied to budgeting and operational management of the system. If no one fills this role at your institution, do whatever you can to identify the information from the various non-committed parties.

As an administrator much of the data is available at your fingertips in order to understand adoption pattern changes and volumetric growth of the system. Invest your time in developing reports for you or key decision makers about the utilization and growth of Blackboard. Try to capture metrics showing user-oriented activity, as well as resource utilization and consumption.

• User/Session Access Frequency
• User/Session Access Patterns
• User/Session Behavior
• Volumetric Data Growth

• Resource Utilization
  ▪ Processing
  ▪ Memory
  ▪ Network Bandwidth
  ▪ Disk/Storage

Correlate this data to show how divergent you Blackboard environment has changed (adoption and growth) over periods of time (daily, weekly, monthly, quarterly, yearly or other). This type of data is invaluable in making key decisions in the management of your Blackboard environment.

Archiving Data
In the last section we discussed how volumetric growth can grow to an inordinate amount of data in short periods of time. To many the data populated in Blackboard can be viewed as mission critical. It is a sure bet that if you kept metrics on access patterns against various pieces of data over a certain time period, you might find that you have a lot of unused data. Different users are particular about their data. We strongly suggest you define a strategy about archiving data. Tools are available within the product to archive data. They can be compressed, exported, moved to our Content System. You name it...the product can pretty much do it.

An archive strategy should consist of the following:

• Terms of data availability.
  ▪ Courses will be available for a period of N Years.
  ▪ Users will be in the system as long as they are enrolled in the institution.
• Notification on when the data will be made unavailable.
• Process for requesting archived data.
• Process for restoring data.
• Offsite or secure location for archival.
• Maintenance window for archiving data.

Back-ups and Restoration
Institutions will differ on their back-up and recover strategies from each other. We encourage institutions to take the processes of back-up (data archiving) and restoration (data recovery) very seriously. First, make sure you have a plan for both processes. It should be written down, readily available, communicated to all critical parties and participants, as well as practiced on a regular basis (quarterly or semi-annually).

At a minimum, back-ups should be taken for all database and file system content, as well as configuration and customization that do not come from the base installation. Full-backs should be taken on a regular basis (daily or weekly) based on the amount of storage required and the amount of time it takes to take full-back-ups of the system. Most commercial back-up software can perform these operations in a few minutes at most. Full backups are often retained for a period of 90 days, and most often are stored in a secure off-site facility.

Partial or differential back-ups should be taken on an incremental basis to areas in system that most likely change. This could be file system and database content, or the entire system. The frequency of the back-up should be decided by the institution based on how much data the institution is willing to lose in case of failure. Many institutions that use Blackboard implement differential back-ups every hour during critical/peak usage periods. The back-up frequency changes to multiple hour intervals during low usage periods. Often these back-ups are retained over the course of 2 to 4 full back-up periods.

Another type of back-up occurs at a course package level in the form of an archive file. Many clients use this built-in feature to archive course data from the system. We recommend that clients archive courses that are inactive and/or do not need to access the data from the system for performance purposes.

We recommend as part of your institution’s back-up and recovery plan that you practice regularly performing restorations (differential and full). By practicing, you will first understand how reliable your back-ups are. Second, you will have a deeper understanding of how long the restoration/recovery process takes so that you can properly communicate the downtime. This is not something that needs to be done weekly or monthly, but should definitely be done a few times a year.

Below are some tips and tricks that you should consider taking on if you have not regarding back-ups and restoration:

• Identify whether your institution has a back-up and restoration policy for enterprise applications.
• Identify if there are any back-up and restoration tools already within the institution available to be used for Blackboard (if not used already).
• Identify how long a full-backup to physical media (not the server) takes.
• Identify how long a differential-backup to physical media (not the server) takes.
• Identify a schedule for full and differential back-ups based on cost, availability and/or use.
• Document your plan and train all participating members on the plan.
• Set-up an automated process to alert you when back-ups fail so that you can immediately remedy the situation.
• Identify an off-site location for storing back-ups.
• Practice...practice...practice...

Maintenance Windows and Tasks
As part of your back-up and restoration activities, you were tasked with identifying periods of peak usage. The best maintenance windows are periods when users avoid the system. In non-globalized deployments it is often easy to pick a window of opportunity to shutdown the system and/or limit access to the environment. Internationalized deployments requiring 24 x 7 access are somewhat challenging to identify windows of downtime. The point we are making is pick the window that will have the least substantial impact to your users.
Schedule your maintenance windows based on the total amount of downtime or non-operational use of the application that you actually need. The last thing you want are a bunch of angry users demanding access to the application after the maintenance window supposed to end. Do your best to identify how much time is actually needed; the best way to do this is to practice on your test or development environment. Another method is to identify a set number of objectives to cover in your maintenance window (nothing more and hopefully nothing less) and identify how much time each operation will take.

Maintenance windows usually take place during undesirable times of the day, week or month for most administrators. These windows might take place at 2am or on a weekend. They are meant to be processed monitored, supervised and/or executed manually by administrators. Resist the temptation of automating a scheduled maintenance window, unless the task is so minor and won’t cause operational downtime. If the task is something that could be automated, then it probably is not worth scheduling a maintenance window.

Here is one last piece of advice. Make sure to notify support personnel and users of the system regarding any operational downtime. This could be in the form of an email or Blackboard system announcement. Also, make sure that when your site is down it is a good idea to configure a static page that announces the downtime.

**Integrating with External Systems**

Many Blackboard deployments integrate with external systems, such as directory naming, authorization/authentication and back-office systems. Integrations occur real-time, asynchronously and scheduled/batch. As a capacity planner it is important to understand the integration process (configured versus automated versus manual), points/interfaces and the frequency of integration. External integration, whether inbound or outbound, should minimally disrupt the performance of the system. If you find that the performance and/or capacity of the system are negatively altered by the integration, then you should definitely evaluate the purpose and outcome of the integration.

**Redundancy and Failover**

Many Blackboard deployments contain redundant configurations, such as load-balanced application servers, clustered databases (active and passive) and dedicated offline environments. Please note that load-balanced application servers, while redundant in nature, do not necessarily define whether a configuration is fully redundant with failover. A load-balanced application configuration might have a single point of failure at the load-balancer level, the file server or the database server.

Blackboard has been architected to be deployed in most standard high-availability configurations. Some configurations, such as Oracle Real Application Clusters (RAC), require additional configuration from our Global Services team to handle load-balancing and failover.

Determining whether to deploy in a high-availability configuration can come down to two factors: cost and need. Many redundant configurations can cost as much as twice as the primary deployment environment. Use of third-party software to accompany the failover component might add an additional cost overhead. Determining the need of a redundant, failover environment is dependent on the maturity of the application in the institution, the need for constant uptime and an organization’s ability to recover from an operational downtime.

**Upgrades (Software and Hardware)**

Software upgrades will take place on a regular basis. Updates are not only subject to Blackboard patches and new releases, but also operating system patches/uploads, database patches/uploads, JDK patches/uploads, LDAP/Directory services patches/uploads and firmware patches/uploads. It is important to establish a series of processes for staying on top of when the patches are available and what the effects of the patch will have on the deployment environment. We recommend that all patches are applied to development/test environments before production. Additionally, it is important to identify windows of opportunities for periods of operational downtime. Hardware upgrades and complicated upgrades could require that the application be taken offline for a short or extended period. Work with institutional personnel and even users regarding acceptable maintenance windows for operational down.
Behavior Modeling

Behavior modeling is a form of trend analysis of how your users navigate and transact on your Blackboard system. There are thousands of tools available in the open source and commercial marketing which assist with the collection and interpretation of the data generated by your users. Very few system administrators perform behavior modeling, for the most part because they do not understand how to interpret the results of the collected data. Our message to system administrators is that you are doing a disservice to yourself by not studying the behavior and patterns of your users in some capacity on daily, weekly, monthly, quarterly or yearly basis.

At a minimum system administrators should study complete usage periods such as a semester or grading period as a means of identifying ideal windows of opportunity for system administrative activities that might require taking down the site. Obviously you would want to schedule maintenance windows at optimal times such as periods of low usage, rather then the assumption that the hours of 2am to 6am Sunday morning is the optimal window. What if it turns out your users rarely use Blackboard on Tuesdays from 3pm to 9pm? You might decide to schedule your maintenance activities for the more ideal window.

Behavior modeling can be used to understand patterns of concurrency and high workloads. Have you ever noticed when driving on a major road or highway a set of wires that span the width of the road for your car to drive over? Those wires are used to collect information about traffic patterns, specifically the volume and frequency of travel from point A to point B using the instrumented road. Transit authorities use the data to determine whether to change the timing of lights, expand lanes, perform maintenance, as well as other activities.

Artifacts from your Blackboard system can be used in the very same fashion to understand the so-called traffic patterns of your users. You can use log mining tools to determine where, when, how, how many and what your users were doing on your Blackboard system. From the instrumented data, you should be armed to make the appropriate cost- or time-oriented decisions essential for managing a healthy Blackboard system.

Quality of Service

The term quality of service is often tied to network bandwidth and uptime. We believe that the same concepts in delivering a high-quality of service for networks can be applied for your Blackboard site. As administrators you have the resources available to tell you answers to the following questions:

- Where are my users coming from?
  - Are they visiting ad hoc?
  - Are they visiting in groups as part of a classroom or laboratory environment?
- What frequency do they visit my Blackboard site?
- How long do they stay logged into my Blackboard site?
- What are they doing when they visit?
  - Do they tend to go to concentrated areas in the application?
  - Do they only use certain functionality?
- What times of the day, week, month, etc. do they tend to visit?
- How much bandwidth are these users consuming sending and receiving files from Blackboard?
Care and Feeding for your Blackboard Application Environment

Below are several quick tips of the trade all clients should consider when managing their Blackboard deployment. While the list is comprehensive, there are many other factors affecting performance and capacity planning.

Measurement of Resource Utilization

The measurement of system resource utilization is absolutely critical in understanding the performance and capacity needs of your Blackboard deployment. At a minimum, institutions should invest the time and effort to have freeware or commercial tool sets implemented to provide heuristics tied to resource utilization. Information from these tool sets should capture data from an hourly, day, week, month and even yearly perspective. This will assist in understanding patterns of peak and low utilization periods.

Database Maintenance and Management

Thousands of books, articles and case studies have been published about the importance of database maintenance and management. We want clients to understand that databases require a lot of care and feeding. Think of your database like a garage or storage closet. A lot of things get put in them and over time they can become quite disorganized containing useless or unnecessary information. Not all deployments require a dedicated DBA to manage the environment. However, all Blackboard deployments should have a series of routine database tasks managed by someone on a scheduled basis. This includes the following:

- Database File Management and Growth
- Backups and Exports
- Security Management
- Database Indexing and Statistics
- Removal of Unnecessary Data
- Extent Growth and Management

Log Review and Rotation

Log files fill-up fast and regularly. The larger the files become the slower access to writing to those files get. We recommend on heavily active systems that logs are rotated daily. On less active systems, weekly rotations are acceptable. Logs can be rotated using the Blackboard log rotation tool without shutting down the system.

Logs should be reviewed for reporting purposes. Often issues are not reported by users unless the issue persists repeatedly. Administrators should review log files for errors within the application, missing links, etc. A good practice is to write automated parsers that check for issues and generate a report of key errors and warnings.

Automated Scripts

The more a deployment becomes automated, the easier it is for administrators to take on additional work and streamline processes. Start with redundant daily tasks such as back-ups, system monitoring and collection, system integration, log parsing and log rotation. Over time, your script library will grow to real-time optimization, patch application, etc.

Archiving Data

Many institutions have defined periods in which data must be accessible via the Blackboard system. If no definition is in place, work with key stake holders in defining the life of a piece of data. The value in doing this is that Blackboard provides a number of tools that can assist in the archival of data without having to restore from a tape or backup. It is also important in managing the growth of the system for capacity planning purposes. As an administrator, you will not only be able to remove unused or unnecessary data, but you will also be able to predict trends of data growth. This will make hardware/storage purchases easier, as well as determining your window of opportunity for conducting back-ups or data recovery exercises.
**Backups...Backups...Backups...**

A lot has already been said about the importance of back-ups. It is important to reiterate the following. Develop a back-up policy with clearly defined goals and procedures. Practice the procedures regularly, not just the back-up, but the recovery exercise as well. Identify your window of opportunity to back-up, as well as restore. Most importantly make sure that the right data is being back-ed up.
**Diagnosing Performance Issues**

The techniques to resolve a performance issue is no different than the techniques applied for solving a functional issue. The same level of care and effort in solving the issue should be given. We recommend the following three steps as the appropriate path for problem determination and resolution:

- Diagnose the Issue
- Resolve the Issue
- Follow Up with the Issue

**Performance Realities**

There are two primary types of performance issues that creep up on customers. The first and obvious performance issue is based on the system’s inability to sustain the workload generated by system users. The second and somewhat surprising issue is tied to the volume and growth of data the system collects over time.

As we discussed in the Introduction, the adoption of Blackboard has grown ten-fold. Institutions that began their Blackboard implementation as a small pilot of a few courses have grown to astounding, highly-interactive communities that utilize Blackboard as institutional digital lifeline. What you have is a situation in which your users, whether they are casual or intense users increase their frequency of access to Blackboard, expand their session activity, as well as introduce higher levels of concurrency. In many cases handling the increased workload involves optimizing the Blackboard application environment through tunable parameters in the logical tiers of the implementation. In some cases, the increased workload is so vast that additional server infrastructure is necessary to relieve the workload issues.

Compound growth of data occurs throughout the application. There are several key areas in the application data model (file system and database components) that can grow to disproportionate levels over time. Areas to consider for data management are COURSES, USERS and the ACTIVITY ACCUMULATOR. We recommend that institutions establish an archival strategy for COURSES and USERS on the system. Simply disabling particular courses and users is not enough. We also recommend that as part of this strategy, you define periods of time in which the COURSE and/or USER will be contained in the system. If a course is not valid in the current system, look to archive the course after a predefined window such as one year or eighteen months. There are many tools that are packaged with Blackboard to handle processes such as Course Archive or Purge Accumulator.

**Setting Performance Objectives**

Performance objectives should be quantifiable and realistic. They should not be based on expectation, but rather experience. Somewhere along the way in the development of the Internet, a standard of 7 seconds was put in people’s heads about how long a web page should respond. It is important to note that 7 seconds is a long time (one...two...three...four...five...six...seven). When we are asked questions about how long should a process take? Our answer is emphatically “It depends.” Clients hate this answer because they are looking for a one-size fit’s all answer for a complicated problem.

Performance objectives should be set on a case by case basis. We recommend that administrators do their best to identify the critical use cases (operations) that any type of user would perform against the application. The use case can be a web operation or batch/command-line operation using any of the Blackboard tools. Start with a chart that plots your critical use cases, expected response time based on past experience, actual response time and the current state of system resources when the transaction was actually executed. We will go into the process of decomposing a performance issue based on the chart below in the subsequent sections.
Table 1

<table>
<thead>
<tr>
<th>Transaction Name</th>
<th>Expected Response Time</th>
<th>Actual Response Time</th>
<th>Resource Saturated (Yes/No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access My Institution (default layout)</td>
<td>3 to 5 seconds</td>
<td>7 seconds</td>
<td>No</td>
</tr>
<tr>
<td>Snapshot (1000 users)</td>
<td>60 seconds</td>
<td>90 seconds</td>
<td>Yes</td>
</tr>
<tr>
<td>Submit a 20 question all at once assessment</td>
<td>5 to 7 seconds</td>
<td>20 seconds</td>
<td>No</td>
</tr>
</tbody>
</table>

**Diagnosing the Issue**

Most users fail to report issues to their system administrators. This is a common theme among not only Blackboard users, but other enterprise software packages system users. Part of the reality for the user is that reporting an issue is not worth the time or effort. If you are seeing a performance issue for the first time in all likelihood someone from your user community saw the issue before hand and failed to report the issue. The exception to this scenario would be an administrative process or batch-process run only by administrators.

For the most part issues are reported when:

- Administrators experience performance issues first hand for their own tasks.
- Instructors are performing course administration activities.
- Instructors are working on the product in a classroom environment.
- Administrators pick up student chatter in BLOGS and Discussion Boards.

So what does this mean for system administrators? Identifying the actual performance bottleneck is hard and requires a well formulated approach.

**Interviewing**

If the issue was not reported by you, then interviewing the reporter of the issue can be quite helpful in timely problem resolution. Logs are great artifacts, which we strongly recommend you utilize in decomposing a problem. However, spending a few minutes asking your user’s simple questions like the examples listed below could potentially save hours of chasing a problem that might not exist. The problem could be user error or misconception of application functionality.

There is an infinite list of questions that need to be asked in solving a performance issue. The top two questions are:

- What was the issue?
- Can the issue be replicated/repeated at will?

**Collect Useful Information**

- Blackboard Log Utilities
- Assess the issue hands-on (recreate the issue if possible)
- Monitoring Tools

**Dissect the Issue**

- Determine Symptoms
- Utilize Collected Information
- Identify Patterns and Trends
Resolving Performance Issues

Resolving a performance issue or series of issues is a challenging feat. In order to begin resolution, you must have already completed a thorough diagnosis of the issues. That means following the steps above of replicating the issue, collecting useful instrumentation, isolating symptoms and interviewing observers of the performance issue. Resolving performance issues is about connecting dots. Not all of the dots are readily visible, but with thorough decomposition, they will become clear.

Problem Determination

A problem can be a consistently poor response time metric or a processing window that exceeded the expected execution time. In order to resolve the issue, you must determine the nature of the problem by asking yourself and/or your team a series of questions:

- Is the problem consistent?
- Can the problem be recreated?
- Has the problem been seen before? If so, how was it resolved?
- Is the problem specific to one operation or similar/like operations?
- Is the problem specific to a set of data or similar/like data?
- Is the problem seasonal or reflective based on patterns of time?
- Are there any artifacts, such as stack traces in the log files that will assist in determining the problem?
- Is the environment subject to routine maintenance?
  - What was the last maintenance performed on the system?
  - How much of the system maintenance is automated?
  - Were there any issues with the automation?
- Have there been any changes to the implementation?
  - Has there been an increase in growth?
  - Has there been an increase in adoption?
  - Has there been a change to the physical environment?
  - Has there been a change to the application configuration?
  - Has there been a change to any integration?

There are hundreds to thousands of more questions to ask yourself or your team. The basic premise is determining whether the response time and/or processing time behavior is characteristic or uncharacteristic of the deployment. The supplementary premise is determining the changing factor.

Problem Resolution

The resolution depends on the outcome of the problem determination. Resolutions are not always easy to come to. They may require hours, days or possibly weeks of effort before they are resolved and the issue subsides. It is important to understand what exactly the problem is before you implement any changes. By introducing another change to the environment, you might introduce a deeper problem or simply hide the problem until a later incident. Therefore, you want to make sure that the problem is easily identifiable and the resolution path is just as clear.

Not every problem will be easily solved by the change of a configuration setting, addition of hardware, or a patch upgrade. It is key to eliminate non-determining factors as soon as possible. When you are ready to resolve the problem, it is important to keep the problem open or on a master list until you are absolutely certain the problem has gone away. If you were able to recreate the problem at will, then after implementing your resolution you should no longer be able to recreate the problem at will. If it shows up sporadically, it most likely means you really did not solve the problem, but simply addressed the symptoms. If the problem is seasonal or time-oriented pattern/trend make sure that you hold off closing out the problem until you go through the same time period again without issue. Remember, there are no silver bullets to resolving issues. The process is drawn through identification → decomposition → resolution.

Documenting and Sharing the Experience

There are thousands of Blackboard deployments across the world. While no two deployments are exactly the same, they are most likely very similar in nature. Most often then not, issues that you have gone through or are presently going through happened at another deployment. Share the issues with your Blackboard support personnel and the various public forums, so knowledge base articles can be written and shared.
Appendix A: Web Server Performance

The Blackboard application environment is comprised of several logical sub-systems. One of these sub-systems is responsible for managing http/https requests and replies. Depending on your application deployment architecture (Windows or UNIX), you will have either Microsoft IIS or Apache.

Microsoft Internet Information Server (Windows-Only)

Microsoft has written a voluminous amount of performance-oriented documentation about their Internet Information Server product. Simply go to the following link below and you will find close to hundred or so supplemental chapters dedicated to optimizing IIS.

http://www.microsoft.com/resources/documentation/IIS/6/all/techref/en-us/iisRG_PER.mspx

From a Blackboard perspective, the IIS web server has minimal processing purpose. We do not use its http/https processing capabilities other then relay to our Perl and Java engines. As of Application Pack 2 of Release 6, we stopped serving content via the web server and pushed that activity to the application layer. IIS is used on Windows for managing the Perl engine for Windows (PerlEx). We cover this part during the application server performance section.

We recommend that clients update their Blackboard web site to expect more than 100,000 hits per day. This change is made on the Performance tab under Properties. The following sites can be shut down in IIS if the customer is not using the Blackboard server to host other sites or services:

- SMTP Virtual Server
- Default Administration Website
- Default FTP Website

The above sites are installed by default as a part of IIS when IIS is setup. If the default and administration sites aren’t being used they can be disabled to reserve resources. We recommend that clients dedicate hardware specifically for Blackboard and not share their environments with other applications that might infringe upon the performance of Blackboard.

IIS offers a compression service to improve network resource consumption. From a performance standpoint, response times should not improve, however the resource utilization by the web server to send the response back to a user will diminish in size. Within the link provided above, Microsoft documents a number of determining factors for using compression. We suggest that you review their recommendations and test the configuration on a test environment before carrying out the configuration. Blackboard has chosen not to enable compression as part of the out-of-the-box configuration at the web server tier. We saw little performance and/or capacity gain by enabling the change.

If you are in the midst of diagnosing a performance issue on your environment and believe the problem lies in your web server sub-system, we strongly recommend you use Microsoft’s built-in instrumentation capabilities. Microsoft packages a number of performance-oriented counters which are documented in the article. We recommend paying attention to the following:

Table 2

<table>
<thead>
<tr>
<th>Object\Counter</th>
<th>Preferred or Ideal Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memory\Pages/sec</td>
<td>0-20. (Unhealthy if greater than 80; probably indicates not enough RAM.)</td>
</tr>
<tr>
<td>Memory\Available Bytes</td>
<td>10% of physical memory.</td>
</tr>
<tr>
<td>Processor\System Processor Queue Length</td>
<td>4 or less.</td>
</tr>
<tr>
<td>LogicalDisk\Avg. Disk Queue Length</td>
<td>4 or less.</td>
</tr>
<tr>
<td>PhysicalDisk\Avg. Disk Queue Length</td>
<td>4 or less.</td>
</tr>
<tr>
<td>LogicalDisk\Avg. Disk Bytes/Transfer</td>
<td>As high as possible.</td>
</tr>
<tr>
<td>PhysicalDisk\Avg. Disk Bytes/Transfer</td>
<td>As high as possible.</td>
</tr>
<tr>
<td>System\System Calls/sec</td>
<td>As low as possible.</td>
</tr>
</tbody>
</table>
Apache Web Server (Unix-Only)

Many administrators in the academic community are familiar with the Apache web server. The freeware product comes from the acclaimed Apache Software Foundation (http://www.apache.org). Blackboard ships with Apache 1.3 single threaded server.

From a Blackboard perspective, the Apache web server has minimal processing purpose. We do not use its http/https processing capabilities other then relay to our Perl and Java engines. As of Application Pack 2 of Release 6, we stopped serving content via the web server and pushed that activity to the application layer. Blackboard comes with two independent installations of Apache; one for http/https and the other for mod_perl.

The Apache web server has a number of tunable configuration settings that can affect performance. We will cover some of these settings below. A more complete list can be found in the application as of Application Pack 2 of Release 6 under the System Administration Panel page.

We ask that you become familiar with performance-oriented resources from Apache. These resources can be found at the following address http://httpd.apache.org/docs/misc/perf-tuning.html.

MaxClients

The Apache MaxClients setting dictates the number of http client requests a server can handle concurrently at that moment in time. Blackboard by default ships with a maximum value of 1024 MaxClients without rebuilding Apache from source. We recommend that this setting be equal or 10% less then the number of Tomcat maximum application threads. The value should never be higher then maximum thread count value in Tomcat.

Please note that increasing your Apache MaxClients count will not always resolve a performance issue. Performance issues should be diagnosed with care and accuracy in a manner in which bottlenecks are identified down to the specific resource.

Spare Servers

Spare servers (spare child processes for Apache) are the number of new requests the system can simultaneously handle without creating new server processes. The MaxSpareServers sets the desired maximum number of idle child server processes. The MinSpareServers sets the desired minimum number of idle child server processes. An idle process is one which is not handling a request. Too few spare servers may create a performance issue because too many children are created; too many and memory will be affected.

Administrators who see errors in the Apache logs may want to adjust the Spare Server setting. The default setting for MinSpareServers is five, and the default setting for MaxSpareServers is ten. If the Apache child processes are frequently created and destroyed, Administrators may also want to consider adjusting these settings.

These settings may be modified in /usr/local/blackboard/apps/httpd/conf/httpd.conf. After making these changes, restart Apache.

Note: There are no exact recommendations for these settings, as the optimal setting is influenced by system configuration, size and usage. Administrators should experiment with these settings to find an optimal balance for their system.

Server Status Page

Apache's server status page is helpful when monitoring system performance. Information on the server status page is located at http://httpd.apache.org/docs/mod/mod_status.html.

To configure the server status page, follow the steps below:

Step 1 In /usr/local/blackboard/apps/httpd/conf/httpd.conf locate and uncomment the ExtendedStatus line.
ExtendedStatus On

**Step 2**  Locate and uncomment the text below:

```xml
<Location /server-status>
    SetHandler server-status
    Order allow,deny
    #Deny from all
    Allow from all
</Location>
```

After making these changes, restart Apache and go http://servername/server-status to view the Server Status page and see what is happening in the Apache server. For security reasons use the Allow from syntax to restrict what domains you want to have access to the server-status page. You will find that the report can be quite helpful in determining the utilization of resources (physical/hardware and logical/interface). You will be able to make calculated decisions based on actual metrics.

**Web Server Instrumentation: What to do with your results?**

Both Microsoft IIS and Apache provide excellent interfaces for collecting instrumentation of physical and logical resource utilization. We recommend that in your efforts to decode whether the performance problem exists as part of the web server tier, that you perform instrumentation sampling over periods of volatility and stability in order to collect the most useful information.
Appendix B: Application Server Performance

The Blackboard Academic Suite is a composite of two programmatic languages (PERL and Java). The original application was written in 100% PERL and over several releases has been drastically ported to Java. Below you will find information about the role each application container plays in the architecture scheme with advice on managing performance.

Tomcat Java Application Server

Tomcat is an open-source Java application container part of the Apache-Jakarta project. Many ISVs package Tomcat with their Java applications. It is the most highly recognizable Java application container on the market. Much has been written about Tomcat performance. However, the most important factors in understanding Tomcat performance is understanding the role of the Java Virtual Machine (JVM) and container components such as execution threads and JDBC connections. There are several web sites available for performance guidance.

- JVM: [http://java.sun.com/docs/hotspot/gc5.0/gc_tuning_5.html](http://java.sun.com/docs/hotspot/gc5.0/gc_tuning_5.html)
- Java Development (Building Blocks): [http://www.javaperformancetuning.com](http://www.javaperformancetuning.com)

Tomcat Threads

The following Blackboard property represents the maximum value of Tomcat application threads. Suggest that administrators use this property conservatively and understand system usage need versus resource capacity. A one to one correlation between application threads and system users does not exist. Tomcat uses a thread pool to manage a volume of user transactions. Most components in the application make single thread requests. Some transactions will require two or more threads. These types of transactions are not multi-threaded, but rather require multiple independent requests such as a frameset. Thread requests typically are sub-second.

Sizing the maximum thread count value is different for every implementation of Blackboard. Our best advice is to size the maximum value based on need during peak usage time. Start with a relatively conservative value, such as our default of 200. Monitor the thread usage through your Operating System provided tools (Windows Task Manager, Prstat or Top). Increase your thread count in increments of 25 to 50 as your threads become saturated or used. Please note that thread consumption is a symptom of a performance issue or degradation. Increasing your thread count will not always solve a performance issue. Performance issues should be diagnosed with care and accuracy in a manner in which bottlenecks are identified down to the specific resource.

If there is CPU consumption and high memory utilization but few users and transactions running on the system, reduce the maximum thread count value by a factor of 10%. Continue reducing by a factor of 10% until the system levels out. Before any changes are made always identify that the CPU and other system resources are in fact being utilized by the Tomcat processes.

When running on a Unix platform (Linux or Solaris) always make sure that the maximum thread count value is equal or greater then the Apache web server maxclient value. No comparative formulas are available for Windows.

Sizing the JVM

Sizing the memory allocation (Java Heap Size) can be different for every implementation of Blackboard. Just like the maximum thread count value for Tomcat, sizing the heap is dependent on usage. We recommend starting with the default value of 1024mb or 1GB unless otherwise needed. The JVM has built-in flags such as -verbosegc and -Xloggc that can be implemented to determine actual memory usage. You can also monitor memory consumption via the Operating System provided tools (Windows Task Manager, Vmstat, Prstat or Top). Increase your memory allocation in increments of 125 to 256mb as your memory resources become saturated or consumed.

Windows and Linux versions of the Sun JVM cannot be sized greater than 1.8 GB. Solaris JVMs can scale up to 3 GB, which at that point requires a change of JVM switches to an intimate shared
memory flag. An allocation of 1 GB if properly managed will suffice for each instance. For more details on configuring JVM options beyond the default -Xms and -Xmx values, please refer to http://java.sun.com/docs/hotspot/VMOptions.html.

Mod_PERL Application Server (UNIX Only)

Blackboard on Unix (Linux or Solaris) uses a second Apache instance for handling Perl transactions. Each system process is roughly a few hundred kilobytes in size, but can grow as high as 40 to 60mb in size.

MaxClients

The Apache maxclients setting dictates the number of client requests a server can handle concurrently at that moment in time. Blackboard by default sets this value to 20. On most systems this value will support the needs of a given application server. We recommend that this setting be used conservatively. Monitor the maxclient usage through your Operating System provided tools (Prstat or Top).

Increase your maxclient count in increments of 3 to 5 as your maxclients are consumed with CPU activity (Run or CPU state). Please note that consumption of this resource is a symptom of a performance issue or degradation. Increasing this resource will not always solve a performance issue and in some cases could cause degradation. Performance issues should be diagnosed with care and accuracy in a manner in which bottlenecks are identified down to the specific resource.

Spare Servers

Historical performance guidance recommends that this setting be close or identical to MaxClients in order to maintain minimal delay or wait periods between transactions, unless the server is performing responsibilities beyond Apache. Performance testing has not shown degradation by setting this value at the default.

Note: There are no exact recommendations for these settings, as the optimal setting is influenced by system configuration, size and usage. Administrators should experiment with these settings to find an optimal balance for their system.

Server Status Page

Apache’s server status page is helpful when monitoring system performance. Information on the server status page is located at http://httpd.apache.org/docs/mod/mod_status.html.

To configure the server status page, follow the steps below:

Step 3 In /usr/local/blackboard/apps/httpd/conf/httpd.conf locate and uncomment the ExtendedStatus line.

ExtendedStatus On

Step 4 Locate and uncomment the text below:

<Location /server-status>
SetHandler server-status
Order allow,deny
#Deny from all
Allow from all
</Location>

After making these changes, restart Apache and go http://servername/server-status to view the Server Status page and see what is happening in the Apache server. For security reasons use the Allow from syntax to restrict what domains you want to have access to the server-status page. You will find that the report can be quite helpful in determining the utilization of resources (physical/hardware and logical/interface). You will be able to make calculated decisions based on actual metrics.
**PerlEx Application Server (Windows Only)**

If ‘Out of Memory’ errors appear in the Perl log, or if overall Perl performance is slow, tuning the PerlEx options may improve performance. PerlEx configuration options are stored in the system registry under:

HKEY_LOCAL_MACHINE/Software/Blackboard, Inc./Blackboard6/PerlEx/

Options that may be tuned include Reload, Interpreters, MinThreads, and Trace.

**Reload**
Lowering reload count will lower performance but may improve stability. The default for the reload count is 1024[0x400]. This may be lowered to 512[0x200] or 256[0x100].

**Interpreters**
A single interpreter is created for each thread in the database. The vendor, Active State, recommends setting the number of interpreters to between two and four times the number of processors for the Blackboard application, but in practice, it has been found that long running processes often tie up an interpreter for some time, meaning more interpreters may be supported. For large boxes (eight or more processors,) clients may be able to go to six or eight times the number of processors.

**MinThreads**
Thread count for maximum performance may be the same as the number of interpreters. For resource-constrained machines, the thread pool size should be smaller (for example, three for eight interpreters).

**Trace**
The higher the trace level, the slower the system will run.
Appendix C: Advanced Topics

Techniques for Conducting Load Testing

This section by itself could be a dedicated paper. For the sake of introduction, we will tell you how we perform load testing here at Blackboard. We use load testing for two primary purposes: software performance engineering and sizing/capacity planning. The two are very different, as hopefully you have seen throughout this paper. Below is a summary of the steps you should undertake when conducting load testing:

- Pick a simulation tool
- Set performance objectives
- Identify critical use cases for analysis (Study behavioral patterns of users)
- Setup a performance testing data model
- Create Performance Scenarios
- Baseline → Calibrate
- Optimize → Re-Calibrate

Pick a Simulation Tool

Let me start off by stating that load testing can be done via the API, command-line, direct to the database and/or via the user interface. We will focus primarily on the user interface for this section. Blackboard primarily uses a commercial off-the-shelf product for load simulation called Mercury LoadRunner. There are hundreds of commercial and freeware products on the market. Two great freeware products are Apache JMeter and Grinder. We have used both here at Blackboard at different times in our development lifecycle. You could also look at a great book called Performance Analysis of Java Web Sites by Stacy Joines (ISBN: 0201844540). It is a practical book that provides a summary of commercial and freeware tools, as well as a worksheet for choosing the write toolset.

Set Performance Objectives

There should be a purpose for every load test you conduct. You might want to find out how many realistic sessions per hour your system could support before resource saturation (CPU, I/O or Memory). You might want to identify what workload the system can sustain before response times become slower than 5 seconds. You might want to identify what response times are like when the data model has doubled in size in order to understand how to handle various capacity planning factors. For a matter of fact, you might want to understand what changes and adoption or new features might introduce to the response time of the system.

Whatever the case maybe, it is important to identify clear, measurable and achievable objectives. These objectives should be founded in some tangible idea or concept such as a business need or driver. Often, We often tell customers to define the performance objectives based on two factors. The first factor relates to abandonment. How poorly does the application response time have to perform before users will abandon the application? The second factor relates to the business need. How poorly does the application response time have to be for one or more of the business processes to fail?

Identify Critical Use Cases for Analysis

When defining your load test, it is important to simulate workload using realistic use cases often exhibited through the application. We strongly suggest that load tests be defined based on behavioral usage patterns exhibited in the application. Please refer to the section on Behavior Modeling above. First, you want to identify which particular transactions are executed most frequently. You will find that in most cases the Pareto Principle (80/20 Rule) will hold true that 80% of most transactions will utilize at most 20% of all use cases. You might find it more like 90/10 as you dig deeper.

Setup a Performance Data Model

Hopefully you will not be conducting your performance tests on a live production system. Most often clients will simulate their performance tests against a clone of the production system. A clone can be a parallel system and/or the production system with a back-up of production data. Using a copy of production data is often done. We don't object to do this as long as it is a backup or a snapshot of data on a given date. We do however, recommend that production data not be used during the performance test, but rather serve as volume data.

We recommend that you add a certain volume of data to your existing data model for the sole purpose of load testing. This data should be uniform in structure so that you know you are testing
uniform transactions. Each user simulated in the scenario should have unique data, such as their own user account. The data should be representative of your model. If the average user is enrolled in 5 courses, then your test data should reflect a 5 enrollment user. If you average course contains (10) 100kb word documents, then your test data should not have (100) 100mb AVI clips; that is unless you are testing the scalability of this extreme case scenario. Your data should be representative of your use case, performance scenario and your performance objective.

Create Performance Scenarios
A performance scenario is a collection of one or more use cases. Scenarios should be realistic in nature and based on recurring patterns identified in session behavior models or identified as new performance scenarios based on changes in adoption. Scenarios can be one or a combination of session paths.

A classic example of a Blackboard performance scenario is an assessment in a laboratory condition. Many clients have a scenario where students are in a computer laboratory taking a quiz or assessment. The scenario calls for all users to authenticate into Blackboard over the period of a minute. It continues with an identical navigational path for all users to a particular assessment. The users launch and execute an assessment. Upon completion, all users log-off the system.

When developing scenarios, you want to be careful to not make the fatal mistake of simulating extraneous workload. You want to avoid defining a scenario by clicking around the system randomly. You want to balance the number of read transactions versus write transactions that are representative for your performance objective. Be aware of arrival and departure rates, as well as virtual iterations. Arrival rates refer to the rate in which virtual users are loaded into a system. Departure rates refer to the rate in which virtual users are evacuated from the system.

Baseline ➔ Calibrate
Every performance load testing exercise you conduct should have a baseline. Your baseline is the starting point or comparative metric as it relates to your load testing scenario (use cases, arrival rate, departure rate, iterations and run times) and software/system configuration. Every test conducted after your baseline is to identify the performance impact of a single data point in comparison to the baseline metric. It may take you dozens of tests until you identify an appropriate baseline.

At Blackboard, we use a process called calibration as a means of identifying our baseline. We calibrate hardware systems, as well as software conditions based on our given performance objectives. We typically have three types of calibration objectives:

- Calibrate to System Saturation
- Calibrate to Identify Peak of Concurrency (Key Metric for Identifying Sessions per Hour)
- Calibrate to Response Time

When calibrating a system to saturation, our primary goal is to saturate primarily the application component of the configuration and not the database system. We will introduce a sufficient workload (combination of scenarios) to saturate the application CPUs in a steady state above 95% without sacrificing response time. We define a maximum criteria of 15 second response times for transactions that normally response in under 1 to 5 seconds on a workload-free system.

When calibrating a system to identify a peak of concurrency, our primary goal is to identify the number of concurrent transactions or hits per second (not users) that can be executed against the system before response times become unacceptable. We can then simulate the synthetic concurrent workload to obtain the number of sessions per hour the concurrent calibration can support.

When calibrating a system by response time, we are primarily concerned with understanding the workload required to force a user to abandon based on predefined thresholds. We use two policies for abandonment: utility-based and uniform-based. Utility-based abandonment Not all transactions should be weighted evenly. In cases where one transaction might have more importance than another, we use a utility-based abandonment policy. Essentially, we define tiers of abandonment and assign various transactions to a given abandonment tier based on utility or purpose. For example, we know that a user is less likely to abandon when submitting the results of their final exam compared to a user who has to wait 5 seconds for the courses tab to load. In cases when we are trying to identify the appropriate workload when all transactions must perform under a predefined response time we use a uniform abandonment policy. In several of our performance
scenarios we run a response time calibration test to understand resource utilization, concurrency and sessions per hour that a given system can support where all transactions are sub-five seconds in duration.
Updates and Additions

This document was published on:

This document was last updated on: 1/10/2007 4:09:00 PM

There have been no revisions to this document since publication.
Appendix 3: Blackboard’s Hardware, Software, and Browser Guide
Compatibility Matrixes

Overview

This section of the document includes information on the following:

- **Server Compatibility Matrix** – Explains which server configurations are supported with this release. The required versions of databases and operating systems are included here.

- **End User Compatibility Matrix** – Reviews which end-user browsers and operating systems are supported with this release.
Server Compatibility Matrix

Server Compatibility

Server software must meet certain requirements before installing the Blackboard Academic Suite, Release 8. The following are important to keep in mind when setting up the server software:

- The database is run on a separate server when using two or more servers. Thus, appropriate client tools for the database must be installed on the Web/Application server or servers when using a configuration with two or more servers.
- Certified configurations are fully tested and supported.
- Compatible configurations are partially tested but should function properly.
- When installing the Java 2 Platform, Standard Edition (J2SE), make sure that both the JDK and the JRE components are installed. Also, ensure that there are no spaces in the path name to the J2SE.
- Solaris users: ensure that the Swap space for the operating system is at least twice the amount of physical RAM on the server.

Note: Clients running the Blackboard Academic Suite on a Windows Operating System must install the .NET framework if they plan on using .NET Building Blocks.

Updating the Operating System or Database Version

When installing an update to the operating system or database to support a new version of the Blackboard Academic Suite, always update the Blackboard Academic Suite and then make the updates to the database and operating system. Installing the database or operating system on an earlier version creates the risk of destabilizing the existing, earlier version. Please take care to back up the database and file system and test the restore process before installing an update.

Certified Server Configurations for the Blackboard Academic Suite

<table>
<thead>
<tr>
<th>Windows</th>
<th>Sun Solaris</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microsoft® Windows® 2003 Server SP1 (32-bit)</td>
<td>Sun® Solaris™ 10 Update 2</td>
</tr>
<tr>
<td>• Microsoft® SQL Server 2005 Enterprise Edition or Microsoft® SQL Server 2005 Standard Edition</td>
<td>• Oracle 10g R2 version 10.2.0.3</td>
</tr>
<tr>
<td>• Microsoft® Internet Information Server (IIS) 6* (not included with Blackboard)</td>
<td>• Apache HTTP Server Version 1.3.3.33</td>
</tr>
</tbody>
</table>
### Compatible Server Configurations for the Blackboard Academic Suite

<table>
<thead>
<tr>
<th>Windows</th>
<th>Sun Solaris</th>
<th>Red Hat Enterprise Linux</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Microsoft® Windows® 2003 Server SP1 (32-bit)</strong></td>
<td><strong>Sun® Solaris™ 10 Update 2</strong></td>
<td><strong>Red Hat® Enterprise Linux® 4.0</strong></td>
</tr>
<tr>
<td>• Microsoft® SQL Server 2005 Enterprise Edition or Microsoft® SQL Server 2005 Standard Edition</td>
<td>• Oracle 10g R2 version 10.2.0.2</td>
<td>• Oracle 10g R2 version 10.2.0.2</td>
</tr>
<tr>
<td>• Microsoft® Internet Information Server (IIS) 6* (not included with Blackboard)</td>
<td>• Apache HTTP Server Version 1.3.3.33</td>
<td>• Apache HTTP Server Version 1.3.3.33</td>
</tr>
<tr>
<td>• Java 2 Platform, Standard Edition 5.0</td>
<td>• Java 2 Platform, Standard Edition 5.0</td>
<td>• Java 2 Platform, Standard Edition 5.0</td>
</tr>
<tr>
<td>• Perl 5.6.1 / Perl Ex 2.3.1</td>
<td>• Perl 5.6.1 / Perl Ex 2.3.1</td>
<td>• Perl 5.6.1 / Perl Ex 2.3.1</td>
</tr>
<tr>
<td>• Tomcat 5.5</td>
<td>• Tomcat 5.5</td>
<td>• Tomcat 5.5</td>
</tr>
<tr>
<td>• Mixed mode compatible: 32-bit application servers with a dedicated, 64-bit database server</td>
<td></td>
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</tr>
</tbody>
</table>

### Certified Server Configurations for Blackboard Learning System - Basic Edition

<table>
<thead>
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<th>Windows</th>
<th>Sun Solaris</th>
<th>Red Hat Enterprise Linux</th>
</tr>
</thead>
<tbody>
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<td><strong>Microsoft® Windows® 2003 Server SP1 (32-bit)</strong></td>
<td><strong>Sun® Solaris™ 10 Update 2</strong></td>
<td><strong>Red Hat® Linux® 4.0</strong></td>
</tr>
<tr>
<td>• Microsoft® SQL Server 2005 Enterprise Edition</td>
<td>• Small-scale Oracle 10G version 10.2.0.2</td>
<td>• Small-scale Oracle 10G R2 version 10.2.0.2</td>
</tr>
<tr>
<td>• Microsoft® SQL Server 2005 Standard Edition</td>
<td>• Apache HTTP Server Version 1.3.3.33</td>
<td>• Apache HTTP Server Version 1.3.3.33</td>
</tr>
<tr>
<td>• Microsoft® Internet Information Server (IIS) 6* (not included with Blackboard)</td>
<td>• Java 2 Platform, Standard Edition 5.0</td>
<td>• Java 2 Platform, Standard Edition 5.0</td>
</tr>
<tr>
<td>• Java 2 Platform, Standard Edition 5.0</td>
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</tbody>
</table>
### Windows

<table>
<thead>
<tr>
<th></th>
<th>Sun Solaris</th>
<th>Red Hat Enterprise Linux</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Perl 5.6.1 / Perl Ex 2.3.1</strong></td>
<td><strong>Perl 5.6.1 / Perl Ex 2.3.1</strong></td>
<td><strong>Perl 5.6.1 / Perl Ex 2.3.1</strong></td>
</tr>
<tr>
<td>Microsoft® SQL Server 2005 Enterprise Edition</td>
<td>Tomcat 5.5</td>
<td>Tomcat 5.5</td>
</tr>
</tbody>
</table>

### Sun Solaris

- Perl 5.6.1 / Perl Ex 2.3.1
- Tomcat 5.5

### Red Hat Enterprise Linux

- Perl 5.6.1 / Perl Ex 2.3.1
- Tomcat 5.5

---

**Compatible Server Configurations for Blackboard Learning System – Basic Edition**

<table>
<thead>
<tr>
<th>Windows</th>
<th>Sun Solaris</th>
<th>Red Hat Linux</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Microsoft® Windows® 2003 Server SP1 (32-bit)</strong></td>
<td><strong>Sun® Solaris™ 10 Updater 2</strong></td>
<td><strong>Red Hat® Enterprise Linux® 4.0</strong></td>
</tr>
<tr>
<td>Microsoft® SQL Server 2000 Enterprise Edition</td>
<td>Small-Scale Oracle 9i version 9.2.0.8</td>
<td>Small-Scale Oracle 9i version 9.2.0.8</td>
</tr>
<tr>
<td>Microsoft® SQL Server 2005 Standard Edition</td>
<td>Apache HTTP Server Version 1.3.3.33</td>
<td>Apache HTTP Server Version 1.3.3.33</td>
</tr>
<tr>
<td>Microsoft® Internet Information Server (IIS) 6* (not included with the Blackboard Academic Suite)</td>
<td>Java 2 Platform, Standard Edition 5.0</td>
<td>Java 2 Platform, Standard Edition 5.0</td>
</tr>
<tr>
<td>Java 2 Platform, Standard Edition 5.0</td>
<td>Perl 5.6.1 / Perl Ex 2.3.1</td>
<td>Perl 5.6.1 / Perl Ex 2.3.1</td>
</tr>
<tr>
<td>Perl 5.6.1 / Perl Ex 2.3.1</td>
<td>Tomcat 5.5</td>
<td>Tomcat 5.5</td>
</tr>
<tr>
<td>Tomcat 5.5</td>
<td>Tomcat 5.5</td>
<td>Tomcat 5.5</td>
</tr>
</tbody>
</table>

- Non-English applications, both operating systems and databases (such as a Chinese-language version of Oracle), are considered compatible with Blackboard Academic Suite Release 8. These systems have not undergone official Blackboard Product Development testing.

The Blackboard Academic Suite Release 8 products ship with Apache HTTP Server Version 1.3.3.33 (UNIX operating systems only).

The Blackboard Academic Suite Release 8 products ship with Perl 5.6.1 / Perl Ex 2.3.1.
### End User Configuration Matrix

**End User Configuration Guidelines**

End users must use a certified or compatible operating system and browser configuration with the Blackboard Academic Suite.

<table>
<thead>
<tr>
<th>Browser</th>
<th>Windows XP</th>
<th>Windows Vista Desktop</th>
<th>Mac 10.3</th>
<th>Mac 10.4</th>
<th>Mac 10.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microsoft Internet Explorer 6</td>
<td>Compatible</td>
<td>Certified</td>
<td>Not Tested</td>
<td>Not Tested</td>
<td>Not Tested</td>
</tr>
<tr>
<td>Microsoft Internet Explorer 7</td>
<td>Compatible</td>
<td>Certified</td>
<td>Not Tested</td>
<td>Not Tested</td>
<td>Not Tested</td>
</tr>
<tr>
<td>Mozilla Firefox 1.5</td>
<td></td>
<td></td>
<td>Compatible</td>
<td>Certified</td>
<td>Not Tested</td>
</tr>
<tr>
<td>Mozilla Firefox 2.0</td>
<td>Certified</td>
<td>Certified</td>
<td>Not Tested</td>
<td>Certified</td>
<td>Not Tested</td>
</tr>
<tr>
<td>Apple Safari 2</td>
<td>Not Tested</td>
<td>Not Tested</td>
<td>Not Tested</td>
<td>Certified</td>
<td>Certified</td>
</tr>
<tr>
<td>Apple Safari 3</td>
<td>Not Tested</td>
<td>Not Tested</td>
<td>Not Tested</td>
<td>Compatible</td>
<td>Compatible</td>
</tr>
</tbody>
</table>

**Key**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Certified</td>
<td>fully tested and supported</td>
</tr>
<tr>
<td>Compatible</td>
<td>key application areas tested</td>
</tr>
<tr>
<td>Not tested</td>
<td>specified Browser is not supported for the Operating System</td>
</tr>
<tr>
<td>Provisional</td>
<td>will test on Beta versions of new platforms and browsers. Certification is dependant on release by 3rd parties</td>
</tr>
</tbody>
</table>

* All configurations marked as Compatible and have undergone a limited engineering analysis to test areas of the Blackboard Academic Suite that may have browser issues.
Appendix 4: Blackboard’s Implementation Planning Overview
Overview

Blackboard’s Implementation Planning engagement is the first step in providing a foundational and holistic understanding of the technology, integration and resources that are required for a successful and supportable implementation of the Blackboard Learning System™. Successful enterprise software implementations require an investment of time on the part of all constituencies vested with the responsibility for deployment, management and adoption of online learning, content and community systems. Blackboard’s Implementation Planning service facilitates a smooth and well organized implementation of the Blackboard Learning System and requisite technologies as well as effective alignment to the client’s strategic e-Learning goals and initiatives.

The primary objective of the engagement is to develop a realistic plan that positions the client to implement the desired e-Learning environment and ultimately achieve the long term strategic goals of the organization. A critical factor in the success of any implementation plan is the establishment of clearly defined and achievable objectives to be completed by the joint implementation team.

Specific objectives of the Implementation Planning consultation will depend upon the client’s needs and requirements; they may include but are not limited to the following:

- Ensure that all team members have a mutual understanding of the implementation initiative and its alignment to the academic and business goals of the client organization
- Educate the client team on the capabilities of the Blackboard Learning System
- Identify opportunities for e-Learning process improvements
- Establish goals and objectives for the Blackboard Learning System
- Outline and prioritize major milestones in order to define the scope of each phase
- Define and outline project work streams
- Define project success criteria and measures
- Identify potential project risks and mitigating factors
- Evaluate and plan for resource impact and staffing requirements
- Develop an initial project plan and implementation timeline
- Prepare for growth and provide tools for critical decision-making

Benefits

From streamlining administrative activities to improving the user experience, implementation planning is the foundation for a successful deployment of e-Learning technologies. Blackboard clients find that significant benefits can be realized by engaging in this service and adopting the resulting recommendations. Such benefits include the following:

- Smoother transitions from one project phase to subsequent phases
- Infrastructure challenges and end user confidence issues are mitigated
- Joint participation and planning fosters interdepartmental understanding and cooperation
• Expectations for the implementation are properly set across all relevant departments resulting in greater satisfaction across the client organization
• A more comprehensive understanding of system implications, security, integration, performance, features, functions and system maintenance requirements
• Planning for system scalability more easily accommodates increased e-Learning adoption

Client Profile

This service is ideal for new Learning System clients, clients who are upgrading from a Basic to Enterprise Blackboard product, or existing Learning System clients who simply need to develop a comprehensive plan for the implementation of the Blackboard e-learning solution. This service is available to clients who are locally hosted or ASP hosted.

Client Team

Blackboard Consulting’s Implementation Planning engagement methodology assumes a high level of participation from the client organization. Client participants include key organizational stakeholders as well as IT staff with direct responsibility for the system operation, integration tools and processes. These individuals must be committed during the term of the engagement. Blackboard has found that this level of participation is necessary to prepare clients to meet ongoing maintenance, performance and user community expectations for an integrated Blackboard Learning System.

Engagement Timeline

Below is an example of a timeline for an institution requesting one week onsite. The actual timeline will be based upon the individual client’s needs and requirements.

For more information…

To learn more about this service and other Blackboard Consulting services, please contact your Blackboard Regional Sales Manager, Client Manager or Services Project Manager today.
Appendix 5: Blackboard’s Client Support Guide
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ALL SUPPORT SERVICES PROVIDED BY THE COMPANY ARE SUBJECT TO THE TERMS AND CONDITIONS OF THE APPLICABLE SOFTWARE LICENSE AGREEMENT OR SUPPORT SERVICES AGREEMENT BETWEEN COMPANY AND THE APPLICABLE LICENSEE. THE SUPPORT SERVICES DESCRIPTIONS AND INFORMATION CONTAINED ON THIS WEBSITE ARE SUBJECT TO CHANGE AT THE COMPANY’S SOLE DISCRETION WITHOUT NOTICE.
A. SUPPORTED PRODUCTS

I. Supported Products

Blackboard Inc., together with its subsidiaries (the “Company”), currently makes Support Services available for certain of its products, based on the support category to which each version of the product has been assigned by the Company and subject to the terms of the applicable software license agreement between the Company and the applicable licensee (the “Agreement”). The Company products that are currently covered (individually, the “Product”; collectively, the “Products”) are as follows:

- **Blackboard Academic Suite™**
- **Blackboard Learning System™--Vista Enterprise License** (formerly WebCT Vista®)
- **Blackboard Learning System™--Enterprise License** (formerly Blackboard Learning System™)
- **Blackboard Learning System™--CE Enterprise License** (formerly WebCT Campus Edition™--Institution License, plus Blackboard PowerLinks™ (formerly the WebCT PowerLinks™ Module), Blackboard PowerSight™ (formerly the WebCT PowerSight™ Module), 2-node Clustering and Enterprise Support)*
- **Blackboard Learning System™--CE Enterprise Ltd. License** (formerly WebCT Campus Edition™--Institution License, plus Blackboard PowerLinks™)*
- **Blackboard Learning System™--Basic License** (formerly Blackboard Learning System™--Basic Edition)
- **Blackboard Learning System™--CE Basic License** (formerly WebCT Campus Edition™--Basic License)
- **Blackboard K-12 Starter Edition™**
- **Blackboard Community System™**
- **Blackboard Community System™--My Accounts Edition**
- **Blackboard Content System™**
- **Blackboard Outcomes System™**
- **Blackboard Portfolio™** (formerly WebCT Portfolio™)

*Includes any WebCT® Modules initially licensed prior to July 8, 2006.

Blackboard® Client Support shall provide Product Support only with respect to the then-current generally available version of the Product and the two (2) most recent previously issued updates of the Product. Each Product version may be assigned to either Full Support, Operational Support or No Longer Supported categories, as further described below.

- **Full Support (formerly Category A):** Full Support includes product versions for which Blackboard offers a wide range of support options. For the two most recent issued product versions, Full Support includes an active maintenance schedule of Service Packs and Hotfixes and for the older product versions under Full Support, it includes workarounds developed on an as-needed basis.
- **Operational Support (formerly Category B):** includes those product versions for which Blackboard offers a modified version of support. This category does not include an active maintenance schedule such as corrections, enhancements, bug fixes, Application Packs, Services Packs or other updates made generally available by Blackboard. All issues related to products in the Operational Support category, for which Blackboard does not have an available fix or workaround, will be examined on a case-by-case basis, and may require a separately priced Professional Services engagement. All client calls will be answered, operational assistance will be provided, and issues will be escalated to Product Development.
- **No Longer Supported (formerly Category C):** includes those products that are no longer maintained by Blackboard. Clients are strongly encouraged to upgrade. Informational questions regarding product use will be answered by Client Support.
II. Support Classifications

The Company’s Product versions are currently categorized as follows:

<table>
<thead>
<tr>
<th>Full Support</th>
<th>General Availability Date</th>
<th>Anticipated Date of Reclassification to Operational Support</th>
<th>Anticipated Date of Reclassification to No Longer Supported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Release 8 of:</td>
<td></td>
<td></td>
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</tr>
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<td>• Blackboard Academic Suite</td>
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<tr>
<td>• Blackboard Learning System--Enterprise License</td>
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<tr>
<td>• Blackboard Community System</td>
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<tr>
<td>• Blackboard Community System--My Accounts Edition</td>
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<tr>
<td>• Blackboard Content System</td>
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<tr>
<td>• Blackboard Outcomes System</td>
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<td>• Blackboard Learning System--Basic License</td>
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<td>Dec 2007</td>
<td>April 2010</td>
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<tr>
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**No Longer Supported**

- All previous Product versions
- Blackboard Learning System ML, all versions
*Includes any WebCT Modules initially licensed prior to July 8, 2006.
B. COMPANY SUPPORT SERVICES OPTIONS

The Company currently offers the following Support Services options for the Products, as further described below:

   I. Basic Support for System Administrators
   II. Enterprise Support for System Administrators (includes WebCT Premium Support initially purchased prior to July 8, 2006)
   III. 24/7 Student and Faculty Support Services
I. Basic Support for System Administrators

Basic Support is included with the following Products:

- Blackboard Learning System–CE Enterprise Ltd. License
- Blackboard Learning System–Basic License
- Blackboard Learning System–CE Basic License
- Blackboard K-12 Starter Edition™

Enterprise Support is available for these products at an additional fee. Please contact your Account Manager or Regional Sales Manager to learn more. If Premium or Enterprise Support has been purchased by a licensee for any of these Products, then Enterprise Support will apply to such Product for such licensee.

Basic Support includes:

- Telephone support – Licensee is eligible to receive support in English from the Company. The Company may make support available in other languages from time to time, subject to the language capabilities of its technical staff. Licensees may request to be assigned to a Technical Support Manager who speaks their language. Where possible, the Company will attempt to provide this service. Licensees accept that this may cause some delays while an available resource in their language is located, and thus may elect to have a faster response in English.

- Telephone based support is available Monday through Friday; 8 A.M. – 6 P.M., according to the local time of the geographical location in which the applicable licensee resides ("Local Time"), excluding applicable public holidays listed on our website at http://library.blackboard.com/docs/support/supportholidays.htm; (Please note that the hours of coverage listed above may vary slightly for those licensees residing in a geographical location which transitions between standard and daylight savings time on other than the more universally observed transition dates. Other variations may occur where Local Time differs from the primary time zone for a given longitude or meridian.)

- Web-based Self Service, including the ability to submit and add notes to cases as well as access to documentation, release notes and knowledge resources.

- Case Communications Via Email – After a case has been created either via telephone or web-based self service, ongoing communication may take place via email, provided that the licensee does so by replying to emails coming from support@blackboard.com and does not alter the subject line.

- Support Team of Technical Support Managers ("TSMs") – Your Support Team of 2-4 TSMs looks at support requests holistically and serves as an internal advocate for ensuring speedy resolution. TSMs are organized regionally to better serve your needs during your business hours.

- Licensee may designate up to two (2) of its personnel for purposes of receiving Support, and may designate substitute personnel by providing written notice to the Company (provided that not more than two (2) persons may be designated as support contacts at any given time). These designated personnel should be staff members who have access to the Blackboard administrator interface and has or can easily obtain ssh or VNC/Terminal Services access to the server on which the Product is installed.

- Updates and releases of the supported Product, on a when and if available basis, that Company makes generally available to its licensees.

- Reasonable efforts to respond to all support requests and to remedy any documented and reproducible errors and defects in the Product that are submitted via an approved means within the following targeted response and resolution times. For Basic Support, a business day is defined as Monday through Friday 8 A.M. – 6 P.M., Local Time, excluding applicable public holidays listed holidays listed on our website at http://library.blackboard.com/docs/support/supportholidays.htm.

- Initial response time targets based on Support Case Severity Levels (as defined below)
Severity 1
*Blackboard Production System is down. System is not functioning, system disabled or non-responsive*

Severity 1 implies that your Blackboard Production Installation [Software] is down and not functioning. Some examples of Severity Code 1 Software errors are as follows: (i) Software is down and will not restart; (ii) Software is not able to communicate with external systems; and (iii) Software is generating a data corruption condition. Severity Code 1 may not be used for Test Environments.

When a Severity 1 issue is reported, the Company will assign resources to remedy the error; if access to the Product is required, we ask that you provide access to your system and other software for the duration of the error correction procedures.

Severity 2
*Blackboard Product is functioning, but major components are unavailable/unusable.*

Severity 2 implies that the Software is running but you may be unable to use major portions of the Software. Some examples of Severity Code 2 Software errors are as follows: (i) an intermittent, critical Software error, and (ii) a major functional component is unavailable.

When a Severity 2 issue is reported, the Company will assign resources to remedy the error; if access to the Product is required, we ask that you provide access to your system and other software for the duration of the error correction procedures.

Severity 3
*Blackboard Product is operating close to normal; however minor components are functioning abnormally*

Severity Code 3 implies that the Software is operating close to normal but there is a non-critical Software error. Severity Code 3 Software errors may be fixed in future software releases, including major releases, Application Packs, Services Packs or Hotfixes. Severity 1 and 2 Software errors will take priority over Severity 3 issues.

Severity 4
*Product enhancement request or instructional assistance is needed*

Severity Code 4 implies that the Software is operating normally but you may be in need of instructional assistance or you are requesting functionality that is not currently included in the Software. Severity Code 1, 2, and 3 Software errors will take priority over Severity Code 4 cases.

The time of logging of a request under Basic Support is the time the call or web-based self service request is recorded by the Company.

Web-based self-service and telephone are the only approved means for initial support request submission under Basic Support. The Basic Support staff is not responsible for responding to requests made via third parties or directly to Company support staff members, or by any means other than those described above.

- Subsequent to the response to the initial support request, Support to respond to requests within one (1) business day of:
- Case creation;
- Email replies to support@blackboard.com emails concerning your case;
- Notes added to cases via web-based self-service; or
- Voicemails or messages left with licensee’s service reps.

- Support’s targeted resolution times are:
  - One (1) subsequent business day for issues with a solution that has been previously implemented and validated by the Company, provided that the solution has been previously resolved by Company within one (1) business day of its identification by the Company as a known issue (“Routine Issues”); and
  - Commercially reasonable efforts until resolution is reached for all non Routine Issues (“Complex Issues”)
  - Targeted resolution times are applicable for implementations operating in certified configurations.

**Upgrades to Blackboard Learning System—CE Enterprise Ltd. License, version 6**

**Support for CE6 Upgrade**

Customers licensing (a) Blackboard Learning System--CE Enterprise Ltd. License or (b) Blackboard Learning System—CE Basic License may upgrade to version 6 under Basic Support on a when and if available basis. Customers upgrading to Blackboard Learning System—CE Enterprise License, or who have purchased the Premium Support option may upgrade under Enterprise Support on a when and if available basis.

**Migration License**

Notwithstanding anything to the contrary contained in the applicable software license agreement (“Agreement”) and, except as otherwise expressly set forth in this section, subject to the terms and conditions of the Agreement, each licensee upgrading to Blackboard Learning System--CE Enterprise Ltd. License, version 6 from a prior release of such Product or the Blackboard Learning System—CE Basic License, as applicable, is hereby authorized to continue to use such prior release or Product for as long as such licensee holds a valid license to use Blackboard Learning System--CE Enterprise Ltd. License, version 6, subject to the following conditions:

(i) If, at any time, the applicable licensee’s Blackboard Learning System--CE Enterprise Ltd. License, version 6 license is terminated or expires and is not renewed, the authorization granted to such licensee hereunder shall immediately and automatically terminate as of the effective date of the termination or expiration of such license;

(ii) Blackboard Learning System--CE Enterprise Ltd. License, version 6 and the prior release of such Product or the Blackboard Learning System—CE Basic License, as applicable, is installed only on the number of production and test/back-up servers permitted by the Agreement;

(iii) The prior release of Blackboard Learning System--CE Enterprise Ltd. License or Blackboard Learning System—CE Basic License, as applicable, is utilized only for the purpose of assisting licensee with its migration to Blackboard Learning System--CE Enterprise Ltd. License, version 6; and

(iv) The licensee uses commercial best efforts to complete such migration as soon as commercially practicable.

If, following the delivery of a license key to a licensee for Blackboard Learning System--CE Enterprise Ltd. License, version 6, the authorization provided herein is subsequently removed from this support description or modified in any way by the Company, the specific authorization granted to such licensee hereunder shall survive such removal or modification.

Except as expressly set forth herein, all terms and conditions of the Agreement shall apply to such continued use of the prior release of Blackboard Learning System--CE Enterprise Ltd. License or Blackboard Learning System—CE Basic License, as applicable, as authorized hereunder.

**Server Access:**
To effectively resolve issues submitted, the Basic Support staff may require any of the following information:

a) login information for Student or Designer/Faculty members experiencing problems;

b) login information for Blackboard Administrator; and

c) ssh or VNC/Terminal Services access to the Blackboard server.

The targeted response/resolution times described herein are subject to the Company's ability to obtain, when needed, server access via the means identified by the Company herein. Any request by a licensee for the use of alternative means of server access must be approved by the Company’s support staff in advance. The Company shall use reasonable efforts to accommodate any reasonable request for the use of an alternative means of server access; however, in the case of such an accommodation, the service level agreement targets for initial response, status updates and resolution as set forth herein shall not apply with respect to the specific support request for which an alternative means of server access is used. Such is the case with VPN access.

Lack of server access or lack of server access in a manner supported by the Company as identified herein may cause delays in resolving support requests and may render the Company unable to resolve a support request. In such cases, licensees may wish to consider an on-site, separately priced professional services engagement.

The Company’s commitment to providing timely, quality technical support is based upon having sufficient server access to resolve a support request.

As per the following Exclusions section, Basic Support shall not include support for any Product running in an unsupported configuration. In the event a licensee is running a Product in an unsupported configuration and reports a problem, the Company may, at its sole discretion, attempt to replicate the issue in-house at the Company on systems running in a Company-supported configuration. If the Company’s support staff is able to replicate the problem on a supported configuration, the Company may elect to handle the support request in accordance with its standard support procedures. If the Company’s support staff is unable to replicate a problem on a supported configuration, the Company shall refer such licensee to the Company’s Professional Services department for a separately priced professional services engagement and recommend that such licensee move to a Company-supported configuration.

Exclusions:

The Basic Support described on this website shall apply only when the Product is installed locally at the applicable licensee’s site or hosted by the Company on behalf of such licensee.

Basic Support coverage shall not include environmental-related support requests that involve the following areas:

- Server migration issues*
- Improper usage of the Product (i.e., database files removed from the Product, customization of the Product, prohibited usage, etc.)
- Improper installation and configuration of operating system components*
- Improper hardware configuration for size of deployment*
- Hardware (server) problems*
- Server operating system problems*
- Non-supported 3rd party tools used with Product (except those where a support partnership exists)
- Issues arising with Products hosted by a third party, unless agreed upon in writing in advance by the Company (where such permission has been granted, issues arising as a result of the third party which would not have occurred with a Company hosted instance of the Product are excluded)
- Issues arising on an unsupported configuration
- Issues known by Company not to be related to the Product application itself
*Separately priced professional consulting services are available – Contact a Company Account Representative to learn more.
II. Enterprise Support for System Administrators

*Enterprise Support* provides broader and deeper support coverage for institutions running in mission-critical and complex Enterprise environments. Enterprise Support is provided a 24/7/365 basis which provides customers with round-the-clock support services.

Enterprise Support also provides technical support for complex implementations of the Company’s products and is highly recommended for installations which involve any of the following elements:
- Multiple servers
- Load balanced and/or clustered environments
- *Blackboard PowerLinks* or *Blackboard Building Blocks*
- Authentication integration
- SIS integration
- *Blackboard PowerSight* or advanced reporting

**Enterprise Support is included with the following Products:**

- *Blackboard Academic Suite*
- *Blackboard Learning System--Vista Enterprise License*
- *Blackboard Learning System--Enterprise License*
- *Blackboard Learning System--CE Enterprise License*
- *Blackboard Community System*
- *Blackboard Community System--My Accounts Edition*
- *Blackboard Content System*
- *Blackboard Portfolio*
- *Blackboard Outcomes System*
- Enterprise Support Option for *Blackboard Learning System--CE Enterprise Ltd. License*
- Enterprise Support Option for *Blackboard Learning System--Basic License*
- Enterprise Support Option for *Blackboard Learning System--CE Basic License*

* Includes any *WebCT* Modules initially licensed prior to July 8, 2006.

**Enterprise Support includes:**

- Telephone support – Licensee is eligible to receive support in English from the Company. The Company may make support available in other languages from time to time, subject to the language capabilities of its technical staff. Licensees may request to be assigned to a Technical Support Manager who speaks their language. Where possible, the Company will attempt to provide this service. Licensees accept that this may cause some delays while an available resource in their language is located, and thus may elect to have a faster response in English.

- Telephone-based support is available twenty-four (24) hours a day, seven days (7) a week, three hundred and sixty-five (365) days a year.

- Web-based Self Service, including the ability to submit and add notes to cases as well as access to documentation, release notes and knowledge resources.

- Case Communications Via Email – After a case has been created either via telephone or web-based self service, ongoing communication may take place via email, provided the licensee does so by replying to emails coming from support@blackboard.com and does not alter the subject line.

- Dedicated Technical Support Manager (“TSM”) or team of Technical Support Managers (“TSMs”) – Your Dedicated TSM or Support Team of 2-4 TSMs looks at support requests holistically and serves as an internal advocate for ensuring speedy resolution. TSMs are organized regionally to provide you with support during your business hours.
• Licensee may designate up to two (2) of its personnel for purposes of receiving Support, and may designate substitute personnel by providing written notice to the Company (provided that not more than two (2) persons may be designated as support contacts at any given time). These designated personnel should be staff members who have access to the Blackboard administrator interface and has or can easily obtain ssh or VNC/Terminal Services access to the server on which the Product is installed.

• Updates and releases of the supported Product, on a when and if available basis, that the Company makes generally available to its licensees.

• Reasonable efforts to respond to all support requests and to remedy any documented and reproducible errors and defects in the Product that are submitted via an approved means within the following targeted response and resolution times.

• Initial response time targets based on Support Case Severity Levels (as defined below):
  o Severity 1 Issues (as defined below) - within one (1) hour
  o Severity 2 Issues (as defined below) - within four (4) hours
  o Severity 3 and Severity 4 Issues (as defined below) - within one (1) business day

All support requests are important. However, some requests take precedence over others. Support has created four categories for support requests. Requests for support will be handled in the order of severity code as follows:

Severity 1
Blackboard Production System is down. System is not functioning, system disabled or non-responsive

Severity Code 1 implies that your Blackboard Production Installation [Software] is down and not functioning. Some examples of Severity Code 1 Software errors are as follows: (i) Software is down and will not restart; (ii) Software is not able to communicate with external systems; and (iii) Software is generating a data corruption condition. Severity Code 1 may not be used for Test Environments.

When a Severity 1 issue is reported, the Company will assign resources to remedy the error; if access to the Product is required, we ask that you provide access to your system and other software for the duration of the error correction procedures.

Severity 2
Blackboard Product is functioning, but major components are unavailable/unusable.

Severity Code 2 implies that the Software is running but you may be unable to use major portions of the Software. Some examples of Severity Code 2 Software errors are as follows: (i) an intermittent, critical Software error, and (ii) a major functional component is unavailable.

When a Severity 2 issue is reported, the Company will assign resources to remedy the error; if access to the Product is required, we ask that you provide access to your system and other software for the duration of the error correction procedures.

Severity 3
Blackboard Product is operating close to normal; however minor components are functioning abnormally

Severity Code 3 implies that the Software is operating close to normal but there is a non-critical Software error. Severity Code 3 Software errors may be fixed in future software releases, including major releases, Application Packs, Services Packs or Hotfixes. Severity 1 and 2 Software errors will take priority over Severity 3 issues.

Severity 4
Product enhancement request or instructional assistance is needed
Severity Code 4 implies that the Software is operating normally but you may be in need of instructional assistance or you are requesting functionality that is not currently included in the Software. Severity Code 1, 2, and 3 Software errors will take priority over Severity Code 4 cases.

The time of logging of a request under Enterprise Support is the time the call or web-based self-service request is recorded by the Company.

Web-based self-service and telephone are the only approved means for initial support request submission under Enterprise Support. The Enterprise Support staff is not responsible for responding to requests made via third parties or directly to the Company support staff members, or by any means other than those described above.

- Support to respond to requests within one (1) business day of:
  - Case creation;
  - Email replies to support@blackboard.com emails concerning your case;
  - Notes added to cases via web-based self-service; or
  - Voicemails or messages left with licensee’s service reps.

- Support’s targeted resolution times are:
  - One (1) subsequent business day for issues with a solution that has been previously implemented and validated by the Company, provided that the solution has been previously resolved by Company within one (1) business day of its identification by the Company as a known issue (“Routine Issues”); and
  - Commercially reasonable efforts until resolution has been reached for all non-Routine Issues (“Complex Issues”).
  - Targeted resolution times are applicable for implementations operating in certified configurations.

### Upgrades to Blackboard Learning System—CE Enterprise License, version 6

#### Support for CE6 Upgrade

Customers licensing (a) Blackboard Learning System—CE Enterprise Ltd. License or (b) Blackboard Learning System—CE Basic License may upgrade to Blackboard Learning System—CE Enterprise License, version 6 under Enterprise Support on a when and if available basis.

#### Migration License

Notwithstanding anything to the contrary contained in the Agreement and, except as otherwise expressly set forth in this section, subject to the terms and conditions of the Agreement, each licensee upgrading to Blackboard Learning System—CE Enterprise License, version 6 from a Blackboard Learning System–CE Enterprise Ltd. License and Blackboard Learning System--CE Basic License, as applicable, is hereby authorized to continue to use such Product for as long as such licensee holds a valid license to use Blackboard Learning System--CE Enterprise License, subject to the following conditions:

(i) If, at any time, the applicable licensee’s Blackboard Learning System—CE Enterprise License is terminated or expires and is not renewed, the authorization granted to such licensee hereunder shall immediately and automatically terminate as of the effective date of the termination or expiration of such license;

(ii) Blackboard Learning System–CE Enterprise Ltd. License and Blackboard Learning System--CE Basic License, as applicable, is installed only on the number of production and test/back-up servers permitted by the Agreement;

(iii) The Blackboard Learning System–CE Enterprise Ltd. License and Blackboard Learning System--CE Basic License, as applicable, is utilized only for the purpose of assisting licensee with its migration to Blackboard Learning System--CE Enterprise License, version 6; and

(iv) The licensee uses commercial best efforts to complete such migration as soon as commercially practicable.
If, following the delivery of a license key to a licensee for the Blackboard Learning System—CE Enterprise License, version 6, the authorization provided herein is subsequently removed from this support description or modified in any way by the Company, the specific authorization granted to such licensee hereunder shall survive such removal or modification.

Except as expressly set forth herein, all terms and conditions of the Agreement shall apply to such continued use of the prior release of Blackboard Learning System—CE Enterprise Ltd. License and Blackboard Learning System—CE Basic License, as applicable.

Server Access:

To effectively resolve issues submitted, the Enterprise Support staff may require any of the following information:

a) login information for Student or Designer/Faculty members experiencing problems;

b) login information for Blackboard Administrator; and

c) ssh or VNC/Terminal Services access to the Blackboard server.

The targeted response/resolution times described herein are subject to the Company’s ability to obtain, when needed, server access via the means identified by the Company herein. Any request by a licensee for the use of alternative means of server access must be approved by the Company’s support staff in advance. The Company shall use reasonable efforts to accommodate any reasonable request for the use of an alternative means of server access; however, in the case of such an accommodation, the service level agreement targets for initial response, status updates and resolution as set forth herein shall not apply with respect to the specific support request for which an alternative means of server access is used. Such is the case with VPN access.

Lack of server access or lack of server access in a manner supported by the Company as identified herein may cause delays in resolving support requests and may render the Company unable to resolve a support request. In such cases, licensees may wish to consider an on-site, separately priced professional services engagement.

The Company's commitment to providing timely, quality technical support is based upon having sufficient server access to resolve a support request.

As per the following Exclusions section, Enterprise Support shall not include support for any Product running in an unsupported configuration. In the event a licensee is running a Product in an unsupported configuration and reports a problem, the Company may, at its sole discretion, attempt to replicate the issue in-house at the Company on systems running in a Company-supported configuration. If the Company’s support staff is able to replicate the problem on a supported configuration, the Company may elect to handle the support request in accordance with its standard support procedures. If the Company’s support staff is unable to replicate a problem on a supported configuration, the Company shall refer such Licensee to the Company’s Professional Services department for a separately priced professional services engagement and recommend that such licensee move to a Company-supported configuration.

Exclusions:

The Enterprise Support described herein shall apply only when the Product is installed locally at the applicable licensee’s site or hosted by the Company on behalf of such licensee.

Enterprise Support coverage shall not include environmental-related support requests that involve the following areas:

- Server migration issues*
- Improper usage of the Product (i.e., database files removed from the Product, customization of the Product, prohibited usage, etc.)
- Improper installation and configuration of operating system components*

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Blackboard Inc. page 15 Client Support Services

Attachment B to UCP-VT-BB-0509 139
• Improper hardware configuration for size of deployment*
• Hardware (server) problems*
• Server operating system problems*
• Non-supported 3rd party tools used with Product (except those where a support partnership exists)
• Issues arising with Products hosted by a third party, unless agreed upon in writing in advance by the Company (where such permission has been granted, issues arising as a result of the third party which would not have occurred with a Company hosted instance of the Product are excluded)
• Issues arising on an unsupported configuration
• Issues known by Company not to be related to the Product application itself

*Separately priced professional consulting services are available – Contact a Company Account Representative to learn more.
III. 24/7 Student and Faculty Support Services

Blackboard managed contact center solutions are designed to provide the Customer with a comprehensive multi-channel contact center to support ongoing academic and administrative technology initiatives. In addition to providing 24/7 help-desk support for students and instructors, the Customer will have access to a privately branded and managed support portal, including knowledge base, animated tutorials and related support resources and knowledge base. In addition, Customer will have a dedicated account manager and receive detailed monthly reports, providing important metrics and diagnostics that will allow Customer to fine-tune its e-learning offerings over time. Support for the following applications is included:

24/7 Student and Faculty Support Services are available for all products and all related application subsystems

All of the solutions outlined herein will be privately branded for customer – including dedicated phone line, voice scripting and knowledge base support solutions.

Blackboard Managed Contact Center Solution for Customer will include:

Support Portal and Knowledge Base:
Offering a fully hosted, web-based knowledge base designed to encourage self-service and empower users to maximize the value of their Blackboard teaching and learning environment.

- The Blackboard Knowledge Base allows for customized branding and integrates within and throughout the Blackboard system
  - Link directly to the Blackboard Knowledge Base from the login page, or directly from a course by clicking on the “help” icon
- The Blackboard knowledge base is searchable, customizable, and fully managed by a dedicated Blackboard account manager
- Includes knowledge base articles, tip sheets, and animated tutorials

Toll Free Phone-based Support:
- The operation will be fully staffed and available for both campus-based and distance learners 24/7/365.
- Customized Branding - Privately Branded scripting and messaging will provide a seamless experience for users and administrators
- Strict Service Level Management Approach
- Detailed monthly reports providing number and type of service requests, as well as depth of usage within each of the application subsystems (i.e., gradebook, assessments, virtual classroom)
- Based on type and nature of inbound calls, Blackboard will make recommended approaches for managing the Customer Knowledge Base

Methods of Accessing Support:
This support package will include knowledge base and phone-based support for all named students and faculty members.

Support Availability:
Support will be available to faculty and students 24/7/365.

Monthly Reporting:
Included in the support package are monthly reports outlining all incidents received during the period categorized by severity and affected application area. This information will be useful in adjusting certain program aspects to reduce the number of end-user problems in future months.

Scope:
24/7 Student and Faculty Support Services are limited to help desk support for faculty and students for covered Products.
Appendix 6: Blackboard’s Consulting Services Catalog
## CONSULTING SERVICES OFFERINGS

### E-Education Planning

#### STRATEGIC PLAN/NEEDS ANALYSIS

Strategy Planning Services help clients align organizational and system goals such as defining primary constituents, developing constituent profiles and implementing the overall framework. The end result is a strategic roadmap clients use to build and deliver a dynamic portal that maximizes ROI objectives. Strategic Planning Services ensures client installations do not become empty vessels but instead a robust, integrated, cohesive learning and community building tools.

<table>
<thead>
<tr>
<th>Strategic Planning Services:</th>
</tr>
</thead>
<tbody>
<tr>
<td>■ Prepare for growth and provide tools to support critical decision making</td>
</tr>
<tr>
<td>■ Mitigate annual institutional and end user support issues</td>
</tr>
<tr>
<td>■ Provide planning tools for clearer planning of funding requirements for growth</td>
</tr>
<tr>
<td>■ Evaluate and plan for resource impact and staffing requirements</td>
</tr>
<tr>
<td>■ Mitigate infrastructure challenges and impact on end user confidence</td>
</tr>
<tr>
<td>■ Prepare and plan for modifications based on the organizations current and future technology plans</td>
</tr>
<tr>
<td>■ Evaluate reporting needs and access to critical data</td>
</tr>
<tr>
<td>■ Provide a document that enables critical thinking around the growth and support of the Blackboard Academic Suite.</td>
</tr>
</tbody>
</table>

#### IMPLEMENTATION PLANNING (LEARNING SYSTEM ENTERPRISE AND LEARNING SYSTEM VISTA)

Blackboard’s Implementation Planning engagement is the first step in providing a foundational and holistic understanding of the technology, integration and resources that are required for a successful and supportable implementation of the Blackboard Learning System. Successful enterprise software implementations require an investment of time on the part of all constituencies vested with the responsibility for deployment, management, and adoption of online learning, content and community systems. Blackboard’s Implementation Planning service facilitates a smooth and well organized implementation of the Blackboard Learning System and requisite technologies as well as effective alignment to the client’s strategic e-Learning goals and initiatives.

<table>
<thead>
<tr>
<th>Completion of this service will ensure that all team members have a mutual understanding of the implementation initiative and its alignment to the academic and business goals of the client organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>■ Educate the client team on the capabilities of the Blackboard Learning System</td>
</tr>
<tr>
<td>■ Identify opportunities for e-Learning process improvements</td>
</tr>
<tr>
<td>■ Establish goals and objectives for the Blackboard Learning System</td>
</tr>
<tr>
<td>■ Outline and prioritize major milestones in order to define the scope of each phase</td>
</tr>
<tr>
<td>■ Define and outline project work streams</td>
</tr>
<tr>
<td>■ Define project success criteria and measures</td>
</tr>
<tr>
<td>■ Identify potential project risks and mitigating factors</td>
</tr>
<tr>
<td>■ Evaluate and plan for resource impact and staffing requirements</td>
</tr>
<tr>
<td>■ Develop an initial project plan and implementation timeline</td>
</tr>
<tr>
<td>■ Prepare for growth and provide tools for critical decision-making</td>
</tr>
</tbody>
</table>
**TECHNICAL IMPLEMENTATION PLANNING**

<table>
<thead>
<tr>
<th>Blackboard Consulting Technical Implementation Planning service produces a road map for clients to use as they begin the process of implementing Blackboard Learning System – Vista Enterprise (Vista) into their existing technology infrastructure.</th>
</tr>
</thead>
<tbody>
<tr>
<td>■ Platform configuration</td>
</tr>
<tr>
<td>The service focuses on:</td>
</tr>
<tr>
<td>■ Oracle database maintenance and backup strategies</td>
</tr>
<tr>
<td>■ SIS integration strategies</td>
</tr>
<tr>
<td>■ Content migration options</td>
</tr>
<tr>
<td>■ Vista security and authentication</td>
</tr>
<tr>
<td>■ Vista components for high availability</td>
</tr>
<tr>
<td>■ Overview of the Vista Software Developer Kit</td>
</tr>
</tbody>
</table>

**Product Specific Services**

**COMMUNITY SYSTEM STRATEGY**

As the need for Web-based services and community building tools grows increasingly mission-critical, institutions are looking for more advanced and strategic outcomes from their portal. Blackboard Consulting Services offers a full range of Community System Services focused on helping customers achieve results. Our world-class consultants leverage years of experience to help clients to enhance the effectiveness of a current Blackboard Community System installation or plan the phases of launching a portal.

<table>
<thead>
<tr>
<th>Services objectives:</th>
</tr>
</thead>
<tbody>
<tr>
<td>■ Well-managed process that accelerates application development</td>
</tr>
<tr>
<td>■ Set of processes and tools that simplify ongoing administration of the application</td>
</tr>
<tr>
<td>■ Ability to further leverage investment in integration services</td>
</tr>
<tr>
<td>■ Galvanizing application that meets both individual as well as institutional needs, while building a sense of community among a body of users</td>
</tr>
</tbody>
</table>

**CONTENT SYSTEM STRATEGY**

The Blackboard Content System is designed to address the growing volumes of content associated with the Learning System. As sophisticated usage of the application grows, the need for a content management layer becomes more prevalent. Customers require an application that not only provides the necessary functionality, but does so in a way that extends the Learning System’s ease of use and meets broader institutional objectives. Implementing Blackboard’s Content System requires detailed planning and careful execution. An effective Content System is the result of a clearly defined set of business and functional requirements, all following a consistent strategy.

<table>
<thead>
<tr>
<th>Primary objectives for this project:</th>
</tr>
</thead>
<tbody>
<tr>
<td>■ Set of use cases, outlining content needs of institution members</td>
</tr>
<tr>
<td>■ Content repository designed to meet the various the needs of individual user roles</td>
</tr>
<tr>
<td>■ Clear release schedule for specific elements of the Content System and the individuals who will have access</td>
</tr>
<tr>
<td>■ Pilot program needs and success measurement criteria</td>
</tr>
<tr>
<td>■ Clearly defined Content System, designed to meet both short-term goals and long term objectives in an easy-to-use manner</td>
</tr>
</tbody>
</table>

**CONTENT SYSTEM READINESS**

Implementing Blackboard’s Content System requires detailed planning and careful execution. An effective Content System is the result of a clearly defined set of business and functional requirements, all following a consistent strategy. However, in

Although Blackboard Global Services will work with the client to best define the engagement to meet the client’s organizational objectives, the objectives of this service may include:

| ■ Determine elements of the Content System that are appropriate for different user groups within the  |
many cases customers would like to be able to take advantage of the Content System capabilities prior to scheduling the comprehensive strategy and planning engagements.

| Institution, and enable those elements with the correct security and configuration. |
| Identify existing course content to be migrated to the content system and prepare an execution plan for the migration. |
| Provide a preliminary plan for Content System launch to the customer’s user community. |
| Jump-start utilization of the Content System feature set. |

**Systems Architecture and Design**

**BLACKBOARD SOFTWARE INSTALLATION**

The success of any mission critical application begins with its foundation. Blackboard Consulting has installed and configured its Academic Suite in hundreds of client environments. Through these experiences, Blackboard has developed a sound approach and a level of expertise that allows for a rapid installation process, following proven practices. Creating a stable and scalable technology platform provides the necessary foundation for educational technology to grow from exploratory or supported phases to be truly transformative.

| System installation services: |
| Scalable implementation with projected impact on the organizational infrastructure |
| Stable implementation to support expected daily usage |
| Sustainable model, consistent with institutional operating practices |
| Necessary foundational components to build and incorporate future educational technologies |

**BLACKBOARD LOAD BALANCED/CLUSTERED INSTALLATION**

The Blackboard Academic Suite inherently accommodates a variety of hardware architectures to meet specific client needs. The use of load balancing and clustered database technologies with the Blackboard Academic Suite enables operability across multiple servers to provide easier scalability, better performance, and greater fault tolerance than operation under single or dual server configurations.

The success of any mission critical application begins at its foundation. A successful implementation requires sound decision-making regarding a variety of system aspects including performance, scalability, redundancy, and availability. There are several components to the Blackboard Academic Suite that interact and rely on each other.

| The primary objective of this service is to deploy the Blackboard Academic Suite in a distributed environment using load balanced, clustered technology to deliver the web/application tier of the system across multiple servers. More specifically, this software installation service is designed to provide: |
| A flexible and scalable architecture with predictable impact on the organizational infrastructure |
| A stable, redundant implementation to support projected usage and desired service levels |
| A sustainable model that is consistent with client operating practices |

**HIGH AVAILABILITY (ORACLE RAC)**

As usage of the Blackboard Academic Suite grows and the system reaches a mission critical level, customers must evaluate the

| As part of the development process for enabling a RAC solution for a client, Blackboard looks to obtain the following objectives: |
overall effectiveness, stability and scalability of the application. A critical element of this evaluation is the database. Typically, Blackboard customers maintain a single database, which introduces a critical point of failure. While there are many options to address this problem, UNIX systems have the opportunity to take advantage of an Oracle technology known as Real Application Clusters (RAC). RAC solutions provide customers with enhanced services to increase redundancy and scalability of the Blackboard database, by allowing more than one server to manage the database itself.

| Leverage Blackboard product knowledge and experience for efficient RAC implementation and configuration, minimizing maintenance and upgrade costs |
| Leverage client investment in Oracle application by using best of breed solutions developed and proven by Oracle Corporation |
| Develop the environment using standard practices that allow for ongoing client management |
| Test the environment to validate failover processes, in conjunction with existing business continuity practices |
| Develop comprehensive documentation for future support and management of the environment |

**Health Check**

The Health Check Service examines closely the implementation and application and database server functions of the Blackboard Learning System – Vista Enterprise and Blackboard Learning System – CE Enterprise environments. By proactively addressing system health, clients are better able to recognize and alleviate issues that can arise when a system is not tuned for optimal performance.

Blackboard Consultants perform the following tasks during a Vista/CE Health Check engagement:

- Ensure that all patches and hotfixes are up to date and installed properly
- Examine and make recommendations regarding system administration parameters and logging features to ensure the following:
  - Logs (Oracle, redo, archive) are properly established and rotating as expected
  - Maintenance scripts are run properly and that indexing is taking place properly
  - Projected database growth rates do not exceed capacity
  - All scheduled events are functioning properly without errors
- Review clustering configuration to ensure services such as chat and whiteboard are functioning properly
- Review and make recommendations regarding system security
- Examine issues reported by the client related to performance and system administration to determine root causes and make recommendations accordingly
- Review of all logs for performance issues and capacity analysis
- Review of the database growth and analysis of usage

**Database Backup Service**

The Blackboard Learning System – Vista Enterprise or CE 6 Enterprise each offer a production hosting environment wherein each hosted client operates as a separate client organization within a single Vista/CE 6 installation. As such, Blackboard Consulting has developed scripts/processes to address specific operational needs that many self-hosted Learning System clients face in running their own

The Blackboard System Operation Script packages and associated consulting services are available for the following operational requirements:

- Database Backup and Monitoring
- Database Restore
- Nagios Integration
- Student Information System (SIS) Integration
environments – especially those in multi-campus or multi-organization scenarios.

Performance Engineering

PERFORMANCE ASSESSMENT AND TUNING

The primary objective of the Performance Audit and Tuning service is to provide insight into existing or potential performance bottlenecks associated with the client’s Blackboard Academic Suite environment. This service can be performed on the application holistically or on its sub-components, such as new Blackboard Building Block functionality. During the engagement, Blackboard Consultants investigate identified bottlenecks to determine their root cause and provide appropriate guidance for resolution. Some of the suggestions can be immediately implemented, while others may require capital investment and additional planning.

More specifically, clients should expect the following outcomes:

- Improved understanding of the current Blackboard infrastructure and capacity
- Introduction of best practices for improved operational stability and system performance
- Recommendations for immediate and long-term performance optimization

PERFORMANCE AUDIT AND OPTIMIZATION

The primary objective of the Performance Audit and Tuning service is to provide insight into performance bottlenecks associated with the Blackboard environment. With this information, customers can assess system thresholds and determine hardware, software or network enhancement needs proactively as well as avoid impending issues prior to their occurrence. Blackboard consultants investigate identified bottlenecks to determine their root cause and provide appropriate guidance for resolution.

Specific objectives:

- Understanding of the current Blackboard infrastructure’s performance
- Identification of a process for improving operational stability
- Recommendations for both short and long-term performance optimization

Systems Integration

Snapshot Integration

Blackboard’s snapshot data integration methodology is the first step in providing foundational technology for the integration of critical data across the breadth of Blackboard products within the Academic Suite. It allows for highly complex business logic and the ability to customize specific data relationships to meet client’s dynamic needs. This two week onsite workshop is designed to expose and document the implicit and explicit business rules for the client institutions.

Integration service is expected to provide the following:

- Foundational technology for the integration of critical data across the breadth of Blackboard products within the Academic Suite.
- Automate process for account and course creation as well as user enrollment, staff assignment and other critical data elements
- Reduce manual system administration, freeing staff for alternative activities and ensuring better data quality
- Enable recovery of processing through standard data
### ASP Snapshot Integration

Blackboard’s Application Service Provider (ASP) infrastructure provides a stable, secure and scalable operating environment for the delivery and support of the Blackboard Academic Suite. Operating the Blackboard application in a hosted environment offers clients the advantages of financial flexibility, operational freedom and reduced risk, yet also allows clients to realize the benefits to be gained by integrating the Blackboard application with other enterprise systems operating on client premises. Data integration between these critical systems can significantly improve operational efficiencies and enhance the user experience.

Blackboard Consulting ASP Snapshot Data Integration is the first step in providing the foundational technology for the integration of critical data from the client’s Student Information System (SIS) or other enterprise system into the ASP hosted Academic Suite. This service allows for highly complex business logic and the ability to customize specific data relationships to meet dynamic organizational needs.

The primary objective of a Snapshot Data Integration engagement is to simplify current data integration processes to position the client for future growth and scalability. More specifically, Snapshot Data Integration is designed to provide the following:

- Foundational technology for the integration of critical data across the breadth of the Blackboard Academic Suite and other enterprise systems
- Automated processes for account and course creation, user enrollment, staff assignment and other critical requirements
- Reduced manual administration resulting in improved data quality
- Recovery of processing enabled through standard data archiving procedures

### Enterprise License Event Integration

The SunGard Event-Driven Integration is offered as an extension to Blackboard Consulting Snapshot Data Integration service. The event-driven technology is one of the solutions created by Blackboard working jointly with Datatel and SunGard that focuses specifically on real-time enrollment mechanisms for the Blackboard Academic Suite. These integrated solutions provide immediate enrollment updates into the Blackboard system, which may be especially critical to an institution during peak add/drop time periods.

Blackboard Consulting follows established rules of engagement with Datatel or SunGard in completing the engagement, and utilizes proven partnering principles and best practices to provide clients with an effective implementation. The Blackboard Consulting Project Manager maintains responsibility and accountability for all Blackboard-related tasks.

The primary objective of the Event-Driven Integration is to provide tailored functionality through real-time data integration between the Blackboard system and the client’s Student Information System (SIS). More specifically, the Event-Driven Integration engagement is designed to automate and accelerate processes associated with:

- User account and course creation and updates
- Changes in student enrollment on a real-time basis
### SIS Integration Design

Blackboard Consulting SIS Integration Design service helps clients who need to achieve seamless integration between the Student Information System (SIS) and a Blackboard Learning System – Vista Enterprise or CE Enterprise system. Blackboard Consulting will help guide the client through this integration by conducting a series of reviews with the client IT staff and other stakeholders in addition to providing SIS integration documents and samples. While Blackboard Consulting provides all of the required documentation, the client is ultimately responsible for the actual implementation of the integration.

Client review session topics for the SIS Integration Design service include:
- Best practices for an integrated environment
- Learning hierarchy and roles as they relate to the SIS integration
- Mapping SIS data elements (and other required data sources) to Blackboard data elements, including defined formats such as people, enrollment, course/sections/groups/divisions
- Review of transaction types such as enroll, un-enroll, deny access and cross-listing of sections
- Understand use of the IMS Application Programming Interface (API) and how to manage the processing of importing accounts, learning context, and enrollments
- Discussion regarding approach and administration of automated batch procedures
- Discussion of mid-term and final grade reporting process

### Vista and CE Hosting Scripts

Blackboard Consulting has packaged some of the most popular System Operation Script packages to give clients a head-start in establishing their own procedures, documents and programming for these activities. This service also allows clients who are self-starters to avoid the higher cost of a fully customized solution.

As these processes and scripts were developed for Blackboard’s ASP hosting service and not for specific client configurations, clients will require Java and/or Perl skill sets to modify the scripts and code examples in order to tailor them to their specific environment. Each System Operation Scripts package comes with documentation, however it is recommended that clients purchase ten hours of technical knowledge transfer from a Blackboard Consultant to assist with the implementation in the client’s environment.

Blackboard also offers services to database administrators of the Blackboard Learning Systems Vista and CE 6 Enterprise that go well beyond training to provide solutions that address the most common system administration tasks. The Blackboard System Vista and CE Hosting Script packages and associated consulting services are available for the following operational requirements:
- Database Backup and Monitoring
- Database Restore
- Nagios Integration
- Student Information System (SIS) Integration
- Section Archiving

### LDAP Configuration

The Blackboard Academic Suite is compatible with the most popular authentication protocols, such as Lightweight Directory Access Protocol (LDAP) and Kerberos, as well as some proprietary solutions including Web server Delegation and Active Directory. Additionally, Blackboard Consulting provides invaluable experience in designing and documenting custom authentication.

LDAP Authentication Configuration Solutions are expected to provide:
- Secure method of authentication Blackboard users by utilizing the LDAP protocol
- Leverage existing investments in customers’ LDAP-compliant directories by including Blackboard in the list of applications using this service for authentication credentials
- Improve authentication process for end users, by
<table>
<thead>
<tr>
<th>Schemas.</th>
<th>reducing the number of usernames and passwords needed to access secure systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>■ Reduce support center call volume, by including LDAP’s simple change password feature as part of the authentication process</td>
<td></td>
</tr>
<tr>
<td>■ Enforce institutional security protocols by configuring Blackboard to either fallback to other LDAP systems or its own database, or not, for authentication purposes.</td>
<td></td>
</tr>
</tbody>
</table>

### Custom Authentication

**With the proven authentication integration approach developed by Blackboard Consulting, clients can achieve integration with institutional technologies for a customized authentication solution.**

**Custom Authentication Solutions are expected to provide:**

- Secure method of authentication using proven technologies
- Model current institutional business processes
- Identify additional opportunities using customized solutions for the client to centralize system operations
- Simplify authentication process for students, users, and administrators
- Knowledge transfer to clients on development methodology, coding standards, and future management of the solution

### Single Sign On Authentication

**Blackboard has developed customizable interfaces which allow the navigation across the Academic Suite and with other local systems in a secure, seamless environment while increasing ease-of-use by removing the need to re-authenticate at each junction. Blackboard Consulting has developed a proven approach to this by facilitating business requirements, identifying system and user stakeholders, and with a thorough understanding of the leading authentication technologies available to our clients.**

**Services is expected to simplify current practices and position the institution for future growth by providing:**

- Secure method of navigating to external system using proven technologies
- Identification of opportunities for institutions to create a personalized single point-of-access regardless of user privileges
- Method to minimize potential points of authentication failure by reducing how many time a user has to re-enter his/her credentials
- Transition for the institution from a web-enabled center of learning into an innovative learning community transparent across departments, systems, and initiatives
- Centralized networked security management into one office using on authoritative system such as LDAP, Kerberos, Shibboleth, etc.

### Gradebook Extract

**A critical component of an institution’s enterprise applications is the ability to perform unilateral and bilateral data transfer including grade data. Blackboard Consulting has developed a proven methodology through a systematic analysis of the institution’s Student Information System and correlating data elements with the Blackboard database, identifying and**

**Gradebook Integration is expected to provide:**

- One-stop reporting for instructors specific to a Course Website
- Opportunities to extract other data housed within the Blackboard Learning System database to institutional databases
- Methodologies to identify potential points of error by removing additional entry mechanisms to the official
evaluation of academic rules, and applying stakeholder interests to create a Gradebook Extract Tool enabled via Building Blocks.

institution grading system

- Greater usage of the Blackboard Gradebook, providing more students with the ability to check grades, gather feedback and reasoning for the grades assigned, and prepare for upcoming assignments or exams

Maintenance Programs

Integration and Customization Maintenance

The ICM program is covered by the Integration customization Maintenance Agreement. This program was designed to simplify the process surrounding the maintenance of Blackboard implemented integration or customization services.

ICM support:

- Eliminates additional processes or paperwork for maintenance support after a project closes
- Provides a subscription based service to simplify client budget forecasts for upgrade management
- Relieves customization-related challenges clients face while upgrading their Blackboard Solution
- Protects the customers investment in custom technology and ensure a viable return on investment
Appendix 7: Blackboard’s Sample License and Services Agreement
    Replaced in Attachment C to Commonwealth of Virginia Contract UCP-VT-BB-0509

Appendix 8: Blackboard’s Detailed Pricing
    Replaced in Attachment C to Commonwealth of Virginia Contract UCP-VT-BB-0509
Appendix 9: Blackboard’s Managed Hosting Security Policies
Information Security Policy

Blackboard Managed Hosting

Last Updated: May 21, 2008
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2 Purpose 3
3 Guiding Principles 4
4 Security Policy Implementation 4
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   4.2 PERSONNEL ................................................................. 5
   4.3 IDENTIFICATION, AUTHENTICATION, AND AUTHORIZATION .... 6
   4.4 COMMUNICATIONS AND NETWORK SERVICES ....................... 6
   4.5 PHYSICAL SECURITY ...................................................... 7
   4.6 HARDWARE AND SOFTWARE ............................................. 7
   4.7 APPLICATION TESTING .................................................... 7
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   4.9 BACKUP AND RECOVERY ................................................. 7
   4.10 SECURITY AWARENESS .................................................. 8
   4.11 ACCEPTABLE USE ....................................................... 8
Key Blackboard Managed Hosting Security Measures:
- Strict Security Policy with 26 supporting standards based on industry standards
- COBIT based framework
- Background checks for all new Managed Hosting personnel
  - Risk assessments based on Six Sigma methodology
    - Simulation testing
    - Social Engineering testing
    - Penetration testing
  - Computer Network Defense (CND) self assessment
  - Redundant Firewalls and Intrusion Detection devices
- Role based security access control and multi factor authentication for sensitive data
- 24x7x365 security at datacenters including physical security and biometrics technology
  - 24x7 Incident response team

1 Introduction

Increasingly, Blackboard Managed HostingSM is implementing technological solutions and network innovations to control costs and to better serve Blackboard’s customers. While these systems accomplish both goals, they also increase exposure to security risks and potential security breaches. To guard against such breaches, Blackboard has developed this Information Security Policy along with supporting standards and procedures (heretofore known as the "Security Policy").

This Security Policy applies to employees, consultants, contractors, temporary employees, vendors, third party partners, and all others who have access to Blackboard Managed Hosting systems and customer information (heretofore known as "Users").

Blackboard Managed Hosting will be responsible for revising, updating and redistributing this Security Policy when appropriate. It is the responsibility of the Managed Hosting Management team to ensure that the Security Program is maintained and communicated to, and followed by, all employees.

Each new employee will receive a copy of this Security Policy when hired. Each new employee must sign the Security Policy, which will be placed in the employee’s personnel file. Contractors, consultants, and temporary help must review and comply with the Security Policy and subsequent policies as a condition of any contract.

2 Purpose

The purpose of the Security Policy is to ensure that three basic goals of security are achieved: confidentiality, integrity, and availability. It sets the following goals:

- Protect the internal network from external threats, vulnerabilities, and risk
- Protect information assets from unauthorized access, use, modification, copying, or destruction
- Prohibit unauthorized receipt or exchange of information assets via external networks
• Protect Blackboard Managed Hosting from charges of imprudence.

3 Guiding Principles

The following are the guiding principles that Blackboard Managed Hosting has followed in creating the Security Policy and procedures:

• The Managed Hosting Management team is ultimately responsible for maintaining, communicating, and ensuring compliance with this Security Policy and for protecting the group’s assets.
• The highest level of security possible will be maintained within all functional areas of Blackboard Managed Hosting in accordance with policy.
• Blackboard Managed Hosting’s vital assets, consisting of all automated information and information residing throughout the organization, require a level of protection commensurate with their value.
• Blackboard must take measures to protect these assets against disclosure (whether intentional or accidental), modification, or destruction.
• Information that is sensitive or confidential must be protected from unauthorized access or modification, whether accidental or intentional.
• Risks to information resources must be managed, and the expense of security safeguards must be appropriate to the value of the asset being protected or the risk of not retaining business.
• Strict adherence to formal Change Management policies and procedures is considered essential to a successful Information Security Program.
• The integrity of data, its source and its destination, must be maintained and changes can only be made by authorized and appropriate methods.
• Security needs must be considered during all phases of development or acquisition of new automated information systems, applications, or major network configuration changes.
• Managers and supervisors must ensure proper separation of function for tasks or duties that are susceptible to unauthorized activity or fraud.
• Each member of the Managed Hosting Security Administrator Team should sign off on revisions to this Security Policy. This will shift accountability from the Managed Hosting VP to overriding submitters in one-off requested cases.

4 Security Policy Implementation

The Security Policy establishes the security controls necessary to protect electronic information and the physical environment. It is important that all Users know and follow the Security Policy and procedures. Failure to follow the Security Policy, either inadvertently or intentionally, may subject an employee to corrective action, up to and including termination of employment. Where appropriate, third parties should also be made aware of and be required to adhere to the Policy as well as included policies and procedures.

At all times, it is important to assess and follow the Security Policy within all functional areas of Blackboard Managed Hosting and at any other facility where information is stored, processed or transmitted. All Users shall receive and read the relevant portions of the Security Policy, including the “Guiding Principles” listed above, and should understand the policies relevant to their roles prior to obtaining access to information systems and shall periodically review the Security Policy thereafter.
The following sections (4.1 – 4.11) provide a summary of the principles and responsibilities in different areas of the Blackboard Managed Hosting Enterprise. *The specific procedures and standards are included in a separate document.*

### 4.1 ORGANIZATION

Senior management of Blackboard Managed Hosting has overall responsibility for overseeing the maintenance, communication, and enforcement of the Security Policy and associated platform configuration management policies, standards and procedures. This will be done through the Vice President, Managed Hosting and the Director, Managed Hosting Infrastructure. Managed Hosting Senior Management will be the ultimate authority accountable for the information security function at Blackboard Managed Hosting. Senior Management will have the basic responsibility for implementing the Security Policy, with assistance from the following:

(a) The Sr. Manager, Managed Hosting Technology and Security, who is responsible for managing and directing the implementation of the Information Security Program.

(b) The Security Administration Team, which is responsible for providing access to network and computing resources.

(c) Managers and Team Leads, who are responsible for communicating the importance of the Policy to their staff and for executing and enforcing the Security Policy within Blackboard.

### 4.2 PERSONNEL

(a) An individual being hired into Managed Hosting will undergo a background check following a conditional offer of employment and may be denied employment based on the results of the background check.

(b) Violations of this Security Policy and/or its implementing policies and procedures will result in disciplinary action, up to and including immediate termination of employment.

Managed Hosting Management shall:

(a) Ensure that contractors and Managed Hosting employees read and sign the Security Policy initially and when redistributed.

(b) Establish controls at the time of a transfer or termination of an employee or a person working under a contract in order to protect the computer system and information from unauthorized access or a breach of confidential information.
4.3 IDENTIFICATION, AUTHENTICATION, AND AUTHORIZATION

The Sr. Manager of Technology and Security, as well as the Security Administration Team Leads, where applicable, shall:

(a) Establish procedures to determine who is allowed to use the information system and the need for access to the system.

(b) Develop procedures to ensure the confidentiality, integrity, and availability of the information system.

(c) Install mechanisms to ensure accountability, encryption, and access control.

(d) Establish a unique user identification code for each person granted access to the information system.

(e) Establish standards for the use and control of passwords to be used in combination with the user identification code.

(f) Establish controls to ensure access is limited to active users by requiring periodic re-certification of all users.

(g) Develop guidelines to control expanded access for the system administration team as needed to perform their job functions.

4.4 COMMUNICATIONS AND NETWORK SERVICES

Under the authority of the Vice President of Managed Hosting and the Director of Managed Hosting Operations, the Sr. Manager, Managed Hosting Technology and Security, shall establish controls, where applicable, to:

(a) Secure internal system access and connectivity.

(b) Secure Internet access with properly implemented network service access and design procedures.

(c) Restrict and monitor file transfer protocol (ftp).

(d) Ensure the security of remote access to Blackboard Managed Hosting systems.

(e) Protect Blackboard Managed Hosting information while granting Internet access.

(f) Secure the transmission of information via remote access.

(g) Protect data stored in and processed through remote facilities and vendors.

(h) Secure and support external access to internal databases.

(i) Protect the electronic mail systems.
4.5 PHYSICAL SECURITY

Blackboard Managed Hosting shall:

(a) Define security measures to protect all computing facilities and equipment.

(b) Mandate logging of access to areas where processing is performed.

These standards should be part of Blackboard Managed Hosting’s broader physical security program.

4.6 HARDWARE AND SOFTWARE

Under the authority of the Vice President, Managed Hosting Services and the Director, Managed Hosting Operations, the Sr. Manager, Managed Hosting Technology and Security, shall develop procedures to:

(a) Identify ownership and proper use of equipment, including portable equipment.

(b) Control copyrights, licenses, and duplication of software.

(c) Establish controls for prevention, detection, of malicious activity.

4.7 APPLICATION TESTING

Operations staff responsible for testing application upgrades or updates generally should not use actual customer data but should create test data. In situations where creating test data is not possible and actual customer data is used for testing, controls must be implemented to protect the data, at the same level as production.

4.8 AUDIT TRAILS AND SYSTEM MONITORING

The Information Security Function at Blackboard Managed Hosting shall assume responsibility, where applicable, to:

(a) Develop and maintain audit trails of all transactions.

(b) Establish procedures to monitor logging on the systems and to review and report suspected or known security violations.

(c) Monitor security escalation for resolution of violations.

(d) Establish a system of internal audits of the information management functions.

4.9 BACKUP AND RECOVERY

The Storage Team shall develop procedures and requirements for regular backup and safe recovery of information.
4.10 SECURITY AWARENESS

The Sr. Manager, Managed Hosting Technology and Security and the Security Administration Team shall coordinate training for all Users to instill awareness of each User’s obligations and responsibilities and to implement the Security Policy.

4.11 ACCEPTABLE USE

The Sr. Manager, Managed Hosting Technology and Security shall communicate and enforce Business Unit practices of acceptable use of Blackboard’s Managed Hosting network resources for various categories of personnel within the Blackboard Enterprise.
Attachment C

to

UCP-VT-BB-0509
Attachment D

to

UCP-VT-BB-0509
RFP 648253 – Summary of Negotiations

The following statements and/or revisions are agreed to as a result of negotiations and are submitted as an attachment to the original RFP 648253 proposal submitted by Blackboard, Inc. that may clarify/modify or supersede the RFP 648253 proposal, and shall be part of any resulting contract awarded.

1) Replace “Appendix 7: Blackboard’s Sample License and Services Agreement” and “Appendix 8: Blackboard’s Detailed Pricing” of Attachment B with Attachment C - The Blackboard System-Wide Master Terms and Blackboard System-Wide Professional Services Contract, including any and all applicable schedules, appendices, and Statements of Work as agreed by the parties.

2) Delete pages 70 through 77 of Attachment B noted as Additional Material and replace with the following:

   a. Attachment A: Terms and Conditions

   2. Availability of Funds: It is understood and agreed between the parties herein that Virginia Tech shall be bound hereunder only to the extent of the funds available or which may hereafter become available for the purpose of this agreement.

   Blackboard acknowledges Virginia Tech’s availability of funds requirement, however, Blackboard requests Virginia Tech to provide written notice 60 days prior to the end of each term if funds are not available. Virginia Tech agrees that it will provide 60 days notice if it plans to invoke this provision.

   b. 13. RENEWAL OF CONTRACT: This contract may be renewed by Virginia Tech upon written agreement of both parties for up to five successive one year periods only under the terms and conditions of the original contract except as stated in A and B below. Price increases may be negotiated only at the time of renewal. Written notice of Virginia Tech’s intention to renew shall be given (approximately 90 days) prior to the expiration date of each contract period.

   A. If Virginia Tech elects to exercise the option to renew the contract for an additional one-year period, the contract price(s) for the additional year shall not exceed the contract prices of the original contract increased/decreased by no more than the percentage increase/decrease of the other services category of the CPI-W section of the Consumer Price Index of the United States Bureau of Labor Statistics for the latest twelve months for which statistics are available.

   B. If during any subsequent renewal period Virginia Tech elects to exercise the option to renew the contract, the contract price(s) for the subsequent renewal period shall not exceed the contract price(s) of the previous renewal period increased/decreased by more than the percentage increase/decrease of the other services category of the CPI-W section for the Consumer Price Index of the United States Bureau of Labor Statistics for the latest twelve months for which statistics are available.
Virginia Tech agrees to waive the limitations of A and B. Prices will be negotiated as part of the Contract Renewal process. Proposed renewal prices will be taken into account in Virginia Tech’s decision as to whether to renew for the next contract period.

c. Exceptions to RFP GENERAL TERMS AND CONDITIONS

2. ANTI Trust: By entering into a contract, the Contractor conveys, sells, assigns, and transfers to Virginia Tech and the Commonwealth of Virginia all rights, title and interest in and to all causes of the action it may now have or hereafter acquire under the antitrust laws of the United States and the Commonwealth of Virginia, relating to the particular goods or services purchased or acquired by Virginia Tech and the Commonwealth of Virginia under said contract.

Blackboard requests to insert the word “Contractor” after the word “action” and before the word “may” in the paragraph. Virginia Tech agrees to replace the word “it” with the word “Contractor”.

d. 24. NONVISUAL ACCESS TO TECHNOLOGY: All information technology which, pursuant to this Agreement, is purchased or upgraded by or for the use of (the “Technology”) Virginia Tech shall comply with the following nonvisual access standards from the date of purchase or upgrade until the expiration of this Agreement:

(i) effective, interactive control and use of the Technology shall be readily achievable by nonvisual means;
(ii) the Technology equipped for nonvisual access shall be compatible with the information technology used by other individuals with whom any blind or visually impaired user of the Technology interacts;
(iii) nonvisual access technology shall be integrated into any networks used to share communications among employees among employees, program participants or the public; and
(iv) the technology for nonvisual access shall have the capability of providing equivalent access by nonvisual means to telecommunications or other interconnected network services used by persons who are not blind or visually impaired. Compliance with the foregoing nonvisual access standards shall not be required if the head of the using agency, institution or political subdivision determines that (i) the Technology is not available with nonvisual access because the essential elements of the Technology are visual and (ii) nonvisual equivalence is not available. Installation of hardware, software, or peripheral devices used for nonvisual access is not required when the Technology is being used exclusively by individuals who are not blind or visually impaired, but applications programs and underlying operating systems (including the format of the data) used for the manipulation and presentation of information shall permit the installation and effective use of nonvisual access software and peripheral devices.

If requested, the Contractor must provide a detailed explanation of how compliance with the foregoing nonvisual access standards is achieved and a validation of concept demonstration.

The requirements of this Paragraph shall be construed to achieve full compliance with the Information Technology Access Act, §2.2-3500 through 2.2-3504 of the Code of Virginia.
Blackboard warrants that the Software and/or Service shall substantially enable Customer to comply with its obligations under Section 508 of the Rehabilitation Act to the extent applicable to the Software and/or Service. In the event of a failure of Blackboard to comply with the foregoing warranty, Customer shall notify Blackboard in writing with a list of specific deficiencies and Blackboard shall use commercially reasonable efforts to remedy such deficiencies subject to Blackboard’s standard support policies. Customer’s sole remedy in the event that Customer is not satisfied with Blackboard’s performance relating to the foregoing warranty shall be to terminate the Agreement by written notice to Blackboard and to receive a pro-rata refund of prepaid fees unused after the termination date.

3) Attachment C- “The Blackboard System-Wide Master Terms and Blackboard System-Wide Professional Services Contract, including any and all applicable schedules, appendices, and Statements of Work as agreed by the parties” contains trade secrets or proprietary information and is considered confidential. Protection has been requested as noted in Section 2.2-4342 F of the Code of Virginia. Contractor agrees that access may only be provided to users or potential users of the contract. Potential users must request access from the Contract Administrator.