A Report to the Maryland General Assembly and Governor Martin O'Malley

Regarding

The Development of the Maryland Longitudinal Data System &

Maryland Longitudinal Data System Center

December 2011

Introduction

Under the terms of Chapter 190 of the Acts of the General Assembly of 2010, the Governing Board of the Maryland Longitudinal Data System is required to submit an annual report to the Maryland General Assembly containing the following:

1. An update on the implementation of the Maryland Longitudinal Data System and the activities of the Maryland Longitudinal Data System Center (hereafter, Center);
2. A list of all studies performed by the Center during the reporting period;
3. A list of currently warehoused data that are determined to be no longer necessary to carry out the mission of the Center;
4. Any proposed or planned expansion of data maintained in the database; and
5. Any other recommendations made by the Governing Board.

The following sections provide an overview of the Maryland Longitudinal Data System (LDS), an update on the activities of the Governing Board, and progress towards the implementation of Maryland's Longitudinal Data System and Center. Requirements two through four listed above are not included in this report as the System and Center are not yet operational, however significant progress has been made in establishing criteria and standards for the eventual reporting of these items.

System Governance

Pursuant to Chapter 190 of the 2010 Acts of the Maryland General Assembly, the eleven (11) member Maryland LDS Governing Board met to organize and direct Maryland's LDS development. Dr. William Kirwan, Chancellor of the University System of Maryland, served as the Chair of the Governing Board in 2011.[1] Governor O'Malley charged the Board with creating the P-20-W Maryland LDS Center per Chapter 190 and the Board voted to accept the charge in December of 2010.

To coordinate staff-level work, the Board created the LDS Interagency Workgroup. This Workgroup includes representatives from all the participating agencies and provides coordination on technical and policy issues. Current planning is for this group to be superseded when the Center is established and fully staffed. In addition, the Office of the Attorney General assigned Assistant Attorney General Elizabeth Kameen to advise the Board on issues surrounding the creation of this system and center.

[1] Full membership roster is included as **Appendix A**.

The Maryland State Department of Education (MSDE) is leading the project management efforts and is overseeing the build-out of the MLDS technology which will be used by the Center. MSDE coordinates this effort through the Interagency Technical Workgroup and various ad hoc workgroups with all of the involved agencies.

Overview of Planned System

The State of Maryland is in the process of developing a plan to construct a statewide data warehouse (the Center) that contains longitudinal data in a P-20-W spectrum (P-20-W refers to Pre-Kindergarten through graduate school and/or the workforce). The LDS will incorporate data collected by the Maryland State Department of Education (MSDE), the Maryland Higher Education Commission (MHEC), and the Maryland Department of Labor, Licensing and Regulation (DLLR).

The primary purpose of the LDS is to address the critical policy questions that will inform education stakeholders at all levels in order to improve the quality of education in the state. In addition, the implementation of a P-20-W LDS will be a key factor in achieving the requirements identified by United States Department of Education in the America Competes Act, the assurances for State Fiscal Stabilizations Funds, and the Data Quality Campaign's 10 State Actions. It will also be critical in meeting the requirements of other state initiatives including Complete College America (CCA). Included below are an initial list of questions the system will be designed to address, areas for which policy questions will be developed and a list of federal assurances.

Critical Education Policy questions:

1. Are Maryland students academically prepared to enter postsecondary institutions and complete their programs in a timely manner?
2. What percentage of Maryland high school exiters go on to enroll in Maryland postsecondary education?
3. What percentage of Maryland high school exiters entering college are assessed to need to take developmental courses and in what content areas?
4. How likely are students placed in developmental courses to persist in postsecondary education and transfer and/or graduate?
5. Are community college students able to transfer within state to 4-year institutions successfully and without loss of credit?
6. What happens to students who start at community colleges and do not go on to 4-year institutions?
7. What are the differences in performance, retention, and graduation, including time to degree, of students who initially matriculate at a Maryland community college

and transfer to a Maryland 4-year institution versus those who initially matriculate at a Maryland 4-year?

8. What are the differences in performance, retention and graduation, including time to degree, of students beginning in dual enrollment programs, at 2-year institutions and at 4-year institutions?
9. Which financial aid programs are most effective in improving access and success (i.e., retention and graduation) for Maryland students?
10. What are the characteristics of 2-year institutions that are allowing students to persist most effectively and either graduate or transfer?
11. Which 4- year institutions are graduating students most effectively and in the timeliest fashion?
12. What are the educational and labor market outcomes for individuals who use federal and state resources to obtain training at community colleges or other postsecondary institutions?
13. What economic value do noncredit community college credentials have in the workplace?
14. Are exiters of Maryland colleges successful in the workforce?
15. How do all of the policy questions vary by different critical subgroups* and backgrounds?

** including Race/Ethnicity, Gender, Age, Income level (defined by FARM eligibility/Pell Status), ESL status, Special Education status, Major discipline area, Geographic origin.*

Federal Assurances and Other Requirements

1. Incorporation into SLDS of student level exit, transfer in, transfer out, drop out or complete P-16 program information.
2. Creation of capacity in K-12 data systems to communicate with higher education data systems.
3. An audit system assessing data quality, validity, and reliability in SLDS.
4. Information on successful transition from secondary to postsecondary school, including whether students enroll in remedial coursework.
5. Other information as deemed necessary to address alignment and adequate preparation for success in postsecondary education and workforce.
6. Provide, for the State, for each LEA in the State, for each high school in the State and, at each of these levels, by student subgroup, the number and percent that enroll in an IHE within 16 months of receiving a regular high school diploma.
7. Provide, for the State, for each LEA in the State, for each high school in the State and, at each of these levels, by student subgroup, the number and percent who enroll in a public IHE within 16 months of receiving a regular high school diploma, the number and

percent who complete at least one year's worth of college credit (applicable to a degree) within two years of enrollment in the IHE

8. The Number of High School Graduates with Postsecondary Enrollment

Gap analysis of MD Education data

In order to determine the feasibility of effectively answering the policy questions and meeting the federal assurances discussed above, the LDS Inter-agency workgroup engaged in a gap analysis of the existing data collections. The results of the gap analysis indicated that improvements in collections particularly in higher education, but including all sectors, were needed to be able to effectively answer the critical policy questions. In particular, additional data were needed in the areas of directory data, non-credit course data, and data concerning developmental/remedial education. In addition, the incorporation of the Maryland Student Identification number (SASID) into higher education's data streams was considered vital. Currently, the existing data are being mapped to each policy question as part of the system development and is discussed below.

System Location

In order to provide cost savings and ensure the highest levels of security for the data, the information system for the LDS is being developed in the Department of Public Safety and Correctional Services (DPSCS) data center. This is also the location of the MSDE K-12 LDS and the MHEC data system upgrade. By locating the system development at DPSCS considerable cost avoidance has been realized through co-service agreements. No decision has been made on the ultimate location of the data system, but the security and ongoing savings opportunity will make DPSCS an attractive option as the long-term location of the system.

System Capabilities and Requirements

The P-20-W LDS is being constructed to meet all the requirements specified in Chapter 190 and provided critical data support for policy decisions and reporting. The requirements are detailed in table 1 below. The most important capabilities of the technical system will be the successful integration of data from the three existing data systems into the MLDS Center and the ability to generate useful information from that data. The key capabilities of this system include tools to:

- extract data from a wide range of source systems of varying levels of technological sophistication;
- transform data, as needed, for validity and compatibility;
- load data into a common data repository;
- generate and modify easily a large number of standard reports;
- enable the creation and saving of customizable queries of any data field in the system;
- produce graphical representations of data; and
- ensure reports are available in easy-to-understand formats via the internet.

Table 1 – MLDS Center Required Activities and Capabilities

Category	Chapter 190 Provision	Proposed Approach
Data Management	Serve as a central repository of the data student data and workforce data in the Maryland Longitudinal Data System	Oversight of DPSCS MLDS and Database Management
Data Management	Oversee and maintain the warehouse of the MLDS Data Sets	Oversight of DPSCS MLDS
Data Mgmt / Policy	Create an inventory of the individual student data	Database management
Data Policy	Develop and implement policies to comply with FERPA and privacy act and any other privacy measures	Combination of center-specific policies and existing policies at State agencies
Data Management / Policy	Ensure routine and ongoing compliance with FERPA and other relevant privacy laws and policies	Oversight of DPSCS MLDS, and Center compliance management
Data Policy	Providing for performance of regular audits	Auditing
Data Policy	Develop a detailed data security and safeguarding plan	Combination of center-specific policies and existing policies at DPSCS
Data Policy	Designate a standard and compliance timeline for Electronic Transcripts	USM, LEAs and MSDE working cooperatively
Data Policy	Set policies for the approval of data requests from state and local agencies, the Md. General Assembly, and the public	Proposal by Interagency Working Group and Executive Director to GB
Research	Conduct research using timely and accurate student data and workforce data to improve the state's education system and guide decision making	Combination of resident analysts, researchers, and university researchers
Research	Conduct research relating to…state and federal education programs… educator preparation programs; and best practices regarding classroom instruction, education programs and curriculum, and segment alignment	Combination of resident analysts, researchers, and university researchers
Data Management / Research	Fulfill Information And Data Requests To Facilitate State And Federal Education Reporting With Existing State Agencies	Oversight of automated data set delivery
Research	Fulfill Approved Public Information Requests	Resident analysts
Research	Establish the policy and research agenda of the center	Proposal by Interagency Working Group and Executive Director to GB

Update on Implementation of P-20-W MLDS Center

The Board, through the organizational mechanisms described above, has made considerable progress in establishing the Maryland Longitudinal Data System which will be used by the Maryland LDS Center. The following sections address the critical areas of this work and progress on supporting projects (i.e. related areas not covered under Chapter 190).

Technology build-out overview

The Maryland Longitudinal Data System is being implemented and developed in the near term at DPSCS. At present the development and test environments have been installed. Production hardware is planned for late spring to summer of 2012. The development environment has been implemented at DPSCS in a secure and standalone Virtual Machine (VM) environment. Infrastructure products which will be used for this system include: an Oracle database 11g (for data storage), Oracle portal (to provide access for authorized users), Oracle OBIEE (an analytical and reporting tool), Oracle Spatial (which supports GIS and mapping of data), Oracle IDM (a tool for identity management), and a suite of performance utilities. There is no licensing cost since software use is covered by the unlimited enterprise licensing provided by MSDE which covers Race to the Top participants. The Test environment is configured to service and support 100 concurrent users. Production environment will be configured to service 300 non-concurrent users for the remaining duration of the Race to the Top Grant. (see Appendix B for detailed discussion of technology)

Data mapping to policy questions

An inventory of the data needed is being prepared through collaboration from an interagency technical work group to align the policy questions with the scope of the development. The selection of data required is defined by the breakdown and analysis of the policy questions. The inventory of data also includes the identification of existing data available from the agencies to answer the policy questions and recommendations for collecting missing data. A multi-agency LDS data dictionary application to document the multi-agency inputs for the LDS data warehouse system is to be implemented.

Identity

Creation of a secure, encrypted, multi-agency individual crosswalk identification table is required to link data between existing longitudinal data systems at MSDE, DLLR and MHEC. A proof of concept design was developed and tested with a load of MSDE, DLLR and MHEC data. The test helped to identify the limitations to the current data collections which impact the match rate between agencies. The development of a probabilistic matching algorithm is

planned that will improve the match rate, as well as requests to partner agencies to increase the data collected that can be shared to improve matching.

Security and Privacy

The MLDS has security software that addresses data security and access at multiple levels in the hardware, application, and database systems. Key security strategies for the LDS data warehouse include: (1) use of "https," (2) intrusion detection at the router level, (3) intrusion detection at the application server level, (4) two token strong password authentication, (5) application and data access authorizations, (6) IP encryption between application and database levels, (7) data masking, (8) data bases access authentication and authorization, and (9) database encryption of PII information.

Technical security policies and best practices to support the implementation and management of the LDS data warehouse and associated data are under development At the time of this writing, a draft of the PII Security Standard Procedures for Desktops and OBIEE application has been prepared, as well as data request practices and procedures. (see Appendix C for detailed of security)

Finally, consulting staff is being added to develop specific plans and protocols to ensure privacy of student data when it is incorporated into the MLDS. The consulting staff will be directly supervised by USM and MSDE staff and the Governing Board will review and approve all privacy plans.

Testing

Testing practices and procedures will follow Maryland Department of Information Technology System Life-Cycle Development (SLCD) processes. At present, no testing activities are required or planned.

Electronic transcripts

The incorporation of the Maryland Student Identification number into the Maryland Higher Education data systems is vital to improving the link between K-12 and higher education. The University System of Maryland has an electronic transcript data system available for implementation by the LEA's. MSDE is collaborating with USM to provide resource support to the LEAs.

Supporting Projects

- K-12 LDS system – Resident within MSDE, the K-12 LDS is rapidly moving toward expansion. Unlike the cross agency system, this system is entirely governed within MSDE and provides federal assurance reporting, and direct support to individual schools and

districts. It provides the technical model which is being used for the construction of the MLDS System to be used by the MLDS Center. The K-12 system is already in use and will be expanding capabilities during 2012.

- MHEC System – Race to the Top funding is supporting major upgrades to MHEC's data systems. The MHEC system will be enhanced to more effectively capture, upload and process data from higher education. This system's enhancement will make it possible for higher education data to be effectively incorporated into the MLDS Center.

- DLLR System – DLLR working with the Jacob France Institute has a long standing system for tracking individuals in the workforce. They are currently engaged in an expansion of this system supported by a grant from the U.S. Department of Labor.

Creating a Sustainable Fiscal Strategy

In addition to overseeing the technology project, the Board has prepared budget and capability analyses and is preparing a plan for a sustainable fiscal strategy for the Center itself. Two important factors influence the estimates of ultimate cost of operating the center: the level of services it will provide including the degree to which those services are accessible directly via web-based formats, and the degree of shared technology services and equipment that are ultimately available.

The Board reviewed a set of capability levels and considered two as viable for a center which would not simply meet the minimum compliance requirements of Chapter 190 but which would also provide added value by placing actionable information in the hands of a wide array of users. The options varied largely rapidity and range of access to data which would be provided to users outside the Center and key agencies. Based on a projected minimum savings of 50% through shared service agreements, the cost of the center on a yearly basis was estimated to be between 1.4 and 2.0 million dollars per year.

With this estimate in place, the Board's fiscal strategy sub-committee requested in November that the IWG develop a consortium funding model for the Center. This model would draw on resources from consortium members to fund a substantial portion of the Center's operations. The three main participating agencies (MSDE, MHEC and DLLR) would contribute to the Center budget in exchange for various services and access to data. Additionally the model would seek to involve private sector partners to fund portions of the Center operations, following a model established in Georgia. In this model, some core portion of the Center funding would be state general funds designated for the MLDS Center. Finally, the Center (once operational) would establish fee structures and schedules for data requests by the public and non-contributing

state agencies, and would aggressively seek grant funding for specific projects. The details of this plan are still being developed by the IWG and should be presented to the Governing Board in the spring.

Current Funding Overview

Per chapter 190, the Governing Board is responsible for seeking State funding and extramural sources of funding. This section details the sources of funding currently being used in the work to create the MLDS Center. It is broadly divided between State of Maryland sources and Federal sources.

State funding

At present no State General Funds have been allocated specifically for the MLDS Center or any of its supporting systems. If this remains the case, this will present a significant challenge as the system transitions from the build and test phases to the operational stages.

Although no direct funding has been allocated, MSDE, MHEC, DLLR, USM and the Jacob France Institute have provided substantial unreimbursed in-kind contributions of staff time and expertise. Morgan State, St. Mary's, the Maryland Association of Community Colleges (MACC), and the Maryland Independent Colleges Association (MICUA) have also allocated staff to MLDS work.

Federal Funding

The State of Maryland received two federal grants in 2010 that are being used directly in the creation of the Center or in support of the three participating agencies. In addition, Maryland is preparing an additional State Longitudinal Data Systems grant application, which will be submitted in December 2011, to help complete the technology and enhance the data collections to ensure the system meets the requirements discussed above. The federal grants are listed below:

Race to the Top

Maryland's receipt of a $250 million Race to the Top grant will significantly propel the development of the LDS and Center. "Using data to improve instruction" was one of the four assurances of Race to the Top, and the State's application designated more funding for this section than any other single section, with approximately $47 million allocated for improvements in data capabilities. Included in this $47 million is $5 million designated specifically for the creation of the LDS Center and supporting higher education systems at the Maryland Higher Education Commission (MHEC).

US Department of Labor Workforce Initiative Grant

DLLR received a U.S. Department of Labor grant to expand longitudinal data collection of workforce and education data. This grant will provide $1 million dollars over three years to improve the connections between K-12, adult education, post-secondary and workforce data. It will ensure that data from the workforce can be effectively linked with the existing and developing data sets from K-12 and postsecondary education.

Current and future SLDS grants

Historically, the State of Maryland has received a pair of SLDS grants which were dedicated to the creation of the K-12 SLDS (which had been almost the sole focus of the Department of Education prior to FY 2008). MSDE at present is in the 3rd year of the K-12 SLDS grant. In December of 2011, a new round of SLDS funding will be available. MSDE is preparing a new collaborative inter-agency SLDS grant application. The value of this grant is unknown at this time, but $3.9 million is being requested. It will not provide operating funds.

Conclusion

This report has detailed the development the Maryland P-20-W Longitudinal Data System and Center during 2011. It was prepared in accordance with the terms of Chapter 190 of the Acts of the General Assembly of 2010. With the support of the U.S. Department of Education Race to the Top Grant, the State of Maryland reached several key milestones in implementing the requirements of this statute. Progress was made on the technological implementation, the organization of the Center, privacy and security, and the identification of the relevant data for the system.

Appendix A. Maryland Longitudinal Data System Governing Board 2010 Membership Roster

Ex Officio Members:

Dr. William "Brit" Kirwan
Chancellor
University System of Maryland
Board Chairman

Dr. Bernard Sandusky
Interim Superintendent
Maryland State Department of Education

Dr. Danette Howard
Interim Secretary
Maryland Higher Education Commission

Alexander M. Sanchez
Secretary
Maryland Department of Labor, Licensing, and Regulation

Dr. W. Stephen Pannill
President
Cecil College
(for the) Maryland Association of Community Colleges

Dr. David Wilson
President
Morgan State University

Dr. Michael Martirano
Superintendent
St. Mary's Public Schools
**Representing Superintendents*

Public Members:

Ms. Nicole Murano
Stevenson University
**Representing Higher Education with Expertise in Large Data Systems*

Ms. Ayana English-Brown
Prince George's County Public Schools
**Representing Teachers*

Mr. Jason Perkins-Cohen
Job Opportunities Task Force
**Representing Workforce*

Mr. Brian Roberts
Montgomery County
**Representing Parents*

Appendix B – MSDE LDS Development and Production Deliverables to MLDS Center

1. Delivery Overview

MSDE is committed to the design and development the core LDS data warehouse database kernel and OBIEE dashboards associated functionality to answer the core policy questions regardless of whether or not data is available in the database to answer those questions. MSDE is not delivering a turnkey system, and therefore many of the deliverables you might find with an off-the-shelf turnkey system will be the responsibility of the MLDS Center and technical staff once they take possession of the system. This section outlines what MSDE will provide to the MLDS Center during the Interim period of development during the grant and identifies what aspects of the LDS system will transition to the MLDS Center after, or before, the grant expires. IT systems operational support for the LDS ends with the end of the Race to the Top Grant in 2014 unless other arrangements are made with DPSCS and/or MSDE.

2. LDS System Infrastructure Delivery

2.1 Delivery Notes for the LDS Hardware LDS Infrastructure Software, LDS Operations, and Maintenance Support

1. MSDE will purchase and transition to the MLDS Center a set of production server platforms with hardware, associated software, and associated software licenses. MSDE will transition physical custody of the hardware platforms to the MLDS Center staff, and retain ownership of the software licenses while continuing to make available their use to the MLDS Center.

2. MSDE will be using a VM development and test environment housed at DPSCS for the LDS system. If the MLDS Center Staff decides to continue to share the VM environments with MSDE at DPSCS, no additional development or test system platforms need be purchased and there will be no maintenance costs for either the hardware or software for the VM development and test environments. If the MLDS Center decides to relocate its LDS system to another data center, it will be responsible for purchasing development and test platforms,

maintenance support, associated software and software maintenance support for the new hardware platforms. It will be responsible of the MLDS Center staff to pay for the cost to dismantle and move the production hardware platforms to its new chosen environment. MSDE will help the MLDS Center to migrate the existing software, databases, and data to the new development and test hardware environment at no cost.

3. MLDS Center may continue to use the foundation software licenses as shown in the table below if it continues to use the equipment purchased by MSDE regardless of location of the equipment for a modest maintenance cost that will be calculated as a percent of the shared Oracle Limited UML maintenance costs. The percent of the maintenance cost each year that MLDS Center continues to use the transitioned production hardware and software LDS system created by MSDE, will be calculated as follows: # CPUs used by MLDS Center for all Oracle products in the UML stack divided by the total number of CPUs being using the all Oracle products in the UML stack by all agencies sharing products from the UML license. For example, if MSDE, MHEC and MLDS Center use a total of 400 CPUs for the Oracle stack of products, and MLDS Center is using only 36 CPUs for its Oracle products for development and production environments, then it's percent of the maintenance contract will be 36/400 * 100 = 9% . The estimated cost for the fixed price maintenance contract for the product suite is about $430,000. Therefore, MLDS Center's maintenance costs each year would be 9% of $430,000 or about $38,000.

4. MLDS Center will be responsible for the full cost of the production hardware maintenance contract which ranges from 18%-24% of the total equipment purchase price. At the time of this writing it is estimated that the total cost for the hardware production environment will be about $400,000. It is estimated that MLDS Center's cost for maintenance hardware per year will be approximately $72,000.

5. There will be no physical facilities costs during the interim period that MSDE is housing the development, test, and production LDS environments at DPSCS. MLDS Center will be responsible for physical facility costs after the grant period if it remains at DPSCS. At the time of this writing the estimated cost for physical facilities rack services is $18,000 per rack. It is estimated that MLDS Center will require only one rack at DPSCS. If the MLDS Center choices to move its production hardware environment after the grant to another physical data center then the MLDS Center will be responsible for its costs of housing and operation at the new data center.

6. If MLDS Center remains with DPSCS it will be able to share and have negotiated use of the MSDE environment and network that DPSCS has provisioned for MSDE including a VM environment, network, network security, mass storage, backup and recovery services, and disaster recovery systems at no cost. If the MLDS Center moves to a data center of its own choice it will need to purchase it own network, network security, mass storage, backup and recover, and disaster recovery systems and services.

7. MLDS Center will not be charged for the operating systems purchased for the LDS system, or associated maintenance costs, if the MLDS Center continues to operate the LDS system on the MSDE equipment at DPSCS. If MLDS Center relocates their machines purchased for the LDS by MSDE to another data center of their choice, the MLDS Center will need to purchase operating systems, associated software, and maintenance contracts.

8. If the MLDS Center continues to reside at DPSCS, data center operations procedures developed jointly by MSDE and DPSCS will be transitioned to the MLDS operations team. If the MLDS Center team moves the LDS systems to a data center of their choice, the MLDS Center will be responsible for developing their own data center operations and system administration procedures that fit the new environment it is locating to.

9. If there are other Oracle products that are purchased and be included in an expanded ULM contact, the MLDS Center will have access to any new products include in an expanded ULM licensing agreement.

10. During the interim period MLDS Center will be able to use the network and associated network security systems at no cost. If the MLDS Center moves the LDS system to a data center of their choice then the MLDS Center will be responsible for provisioning and paying for network, and associated network security, costs.

2.2 Summary Table of LDS Infrastructure Deliverables and Post-Grant Transition Description.

Table 2.2

Hardware, Software, and Maintenance Costs During the Interim Development and Operation Of the LDS System and after the Grant period is Expired and the LDS System Transitioned to The MLDS Center.

Infrastructure Item	Production Equipment & Specification	Oracle Products included in the UML License	Hardware Maintenance	Oracle Maintenance	Operating Systems	Documentation	Data Center Operations Procedures
Server Assumptions	System sized for 300 users with a concurrency rate of 50 people	NA	No charge during interim period full responsibility after interim period – see notes	No charge during interim period. Pro rated charge after interim period see notes.	All servers Windows DC 2008 R2	NA	NA
• http an application s servers	Yes – 2 CPU 6 core Dell system	Weblogic Suite llg	See note	See note	See note	Vendor documentation	See notes
• OBIEE server	Yes – 4 CPU 6 core Dell	OBIEE llg	See note	See note	See note	Vendor documentation	See notes

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Hardware, Software, and Maintenance Costs During the Interim Development and Operation Of the LDS System and after the Grant period is Expired and the LDS System Transitioned to The MLDS Center.

Infrastructure Item	Production Equipment & Specification	Oracle Products included in the UML License	Hardware Maintenance	Oracle Maintenance	Operating Systems	Documentation	Data Center Operations Procedures
	system						
• Portal server	Yes – 2 CPU 6 core DELL system	Weblogic suite llg WebCenter suite	See note	See note	See note	Vendor documentation	See notes
• Security server	Yes – 2 CPU 6 core DELL system	IAM Suite llg Adv Security Data Masking	See note	See note	See note	Vendor documentation	See notes
• DWH Database server	Yes – 4 CPU 6 core DELL system	DB EE llg OLAP Partitioning Adv Security	See note	See note	See note	Vendor documentation	See notes

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Hardware, Software, and Maintenance Costs During the Interim Development and Operation Of the LDS System and after the Grant period is Expired and the LDS System Transitioned to The MLDS Center.

Infrastructure Item	Production Equipment & Specification	Oracle Products included in the UML License	Hardware Maintenance	Oracle Maintenance	Operating Systems	Documentation	Data Center Operations Procedures
		Masking					
• GIS server	Yes – 2 CPU 6 core DELL system	Spatial 11g	See note	See note	See note	Vendor documentation	See notes
• Portal Repository	Yes – 2 CPU 6 core DELL system	Included with portal	See note	See note	See note	Vendor documentation	See notes
Performance utilities	NA	BPEL OBIEE Pack Diagnostics Tuning Change Mgmt	See note	See note	See note	Vendor documentation	See notes

Table 2.2

Hardware, Software, and Maintenance Costs During the Interim Development and Operation Of the LDS System and after the Grant period is Expired and the LDS System Transitioned to The MLDS Center.

Infrastructure Item	Production Equipment & Specification	Oracle Products included in the UML License	Hardware Maintenance	Oracle Maintenance	Operating Systems	Documentation	Data Center Operations Procedures
Backup System	Provided as part of interim support	NA	NA	NA	NA	NA	NA
Network	Provided as part of interim support	NA	NA	NA	NA	NA	NA
Disaster Recovery	Provided only during interim period	NA	NA	NA	NA	NA	NA
Server monitoring	Provided only during interim period	NA	NA	NA	NA	NA	NA

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Hardware, Software, and Maintenance Costs During the Interim Development and Operation Of the LDS System and after the Grant period is Expired and the LDS System Transitioned to The MLDS Center.

Infrastructure Item	Production Equipment & Specification	Oracle Products included in the UML License	Hardware Maintenance	Oracle Maintenance	Operating Systems	Documentation	Data Center Operations Procedures
Firewall	Provided only during interim period	NA	NA	NA	NA	NA	NA
Hardware monitoring	Provided only during interim period	NA	NA	NA	NA	NA	NA
Intrusion detection	Provided only during interim period	NA	NA	NA	NA	NA	NA
Antivirus	Provided only during interim period	NA	NA	NA	NA	NA	NA
Application	Provided only	NA	NA	NA	NA	NA	NA

Table 2.2

Hardware, Software, and Maintenance Costs During the Interim Development and Operation Of the LDS System and after the Grant period is Expired and the LDS System Transitioned to The MLDS Center.

Infrastructure Item	Production Equipment & Specification	Oracle Products included in the UML License	Hardware Maintenance	Oracle Maintenance	Operating Systems	Documentation	Data Center Operations Procedures
monitoring	during interim period						
Application management	Provided only during interim period	NA	NA	NA	NA	NA	NA
Application updates	Provided only during interim period	NA	NA	NA	NA	NA	NA
Security audits	Provided only during interim period	NA	NA	NA	NA	NA	NA
Technical support	Provided only during interim	NA	NA	NA	NA	NA	NA

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Hardware, Software, and Maintenance Costs During the Interim Development and Operation Of the LDS System and after the Grant period is Expired and the LDS System Transitioned to The MLDS Center.

Infrastructure Item	Production Equipment & Specification	Oracle Products included in the UML License	Hardware Maintenance	Oracle Maintenance	Operating Systems	Documentation	Data Center Operations Procedures
	period						
Database administration	Provided only during interim period	NA	NA	NA	NA	NA	NA
Load balancing	Provided only during interim period	NA	NA	NA	NA	NA	NA
DNS hosting service	Provided only during interim period	NA	NA	NA	NA	NA	NA
Performance tuning	Provided only during interim period	NA	NA	NA	NA	NA	NA

Table 2.2

Hardware, Software, and Maintenance Costs During the Interim Development and Operation Of the LDS System and after the Grant period is Expired and the LDS System Transitioned to The MLDS Center.

Infrastructure Item	Production Equipment & Specification	Oracle Products included in the UML License	Hardware Maintenance	Oracle Maintenance	Operating Systems	Documentation	Data Center Operations Procedures
Software installation and configuration	Provided only during interim period	NA	NA	NA	NA	NA	NA
Help desk User management	Provided only during interim period	NA	NA	NA	NA	NA	NA
Programming consultation	Provided only during interim period	NA	NA	NA	NA	NA	NA
DDoS protection and mitigation	Provided only during interim period	NA	NA	NA	NA	NA	NA
physical	Provided only	NA	NA	NA	NA	NA	NA

Table 2.2

Hardware, Software, and Maintenance Costs During the Interim Development and Operation Of the LDS System and after the Grant period is Expired and the LDS System Transitioned to The MLDS Center.

Infrastructure Item	Production Equipment & Specification	Oracle Products included in the UML License	Hardware Maintenance	Oracle Maintenance	Operating Systems	Documentation	Data Center Operations Procedures
facilities with access control, fire control, scalability, power backup, air-conditions, temp/humidity control	during interim period						

3. LDS System Custom Software Delivery

3.1 Delivery Notes for the LDS Custom Software, Data, and Applications Operations, and Maintenance Support

1. MSDE will transfer to the MLDS Center before or at the end of the RttT grant in 2014 all custom software components that comprise the LDS system for different custom developed components including but not limited to:
    a. Custom database structures,
    b. Database data,
    c. Portal application metadata and structures,
    d. Java, SQL, PL/SQL and HTML programming code used in HTML screen development, data base packages and triggers, batch processes, and OWB-ETL programs,
    e. Security setups
    f. Application management alerts
    g. BPEL processes
    h. Application management processes
    i. Custom documentation including requirements, development Specifications, and schema documentation for the custom developed portions of the LDS system.

3.2 Summary Table of LDS Custom Software Deliverables and Post-Grant Transition Description.

Table 3.2

Summary Table of LDS Custom Software Deliverables and Post-Grant Transition Description

Custom Component	Products to Transition	Documentation	End user Multimedia Training	Application Management	Programming Code	Operations Procedures	Other
Data warehouse database structures for 15 questions and crosswalk table	Database structures Security Setups for adv security, masking,	Schemas Printouts of security setups Design documentation for gap and decomposition analysis	NA	NA	PL/SQL packages SQL	Vendor documentation	NA
ETLs and staging table structures for	OWB-ETL project programs	Program code Schemas for	NA	NA	PL/SQL packages	Vendor documentation	NA

Table 3.2

Summary Table of LDS Custom Software Deliverables and Post-Grant Transition Description

Custom Component	Products to Transition	Documentation	End user Multimedia Training	Application Management	Programming Code	Operations Procedures	Other
loading data for the Crosswalk and 15 questions	Staging database table data structures	staging tables ELT load procedures			SQL		
Data	loaded at the time of the transition	NA	NA	NA	NA	Vendor documentation for exporting and importing and integrity management of data	NA
OBIEE Dashboards and Analytics	RPD structure OBIEE Security setups	Vendor documentation Requirements Design specs	2 navigation modules for OBIEE 1 multimedia	Vendor Documentation	SQL code	Vendor documentation	NA

Table 3.2

Summary Table of LDS Custom Software Deliverables and Post-Grant Transition Description

Custom Component	Products to Transition	Documentation	End user Multimedia Training	Application Management	Programming Code	Operations Procedures	Other
			user training module for each dashboard set				
Portal	Portal meta-repository Portal screens and pages Portal security setups	Vendor documentation Portal tree Hard copy of all portal pages	1 navigation multimedia module in Captivate	Vendor documentation	SQL code	Vendor Documentation	NA
Security server	Security setups	Vendor documentation	NA	Vendor documentation	NA	Vendor Documentation	NA

Table 3.2

Summary Table of LDS Custom Software Deliverables and Post-Grant Transition Description

Custom Component	Products to Transition	Documentation	End user Multimedia Training	Application Management	Programming Code	Operations Procedures	Other
		Design documentation setups		MSDE policies			
HTML Data entry/edit Screens	APEX programs	Vendor documentation Design specs	Multimedia module for each APEX screen	MSDE policies	HTML code	Vendor documentation	NA
GIS server	GIS data	NA	NA	NA	NA	Vendor documentation	NA
Data Dictionary	Application Database	Vendor documentation	NA	Vendor documentation	NA	Vendor documentation	NA

Appendix C

Security Tools Available in the LDS System for Use by the MLDS Center Upon Transfer of the System from MSDE

Security Tool Category	Security Tool	Purpose	Tool Available for LDS System	Responsibility for Use And Setup
IP secure transport	HTTPS and security certificates	Secure IP packet transport and connect identification	Possibly	MLDS Center IT team can use the setups implemented by MSDE team. If MLDS team Moves equipment to another vender outside the DPSCS Data Center, new setups will have to be implemented by the MLDS Center IT Team.
MFT File transfer system	TBE	Secure file transfer with file transfer management	Possibly	MLDS Center IT team can use the setups implemented by MSDE team. If MLDS team Moves equipment to another vender outside the DPSCS Data Center, new software to purchase and will have to be implemented by the MLDS Center IT Team.
Single Sign On	SSO-IDM	Single Sign On-Advanced Identity Management	Y	MLDS Center IT Team
Authentication	IDM	Login Integrated LDAP and Active directory Federation Access administration	Y	MLDS Center IT Team
Strong Authentication	OAAM	Strong Second Authentication	N	Not applicable
Authorization	SSO/IDM OBIEE APEX Portal	select access to both applications and data in data base – this is application level security	Y	MLDS Center IT Team
Internet Protocol Security/IP Encryption	Advanced Security	Packet Level Security	Y	MLDS Center IT team can reset the setups implemented by MSDE team if physical equipment stays @ DPSCS

				If MLDS team Moves equipment to another vender outside the DPSCS Data Center, new setups will have to be implemented by the MLDS Center IT Team.
Database Encryption	Advanced Security	FERPA/PIAA	Y	MLDS Center IT team can reset the setups implemented by MSDE team. If MLDS team Moves equipment to another vender outside the DPSCS Data Center, new setups will have to be implemented by the MLDS Center IT Team.
Low Level DB Masking	Advanced Security	FERPA/PIAA	Y	MLDS Center IT team can reset the setups implemented by MSDE team. If MLDS team Moves equipment to another vender outside the DPSCS Data Center, new setups will have to be implemented by the MLDS Center IT Team.
Database access security	Database Utilities, and DBVault	Enterprise Management Best Practices, USDE Governance Rules, FERPA, PIAA.	Y	Initial setup to be done by MSDE and DPSCS team. MLDS Center IT Team can modify as needed.
Intrusion Detection	IDS – vendor to selected	Penetration From Any Outside Sources	Possibly	This tool will only be available for incorporation into the LDS system if LDS systems stays at DPSCS
Systems	Grid Control Monitoring	Network Traffic/Bandwidth Management	Grid Control is free Some of the utilities can be used by MLDS Center IT Team	MLDS Center IT team can reset the setups implemented by MSDE team if physical equipment stays @ DPSCS If MLDS team Moves equipment to another vender outside the DPSCS Data Center, new setups will have to be implemented by the MLDS Center IT Team.