



FLORIDA STATE UNIVERSITY
OFFICE OF DISTANCE LEARNING

**2016 Student Technology Fee Proposal:
Hadoop Data Platform**

Prepared for: Student Technology Fee Advisory Committee

Prepared by: Robert Fuselier, Interim Director
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December 9, 2016

Project Description

Purpose

The Opt-in LMS Feasibility Workgroup at FSU has provided a unanimous recommendation to adopt Canvas by Instructure as the primary learning management system (LMS) for Florida State University. We will begin set up and configuration of Florida State's Canvas instance during the Spring 2017 term. Soon after the instance is configured, we will begin using best practices for migrating course materials from Blackboard to Canvas. This migration into Canvas will include course materials, but we will require a separate place to store Blackboard student and instructor data for historical purposes. Also, because Blackboard was self-hosted, and Canvas is not, we will need a place to capture and analyze Canvas data once we make the transitions. The Hadoop Data Platform will allow us to:

1. Capture/export Blackboard data for future reference (faculty reference, grade disputes, research)
2. Capture and analyze Canvas data since we will no longer be self-hosted
3. Integrate Canvas data with historical Blackboard data for reporting purposes
4. Centralize ODL data for improved support and service

With over 96% of our students currently enrolled in at least one Blackboard course site, and over 95% of instructors teaching in at least one Blackboard site, the university has a wealth of student data available that will be lost if we do not store this data in a manner that can be extracted for analysis and reporting.

If funding is approved for the Hadoop Data Platform, we will be able to integrate not only Blackboard historical data with Canvas data, but also Testing Center data, Instructor Training data, and Support data. This will help us provide clear picture of LMS usage and help us to expand our service offerings at the Office of Distance Learning.

Goals

Usage of the information stored on the Hadoop Data Platform system will provide the following:

1. Retrieval of stored student data and activity logs to investigate grade disputes, locate course materials inadvertently deleted, pinpoint enrollment issues, and research learning outcome data
2. Retrieval of instructor and student usage information for historical reporting
3. Aggregation of instructor LMS and testing center usage in order to provide better training and support
4. Near real-time delivery of records from Campus Solutions to the LMS and other providers

This data will also provide the means for evaluating:

1. Support and training needs
2. Instructional technology adoption and LMS course technology integration
3. Additional support needs for the Testing Center and the LMS
4. Projection of LMS usage
5. Historical activity

All of these goals would be beneficial to the university's continued commitment to supporting our mission of quality teaching and learning.

Project Benefits

Impact on Instruction

Virtually every student enrolled at FSU will benefit from this data storage and integration. The data system will:

- Preserve LMS course site enrollment and assignment data
- Provide insight into student usage and drive instructional technology improvements
- Provide insight into instructor usage and drive instructional technology training for improved instruction
- Provide a historical connection between course objectives and outcomes to LMS student logs and LMS integration
- Provide course artifacts for accreditation reviews
- Provide support staff with the tools to quickly analyze LMS data and provide instructors and students with efficient technical support

Impact on Institutional Goals

The Hadoop Data Platform will allow the university to better support several key strategic goals defined by both Florida State University and the Board of Governors:

FSU Strategic Goals

- **Goal 1:** Deepening Our Distinctive Commitment to Continuous Innovation
Specifically, this system will allow us to “launch solutions early, evaluate results critically, and make improvements continuously.”
- **Goal 2:** Amplifying Excellence Across our Academic and Research Programs
Specifically, to “Expand innovated teaching strategies” by means of implementing online learning strategies “that will enable expansion of online programs, hybrid learning, and online collaboration while increasing student retention and lifelong learning.”
- **Goal 6:** Investing Strategically in Our Institution and Reputation
Specifically, to “Provide an up-to-date and adaptable information infrastructure”
 - Refine our technology platform to make it more robust and flexible for teaching and learning, assessment, research, institutional communications, and informed decision-making.
 - Ensure that all departments and schools have adequate access to the technology necessary for innovative pedagogical practices and enhanced collaboration among faculty, students, staff, and departments.
 - Design and implement electronic systems that will streamline administrative processes and move the University toward simpler and more efficient operations.

State University System of Florida Board of Governors Goals (Teaching & Learning)

- **Strengthen Quality & Reputation of Academic Programs and Universities:** Increase the quality and relevance of all academic programs, and grow the number of institutions and academic programs with state, national, and/or international preeminence.
- **Increase Degree Productivity and Program Efficiency:** Increase access and degree completion for students, including students from traditionally underrepresented groups, returning adult students, and distance learning students.

Project Plan

Overview

The acquisition and implementation of Hadoop Data Platform (HDP) at FSU is comprised of a multi-stage process:

- Research & analysis of pilot systems
- Installation of production hardware and software
- Configuration of data sources and data nodes
- Development and testing of custom code for use cases
- Development of analytical procedures
- Implementation of production systems

The timeframe expected from installation to production implementation is up to six months.

Milestones

Planning and Set-up Phase

Research & Analysis (in progress)

Throughout 2016, we have actively researched and analyzed the HDP system. Our pilot testing has determined that this platform is able to consume data from different unstructured sources and from database systems.

Installation – 1 week

Installing HDP at the Office of Distance Learning, will require us to have commodity hardware such as the PowerEdge R730xd cluster of 5 nodes running Red Hat Linux and Cloudera/Hortonworks data platform software. Open source software will then be installed in the Master Node, which deploys application servers on the remaining nodes in the cluster. As part of installation, firewalls between HDP and the LMS must be also configured by ITS Core and the ODL systems teams. Installation of hardware and software timeframe is estimated to be one week.

Configuration – 1 month

Once the HDP pilot cluster is active, we will configure the platform so that it can consume data from Blackboard application server logs. Other configurations include the lock down of the system with Kerberos using LDAP integration, memory and other system resource sizing, data source point configuration, and database to HDFS configuration. The configuration step can take from three weeks to a month depending on the number of use cases developed during this stage.

Development of Custom Processes – 1 month

Spark, Scala, Kafka, Hue, Solar, and Impala are among the applications that comprise the HDP environment. We will develop background processes that consume unstructured data or combine records, create a subscription system for notification queues, map data across the entire storage disks, and provide access as a relational database system.

Testing – 1 month

After development is complete, testing of use cases will take up to a month to ensure all processes have time to be fixed or restructured. The most important factor during this stage is to ensure data accuracy when receiving records and posting them for consumption by other applications. Each source shall have a sanity check of records based on use cases requirements.

Project Plan (continued)

Deployment Phase – 1 month

Consumption of Data – 2 weeks

Sources for consumption of data include:

- Data replication from Datacache systems
- Direct download of records from Blackboard database
- API calls to HappyFox ticketing system
- API calls to Canvas and download of summarized user/course activity
- Blackboard logs
- ODL Faculty and Staff data

Production Release – 2 months

HDP can run concurrently with legacy systems so cases or processes are gradually incorporated. Transition to the production system can take up to two months to fully complete. At the production stage, the analysis of data begins. ODL's current staff will be fully able to maintain and update the system as needed.

Project Team

ODL Technology Staff will setup and configure the hardware, set up the data architecture, and write the necessary scripts to fetch, consume, organize, and display the data.

Implementation Team

The implementation team consists of the managers and senior staff who will be responsible for assisting in project planning and overseeing the technical aspects of the project.

- **Mary Eichin, Assistant Director, Technology**, Office of Distance Learning
- **Julian Hernandez, Senior LMS Systems Administrator**, Office of Distance Learning
- **Chi Cui, Senior Developer**, Office of Distance Learning
- **Scott Bickley, Support Manager**, Office of Distance Learning

All members of the project team listed above are extremely experienced in their roles within the university and are highly qualified to bring the project to successful completion.



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Price Summary

Description	Quantity	Unit Price	Subtotal Price
PowerEdge R730xd	5	\$12,958.58	\$64,792.90
Subtotal:			\$64,792.90
Taxable Amount:			\$0.00
Non-Taxable Amount:			\$64,792.90
Taxes			\$0.00
Shipping:			\$0.00
Environmental Fees:			\$0.00
Total			\$64,792.90

Note: All tax quoted above is an estimate; final taxes will be listed on the invoice.

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Product Details by Shipment

Shipping Group 1

Shipping Contact:	JOHNSON GLORIA	Subtotal:	\$64,792.90
Shipping Phone No:	1 (850) 6452809	Taxes	\$0.00
Shipping via:	Standard Ground	Shipping:	\$0.00
Shipping Address:	296 CHAMPIONS WAY	Environmental Fees:	\$0.00
	UNIV CTR C RM 2213	Total	\$64,792.90
	TALLAHASSEE		
	FL 32306-0001		
	US		

Description	Quantity	Unit Price	Subtotal Price
PowerEdge R730xd	5	\$12,958.58	\$64,792.90

Estimated Delivery Date: 12/05/2016
Contract Code: 53AHF

210-ADBC	PowerEdge R730xd Server	5	-	-
329-BCZK	PE R730/xd Motherboard MLK	5	-	-
461-AADZ	No Trusted Platform Module	5	-	-
350-BBFE	Chassis with up to 24, 2.5 Hard Drives and 2, 2.5" Flex Bay Hard Drives	5	-	-
340-AKPM	PowerEdge R730xd Shipping	5	-	-
338-BJCT	Intel Xeon E5-2690 v4 2.6GHz,35M Cache,9.60GT/s QPI,Turbo,HT,14C/28T (135W) Max Mem 2400MHz	5	-	-
338-BJEH	Intel Xeon E5-2690 v4 2.6GHz,35M Cache,9.60GT/s QPI,Turbo,HT,14C/28T (135W) Max Mem 2400MHz	5	-	-
370-ABWE	DIMM Blanks for System with 2 Processors	5	-	-
374-BBHM	Standard Heatsink for PowerEdge R730/R730xd	5	-	-
374-BBHM	Standard Heatsink for PowerEdge R730/R730xd	5	-	-
370-ACPH	2400MT/s RDIMMs	5	-	-
370-AAIP	Performance Optimized	5	-	-
780-BBLM	RAID 10 for H330/H730/H730P (4-24 HDDs or SSDs in	5	-	-

	pairs)			
405-AAEG	PERC H730 Integrated RAID Controller, 1GB Cache	5	-	-
540-BBBB	Intel X520 DP 10Gb DA/SFP+, + I350 DP 1Gb Ethernet, Network Daughter Card	5	-	-
385-BBHO	iDRAC8 Enterprise, integrated Dell Remote Access Controller, Enterprise	5	-	-
634-BBWU	OpenManage Essentials, Server Configuration Management	5	-	-
350-BBEJ	Bezel	5	-	-
770-BBBR	ReadyRails Sliding Rails With Cable Management Arm	5	-	-
384-BBBL	Performance BIOS Settings	5	-	-
450-ADWM	Dual, Hot-plug, Redundant Power Supply (1+1), 1100W	5	-	-
631-AAJG	Electronic System Documentation and OpenManage DVD Kit, PowerEdge R730/xd	5	-	-
619-ABVR	No Operating System	5	-	-
421-5736	No Media Required	5	-	-
800-BBDM	UEFI BIOS	5	-	-
332-1286	US Order	5	-	-
330-BBCO	R730/xd PCIe Riser 2, Center	5	-	-
330-BBCR	R730/xd PCIe Riser 1, Right	5	-	-
951-2015	Thank you for choosing Dell ProSupport Plus. For tech support, visit http://www.dell.com/contactdell	5	-	-
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900-9997	On-Site Installation Declined	5	-	-
973-2426	Declined Remote Consulting Service	5	-	-
370-ACNX	16GB RDIMM, 2400MT/s, Dual Rank, x8 Data Width	40	-	-
400-AJPR	300GB 10K RPM SAS 12Gbps 2.5in Flex Bay Hard Drive	10	-	-
400-AJON	1.2TB 10K RPM SAS 12Gbps 2.5in Hot-plug Hard Drive	40	-	-
540-BBCT	Intel X520 DP 10Gb DA/SFP+ Server Adapter	5	-	-
450-AALV	NEMA 5-15P to C13 Wall Plug, 125 Volt, 15 AMP, 10 Feet (3m), Power Cord, North America	10	-	-

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